Antichistica 13
Filologia e letteratura 2

Certissima signa
A Venice Conference on Greek and Latin Astronomical Texts

edited by
Filippomaria Pontani

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Certissima signa

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Collana diretta da
Lucio Milano

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Foreword

Filippomaria Pontani
(Università Ca' Foscari Venezia, Italia)

The observation of the stars has never just been a matter of 'science', but has constantly intersected, supported or been amplified by material from the domains of philosophy, literature, medicine, religion, history and, indeed, sometimes of magic *tout court*. This is one reason why the study of ancient astronomy is such an immensely complex field. In addition, however, research into the history of astronomical writings often requires an acquaintance with if not a proficiency in skills such as paleography, mathematics, art history, ancient and medieval philosophy, codicology, geography, classical philology and others. Whereas there have been a few scholars from previous generations who attempted to tackle this immense body of material individually, even the earliest scholarship on the topic shows that it has always attracted collaborative ventures amongst specialists of differing disciplines.

It is in this tradition that the *Certissima signa* project was established in 2008 by Anna Santoni at the Scuola Normale Superiore in Pisa (see `http://certissimasigna.sns.it`). The project aims to create an international community of scholars from different backgrounds keen on the study of ancient astronomical texts and manuscripts, and more broadly on the history of science. The title of this volume records a shared commitment to this endeavour by all its authors.

The present collection of essays is based on papers delivered at a conference held at the Biblioteca Nazionale Marciana, Venice on June 16-17, 2016.[1] At the Venice meeting, the main focus of discussion was on topics exploring the relationship between texts and images, the *Nachleben* of the Greco-Latin tradition in later Western culture, the fate of astronomical theories and representations throughout the centuries and the relationship between astronomy and geography.

1 We are most grateful to the Dipartimento di Studi Umanistici of the Università Ca' Foscari for making the conference possible. We also wish to thank the series director, Lucio Milano, for accepting and promoting this volume, as well as the anonymous referees for their suggestions during the review process. Special thanks go to Kristen Lippincott for her invaluable support and to Anna Santoni, μήτηρ τοῦ λόγου.

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The volume opens with two papers devoted to the Biblioteca Marciana. Susy Marcon provides an illuminating survey of the history of the Marciana collections and introduction to the changing physical arrangement of the books within the Library across the centuries. Elisabetta Sciarra examines the history of some of the early printed editions in the Marciana and identifies some owners and annotators of the 'cinquecentine' in the collection. This choice to begin the volume with two essays devoted to the Library is not only a token of homage to the hosting institution, but it also mirrors a belief, shared by all contributors, in the absolute need for a close relationship between academia and libraries, and for a constant dialogue amongst researchers, librarians, archivists, keepers and curators, particularly where the 'special collections' of manuscripts, incunables and early printed editions are so rich and unique.

The discussion of ancient Greek astronomical theories is the focus of two papers. Jordi Pàmias explores the associations between myth and astronomy prior to Eratosthenes' *Catasterisms*, tracing certain elements back to the Pythagorean tradition of two centuries before. Klaus Geus and Irina Tupikova tackle the so-called 'zenith star method' for the measurement of the earth described by Ptolemy, discussing its possible dating and geographical location. Moving forward several centuries, Anne Weddigen examines some intriguing passages discussing planets and spheres in Manuel Bryennios' *Harmonica* (early 14th century), as well as the diagram with lunar phases that appears at the end of some manuscripts of Bryennios' treatise.

Shifting the focus to the transmission of Latin astronomical texts, there are three papers dealing with medieval manuscripts. In a painstaking study of one of the Biblioteca Marciana's manuscripts (ms. Marc. lat. VIII, 22), Fabio Guidetti explains why the iconography of the Carolingian star-catalogue in this codex, known as the *De signis coeli*, is so peculiar. He discusses its relationship with the images found in the related *De signis coeli* manuscript in Padua (Biblioteca Antoniana, ms. Anton. 27) and with the iconography of both the *Aratus Latinus* and Germanicus' *Aratea*. Anna Santoni addresses the relationship between the *De signis coeli* and the coeval treatise most often referred to as the *De ordine ac positione stellarum*. Her paper investigates the similarities and differences between the texts, as well as their relationship with the traditions preserved in Germanicus and the *Aratus Latinus*, especially with regard to the role of pagan mythology in the description of the skies. Finally, Francesco Bertola offers an overview of ten illuminations (one of which is from the above-mentioned manuscript, Marc. lat. VIII, 22) depicting the use of astronomical sighting tubes dating from the 10th through the 15th century, and presents his hypotheses concerning the use of these objects based on the available pictorial evidence.

The 15th century is a turning-point in the fate of Greco-Latin astronomy, which is particularly evident in Italian manuscripts and early printed editions of ancient texts from the period. Three papers explore different aspects of this phenomenon. Arnaud Zucker analyses the degree of correspondence in the positioning of the stars between text and images (and the sky) across twenty illuminated manuscripts of Hyginus' *De astronomia* dating to the late-15th and early-16th centuries. He provides a detailed description of the constellations as they appear in each of these various witnesses. Kristen Lippincott explores numerous issues regarding the illustrations of the *editio princeps* of Hyginus' *De astronomia* (Venice 1482) and the problems surrounding their apparent indebtedness to a set of drawings that first appear in a 12th-century Germanicus manuscript (Madrid, Biblioteca nacional, ms. 19) and resurface in the illustrations to the *Liber introductorius* of Michael Scot. In their contribution, Filippomaria Pontani and Elisabetta Lugato provide the first detailed description of one of the masterpieces of the earlier phase of the Aldine press: the 1499 *Scriptores astronomici veteres* – a remarkable incunable both for its selection of texts (some of which appear in a surprising philological *facies*) and for its illustrations (partly connected to those of the 1482 Hyginus).

The volume is rounded off by two essays that are more loosely connected with the history of astronomy *per se*, but address two texts of the utmost interest. Petr Hadrava and Alena Hadravova describe the textual tradition of Christannus de Prachaticz's *Treatises on the Astrolabe* (ca. 1407), and discuss the advantages of using a computer-based method in the preparation of their critical edition of the text. And, finally, Davide Baldi analyses the presence of quotations from Classical authors (amongst them, Ptolemy) in the 1507 *Cosmographiae introductio*, the earliest geographical treatise to baptise the New World as 'America'.

At the Marciana conference, all the papers were delivered in front of what might be considered the most venerable extant map of the world, Fra Mauro's planisphere (ca. 1450); and on those very days, the *incertissima signa* of Venetian meteorology decided to baptise the event by conjuring up a highly unusual midsummer *acqua alta*. Even if these *thaumata* cannot be mirrored on the written page, we hope that readers will get a flavour of the enthusiasm that brought together fourteen scholars from seven different countries in a spirit of friendship and cooperation – perhaps the finest tribute to a city whose greatest printer, Aldus Manutius, hosted in his house and in his books, a number of friends and scholars from various countries, in the conviction that, as William Grocyn stated in the 1499 *Scriptores astronomici*, "debent esse τὰ τῶν φίλων κοινά".

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Astronomica
Le segnature dei manoscritti marciani

Susy Marcon
(Biblioteca Nazionale Marciana, Venezia, Italia)

Abstract The physical arrangement of the volumes reflects the nature of a library. Throughout the various life stages of the Biblioteca di San Marco, astronomical manuscripts were placed on plutei and on shelves, according to an established order and to groupings by subject matter. Thus, our object of study will be the ancient (and the current) structure of the shelfmarks of the 'Marciani' manuscripts of astronomical content.

Keywords Marciana National Library, Venice. Astronomical Manuscripts. Catalogues and Shelfmarks. History of Libraries.

1 La disposizione dei volumi

Come primo intervento di questo volumetto *marciano* dedicato agli *astronomica*, e in particolare allo studio di singoli manoscritti e al censimento delle opere in essi contenute, è parso opportuno creare una sorta di cornice introduttiva per delineare in che forma la materia dell'astronomia e dell'astrologia, indissolubilmente legata alla matematica e alla musica, si presenti all'interno dei fondi manoscritti marciani. Terremo come assunto, che in questo contesto non ha bisogno di dimostrazioni, il fatto che la disposizione dei volumi (logicamente esposta o messa in atto fisicamente) è strettamente legata alla concezione di una biblioteca, e ne esplicita la natura e le finalità.[1] La storia di una biblioteca diventa immediatamente evidente nei cambiamenti che nel corso del tempo sono stati apportati all'ordine dei

1 Per l'inquadramento teorico, che esula dal presente, breve intervento, limitato e mirato, si rinvia senz'altro all'esame di Derolez 1979. Si vedano inoltre Rapp, Embach 2008, nonché l'introduzione di Giovanni Fiesoli ed Elena Somigli che apre il primo volume del RICABIM.

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volumi e alla loro inventariazione o catalogazione. Da questo punto di vista, le segnature dei documenti diventano particolarmente eloquenti.

La Biblioteca di San Marco, nata come vero e proprio *antiquarium* della Repubblica, consiste in raccolte che in buona sostanza possiamo definire di tipo umanistico.[2] Vedremo come nel corso dei circa cinquecento anni della propria esistenza la Biblioteca si caratterizzi per la prevalenza degli elementi di continuità nella concezione e sistemazione, insomma per il rispetto dei criteri esistenti alla propria fondazione. I cambiamenti si registrano invece nella collocazione fattiva dei volumi.

La struttura attuale delle segnature marciane è eloquente nell'esporre il contenuto testuale, e corrisponde a quella formalizzata verso la metà del Settecento. Per chiarezza ricordo sin da ora che la stringa identificante i codici conservati oggi presso la Biblioteca Nazionale Marciana (BNM) è formata da diversi elementi. In primo luogo compare la distinzione per lingua del testo, poi la classe e il numero di catena: si tratta della segnatura in senso proprio, fissata e codificata.[3] Al primo posto la lingua del testo contenuto: i manoscritti sono Greci, Latini, Italiani, Francesi del Fondo Antico, Stranieri dell'Appendice, Orientali (lingua abbreviata con Gr., Lat., It., Fr., Str., Or.). Segue l'indicazione dell'appartenenza al Fondo Antico, formalizzata con una Z. (che sta per Zanetti) seguita dal numero di catena, oppure dall'indicazione della 'classe' in numero romano, qualora il manoscritto (come preciseremo) sia entrato in Biblioteca in epoca successiva, seguita da serie separate di numeri di catena. Questa segnatura, identificante e invariata nel tempo, è seguita dalla collocazione fisica, un elemento che è mutato a seconda degli spostamenti dei volumi nei vari luoghi di conservazione, e attualmente è costituito da un numero arabo in serie continua apposto a partire dal 1904. Tale numero di collocazione fisica costituisce l'ultima parte della segnatura.

Le classi si identificano con quelle materie che la Scolastica medievale ha trasmesso agli umanisti, che l'Illuminismo ha poi ribadito, e che la risistemazione rigorosa del secondo Ottocento e Novecento non ha fatto che replicare sistematicamente. Tali classi corrono dai contenuti ecclesiastici e spirituali a quelli scientifici, civili e letterari, per chiudersi con le raccolte miscellanee.

2 Le fonti per la storia della Biblioteca Marciana sono raccolte con acribia da Ferrari 1986 (scritto intorno al 1954). Le vicende della Biblioteca sono delineate all'interno della storia dei patrizi veneziani e narrate con dovizia di particolari da Zorzi (1987). Nel presente intervento si fa riferimento ai due saggi, con rinvii anche taciti.

3 La lista completa delle segnature normalizzate, disposte per lingua e fondi (poiché le classi, per ragioni storiche costituiscono ormai veri e propri fondi), è pubblicata in `http://marciana.venezia.sbn.it/la-biblioteca/cataloghi/cataloghi-sede-di-manoscritti/lista-delle-segnature-di-tutti-i-codici`. Per facilitare il lettore che disponga di indicazioni parziali, la lista è pubblicata anche disposta nell'ordine delle collocazioni fisiche: `http://marciana.venezia.sbn.it/la-biblioteca/cataloghi/cataloghi-sede-di-manoscritti/tabella-delle-concordanze`.

I pochi fondi marciani che esulano da questa sistemazione sono acquisizioni moderne che rispondono alla rinnovata esigenza di rispettare i fondi specifici di provenienza: esemplare il Fondo Gozzi, ibrida la situazione del Fondo Praga e dell'Archivio Morelliano. Si tratta di storia recente, che in questa occasione tralasceremo.

2 La biblioteca bessarionea

Gli oltre 13.000 manoscritti oggi conservati presso la Biblioteca Marciana sono pervenuti grazie a lasciti e ad acquisti che, nel tempo, si sono venuti aggregando al nucleo primitivo costituito dalla biblioteca del monaco basiliano e cardinale Bessarione (Trebisonda 1400 ca.-Ravenna 18 novembre 1472), donata allo Stato veneziano nel 1468. La raccolta, cospicua di codici greci e latini, in numero tale da essere davvero imponente rispetto alle collezioni coeve, si era andata formando nella casa romana del cardinale di origini greche. Essa era iniziata dal piccolo nucleo che il presule aveva portato con sé dalla Grecia, per poi essere aumentata con commissioni specifiche di codici greci e latini, a partire dal 1450 circa e ancora più velocemente a seguito della caduta di Costantinopoli. La ricerca ininterrotta di codici antichi aveva affiancato l'opera di emendazione dei testi e di copiatura. L'intento di formare una biblioteca che dovesse durare nel tempo e costituire un punto di riferimento per lo studio della civiltà greca fu riaffermata dal cardinale niceno, a partire dal 1450, con l'apposizione del proprio stemma nelle copie da lui stesso commissionate, controllate nei testi e dall'aspetto formale prestigioso, nonché con la cura del reintegrare e riallestire i preziosi codici antichi.

Gli studi di Lotte Labowsky permettono di considerare il fondo bessarioneo comparando le segnature della sua biblioteca (i *loci* segnati all'interno degli *ex libris* parzialmente autografi apposti sistematicamente all'interno della guardia iniziale), e seguendo gli inventari che furono stilati in successione.[4]

Ai nostri fini, vedremo l'individuazione all'interno di tali inventari di un manoscritto greco e di uno latino contenenti testi astronomici, come esempio di ricerca.

L'interpretazione dei *loci*, o *topoi,* inseriti nell'*ex libris* manoscritto che correda i codici della raccolta bessarionea, non è stata ancora chiarita in modo tale da poter ricostruire come le raccolte fossero disposte nella sua casa romana. Infatti i numeri sovente sono sovrascritti, a indicare come i volumi abbiano avuto collocazioni diverse, non foss'altro che per il forte aumento del loro numero lungo una quindicina d'anni. La ricostruzione per

4 Gli inventari, corredati da tavole di corrispondenza tra le diverse numerazioni, sono stati pubblicati da Labowsky 1979.

materie secondo i *loci* è pur stata tentata, senza esito, e sarà necessario studiare ulteriormente, per verificare quale genere di ordine e di aggregazione vi fosse tra i vari manoscritti bessarionei.[5] Che esistesse però una sostanziale distinzione tra la serie greca e la serie latina si evince dal fatto che in tale modo è stilato nel 1468 l'inventario notarile dei volumi generato ai fini della donazione a San Marco. Gli svariati interessi testimoniati all'interno delle raccolte potrebbero giustificare una disposizione in blocchi di materie diverse, come peraltro si registra (almeno tendenzialmente) in altre coeve biblioteche monastiche, conventuali e di singoli umanisti, purché di dimensioni tali da imporre un ordinamento e una classificazione sistematica, seppure secondo svariatissimi casi.

Il monaco basiliano Bessarione, avviato agli studi religiosi, letterari e filosofici, unì all'educazione ascetica quella nelle scienze; elevatosi nei gradi ecclesiastici, partecipò al Concilio di Ferrara elaborando questioni dogmatiche sulla base di argomentazioni dottrinali e dell'esame degli scritti dei Padri della Chiesa. Alla documentazione sui testi greci, si aggiunse in seguito la conoscenza della lingua latina. La nomina a cardinale prete della basilica dei Santi XII Apostoli a Roma, e quindi la sua aggregazione alla Curia romana, avvenne nel dicembre 1439, con effettivo trasferimento nella sua nuova dimora presso il Laterano nell'autunno 1443. Il timore per l'avanzata dei Turchi lo indusse a sollecitare la coalizione delle forze per la salvezza delle terre occidentali, e lo spinse a formare una biblioteca che salvaguardasse la sopravvivenza della civiltà greca e bizantina. Lo studio della Patristica e una vieppiù conquistata conoscenza dei testi latini lo convinsero a sostenere l'unione delle due Chiese. Egli non si sarebbe più allontanato dall'ambito della corte pontificia romana se non per incarichi di legazione assegnatigli dal papa.

Visitatore apostolico dei monasteri basiliani dell'Italia meridionale e della Sicilia, si adoperò a vantaggio dell'Ordine e in favore della persistenza dell'uso e dello studio della lingua greca; ebbe modo di conoscere i fondi manoscritti conservati presso i monasteri; in particolare, nel 1456 venne nominato archimandrita dell'abbazia di San Salvatore a Messina, e nel 1462 abate commendatario del monastero di Santa Croce di Fonte Avellana e commendatario di Grottaferrata. Fu inoltre cardinale di Tuscolo dall'aprile 1449. Nel maggio 1463 egli fu nominato patriarca di Costantinopoli; dall'ottobre 1468 portò il titolo di vescovo Sabinense e non più Tuscolano. Tali titoli sono segnalati nelle note di possesso manoscritte poste nei suoi codici, e costituiscono indizi preziosi per periodizzare il momento di acquisizione dei singoli manoscritti. Si trattò dunque di una biblioteca variegata nelle materie, sempre disponibile per studi che avrebbero potuto trovare giovamento se vi fosse stata, come sembra ipotizzabile, un'aggregazione di serie di opere affini.

5 Gasparrini Leporace, Mioni 1968. Aggiornamenti in Fiaccadori 1994.

L'atto originale di donazione della biblioteca bessarionea a San Marco (lo Stato veneziano dunque, al tempo del doge Cristoforo Moro) chiedeva l'impegno a collocare i volumi in una sede veneziana degna di loro e dei lettori. Si tratta del codice marciano Lat. XIV, 14 (= 4235), di elegante fattura e racchiuso in uno scrigno coevo (fig. 1): *Acta ad munus literarium D. Bessarionis cardinalis Nicaeni, episcopi Tusculani et patriarchae Constantinopolitani, in Serenissimam rempublicam Venetam collatum spectantia*, datato a Viterbo il 31 maggio 1468. Papa Paolo II, della famiglia veneziana Barbo, ratificava poi la revoca della donazione bessarionea al monastero veneziano di San Giorgio Maggiore e acconsentiva la donazione all'attuale indirizzo. L'ambasciatore veneziano presso la sede apostolica Pietro Morosini prendeva possesso della biblioteca con atto redatto a Roma, nell'abitazione del cardinale presso i Santi XII Apostoli, il 26 giugno 1468. L'atto comprende l'*Index librorum utriusque linguae quos Bessario cardinalis et patriarcha Constantinopolitanus basilicae Beati Marci Venetiis dicavit*, suddiviso nelle due serie di libri greci (nel numero di 482) e latini (264) e non porta indicazioni di segnature o distinzioni di materie né di divisioni in scanni o scaffali, né suddivisione in casse o indicazione di previsione di spedizione. Una serie di cambiamenti nella disposizione dei volumi dovette verificarsi ulteriormente, poiché questa donazione del 1468, *inter vivos*, prevede che parte dei codici elencati – quanto serva al cardinale per i propri studi – rimanga presso di lui. Nella primavera del 1469 pervennero a Venezia le prime 30 casse, contenenti 466 fra i manoscritti inventariati. Tutti i restanti, aumentati di ulteriori acquisizioni e copie, giunsero con una seconda spedizione, nel febbraio del 1474, inviati da Urbino, dove il cardinale li aveva messi al sicuro presso il duca Federico da Montefeltro, prima di partire per il suo ultimo, fatale, viaggio. Risultano oggi posseduti a Venezia 548 codici greci, 337 latini, e 27 incunaboli a stampa.

Il catalogo settecentesco che, come vedremo in dettaglio, chiude il Fondo Antico, comprende 37 manoscritti nella classe dei *Mathematici et astronomi*, e sono tutti bessarionei, a segnalare il più che vivo interesse del cardinale per la materia (da Gr. Z. 300 a Gr. Z. 336).[6] Diversa la situazione dei manoscritti latini, legati in misura minore agli studi bessarionei. Nella classe del catalogo Zanetti latino dedicata ai *Mathematici et astronomi*, dei diciassette manoscritti (da Lat. Z. 327 a Lat. Z. 344) possono esserne riconosciuti al Bessarione solo otto, mentre gli ulteriori provengono dalle aggregazioni successive. Cinque erano appartenuti al patrizio Giacomo Contarini (1536-1595, lascito che ebbe effetto solo nel 1713), il quale ebbe fra i propri molteplici interessi anche quello per le scienze, l'architettura e la matematica, mentre gli altri quattro provengono dalla collezione

6 I dubbi ancora presenti nell'inventariazione settecentesca sono stati chiariti dalla catalogazione moderna, che riconosce per tutti la stessa provenienza: Mioni 1985, per i codici Gr. Z. 300-36.


ILLVSTRISSIMO ATQVE INVIC
TISSIMO PRINCIPI DNO CHRI
STOPHORO MAVRO DVCI ET
INCLYTO VENETORVM SENA
TVI BESSARIO CARDINALIS &
PATRIARCHA COSTANTINOPO
LITANVS SAL.
EQVIDEM SEMPER
à tenera ferè pueritiaq;
ætate omnem meum
laborem omne opera
curam studium que
adhibui ut quotcuq;
possem libros in omni disciplinarum
genere compararem. propter quod no
modo pleroslq; et puer et adolescens
manu mea conscripsi sed quicquid
peculiolæ seponere interim parca fru
galitas potuit in his coemendis ab
sumpsi. Nullam enim magis dignā
atq; præclaram supellectilem nullum

Figura 1. *Acta ad munus literarium D. Bessarionis*. 1468. Venezia, BNM, Lat. XIV, 14 (= 4235), f. 1*r* settecentesca formata di manoscritti ‘belli’ del letterato Giovan Battista Recanati (1687-1734) che in morte lasciò i propri libri alla Repubblica.

Tali codici bessarionei di materia astrologica e matematica, individuabili nelle tabelle della Labowsky (per i greci tabella alle pagine 439-40, per i latini alle pagine 450-51), a partire dalla segnatura settecentesca che ho or ora ricordato, si riscontrano con *loci* fisici solo parzialmente continui o coerenti. Le medesime tabelle registrano la presenza dei manoscritti negli inventari successivi al documento della donazione, che prenderemo ora in esame.

Gli ulteriori inventari disponibili del fondo bessarioneo non aiutano a chiarire la collocazione fisica dei manoscritti presso la casa del cardinale, poiché presentano elenchi divisi per casse destinate alla movimentazione, per i trasporti che avrebbero avuto come destinazione finale la sede veneziana.

Consideriamo dunque le fonti storiche in sequenza.[7] Il manoscritto marciano Lat. XIV, 15 (= 4592) è semplicemente una copia secentesca, pergamenacea, del testo dell’intero *munus* Lat. XIV, 14 (= 4235). Esso presenta l’inventario del 1468 nel medesimo ordine, senza aggiunte di disposizione sistematica, né di segnature o collocazioni fisiche.

Dopo il primo invio di 30 casse a Venezia, la seconda spedizione, da Urbino, avvenne nel febbraio 1474, e conteneva i codici che Bessarione tenne per studio sino alla morte, e i nuovi acquisti fino al 1472 (circa 265 manoscritti). L’inventario del 1474 (‘B’ nel testo della Labowsky), individuato nelle copie della Biblioteca Apostolica Vaticana, Reg. Lat. 2099, ff. 313-326, e Vat. Lat. 3960, ff. 19-46, presenta una divisione in 57 casse, designate mediante lettere e colori. La distinzione del contenuto delle casse per lingua è chiaramente mantenuta, anche se per i formati grandi e per ulteriori gruppi di codici si dovette derogare dall’ordine per materia, e nelle casse si mescolarono i greci con i latini. L’esame della Labowsky mostra come l’indizio dell’esistenza di un accorpamento sistematico emerga nel fatto che i testi sacri e quelli secolari risultano tendenzialmente disposti in casse diverse, in particolare per i codici greci, che sono nettamente prevalenti rispetto ai codici latini.[8]

Giunti a Venezia, i manoscritti furono ancora conservati in casse, inizialmente nella sala del Palazzo Ducale detta Sala Novissima (in seguito denominata Sala dello Scrutinio):[9] una condizione di conservazione non dissimile da altre raccolte coeve. La situazione dei codici bessarionei a Ve-

7 L’esame dettagliato si trova in Labowsky 1979.

8 Schema in Labowsky 1979, 41-42.

9 La relazione presentata nel 1738 dal procuratore e bibliotecario Lorenzo Tiepolo (nel Marciano It. VII, 754 (= 7284), ff. 71*r*-73*v*, 78*r*-80*v*) è fonte per questa e altre notizie. Ferrari 1986 trae le informazioni dalla prefazione mai pubblicata dello Zanetti alla catalogazione marciana che si stava effettuando in quegli anni, e della quale diremo qui oltre.

nezia, dopo circa cinquanta anni dalla loro consegna, e quando le raccolte pubbliche si limitavano ancora essenzialmente ai soli libri bessarionei, è dichiarata dall'Inventario del 1524: il bibliotecario Andrea Navagero, in partenza per l'ambasceria di Spagna, riconsegna i libri ai Procuratori de supra, avendo proceduto alla loro inventariazione.

Nel frattempo, dopo il 1485, i volumi in casse erano stati trasportati in un settore separato della Sala del Collegio del Palazzo Ducale. L'inventario del 1524 si legge nei manoscritti della Biblioteca Apostolica Vaticana, Vat. Lat. 14011, ff. 1-14, e della Österreichische Nationalbibliothek di Vienna, Lat. 96542 (inventario 'C' in Labowsky). Vi si mostra una divisione per casse, ma col contenuto che non corrisponde a quello delle casse inviate a Venezia. Si riscontra una riorganizzazione che presenta - è sempre la Labowsky a rilevarlo - una più netta separazione tra libri greci e latini, e un più sottolineato accorpamento delle materie nelle singole casse. Ci sarebbe stata quindi una chiara intenzione di disporre i volumi in modo sistematico, ai fini della pronta reperibilità e riconoscimento dei documenti. Del resto, il destino della collezione bessarionea, sulla quale si fonderà la raccolta antiquaria della Repubblica, era già stato determinato. La scelta transitoria del Governo, che nel 1494 aveva intravisto la possibilità di collocare la biblioteca nel convento domenicano ai Santi Giovanni e Paolo (dove già aveva sede la prestigiosa raccolta di manoscritti voluta da Gioachino Torriano) era stata definitivamente superata dalla decisione assunta nel 1515 di costruire la nuova Libreria di fronte al Palazzo Ducale.

Poco più tardi, l'inventario del 1543 mostra attuata la volontà di dare un nuovo ordine alla biblioteca, al tempo del bibliotecario Pietro Bembo. Questi tenne l'incarico prestigioso dal 1530, e divenne poi cardinale nel 1539, per trasferirsi infine a Roma. Il presule effettuò quindi la consegna appunto nel 1543. Intanto, nel 1531, a causa della riorganizzazione delle sale del Palazzo Ducale sotto il doge Andrea Gritti, i libri erano stati trasferiti in una sala della chiesa di San Marco raggiungibile dal portico. La totale mancanza di fonti iconografiche, di disegni o di schemi, fa sì che possiamo solo immaginare la situazione, che nel frattempo aveva avuto una evoluzione. L'inventario dei beni librari effettuato per la consegna da parte del bibliotecario Pietro Bembo al segretario ducale Benedetto Ramberti nel 1543 (marciano Lat. XIV, 17 = 4236, una sorta di vacchetta, contiene l'elenco designato 'D' in Labowsky) presenta i titoli disposti per 15 'Banchi' chiamati A-Q e per 'Numeri' 1-39 (fig. 2). Non sappiamo esattamente che cosa designino questi 'Numeri', se scaffalature o tavoli/banchi, ma è chiaro che il metodo di conservazione in casse era stato allora abbandonato per attuare disposizioni più aperte ai fini dell'individuazione dei documenti e della loro più agevole lettura. Labowsky giudica che la distinzione tra i gruppi di collocazione vi compaia effettuata in modo piuttosto confuso, anche se tendenzialmente sistematico. In effetti, i codici greci e latini risultano in parte misti all'interno delle suddette divisioni.

Un'ulteriore evoluzione si mostra nel 1545-1546, tramandata dal manoscritto marc. Lat. XIV, 111 (= 4057) (fig. 3), un esemplare di lavoro che ha la copia elegante nel marc. Lat. XIV, 16 (= 4053) (inventario 'E' di Labowsky). Si osserva che questo *Index librorum reverendissimi q. Cardinalis Niceni confectus mandato clarissimorum doctorum D. Sebastiani Foscareni, Marci Antonii Venerii, et Nicolai de Ponte Gymnasii Reformatorum, ut Senatus Consultum a X Viris factum tertio Calendas Ianuarii exequerentur, ordine literarum servato*, si configura, per la prima volta, come un catalogo. La disposizione delle voci è alfabetica per titolo o autore, distinta fra libri greci e latini. Accanto a ogni voce, è apposta la segnatura, per numero di 'Bancho' (banchi da 1 a 59: 38 greci e 21 latini) o di 'Armaria' e posizione di 'Monte' indicata da una lettera, il tutto segnato nel margine sinistro; d'altra parte, sul margine destro, viene riportato il numero sequenziale del libro. Labowsky rileva che la divisione per materia non è sempre rispettata. Si tratta di una riorganizzazione voluta dopo che nel 1544 i tre Riformatori allo Studio di Padova (Sebastiano Foscarini, Nicolò Da Ponte e Marcantonio Venier) avevano assunto la supervisione della Libreria, e avevano avuto l'incarico di redigere un nuovo inventario.

Continuava l'uso del metodo del prestito per i manoscritti: i registri oggi esistenti, Lat. XIV, 22 (= 4482) e Lat. XIV, 23 (= 4660), coprono gli anni che corrono dal maggio 1545 al novembre 1548 e dal febbraio 1551 all'aprile 1559.[10] Un accesso di tale genere poneva la biblioteca bessarionea nel circuito delle biblioteche monastiche e conventuali veneziane, che assicuravano una presenza 'pubblica' di esemplari delle opere letterarie e scientifiche nella città. L'uso della formula del prestito, e la consuetudine di liberalità anche da parte dei veneziani possessori di vaste e interessanti biblioteche sono testimoniati sin dal Quattrocento dal noto *ex libris* «Liber mei et amicorum» di Leonardo Giustinian e dalle note di prestito effettuate da Girolamo Molin tra il 1450 e il 1456.[11]

3 Due *astrologica* bessarionei

Seguiamo negli inventari (Labowsky 'A'-'E') un codice greco e uno latino. L'antico bessarioneo *Tabulae astronomicae* Gr. Z. 331 (= 552) (fig. 4) ha perduto le guardie antiche che dovettero portare l'*ex libris* manoscritto, e dunque non abbiamo più traccia del *topos* all'interno della biblioteca romana.[12] Nell'inventario del 1468 il codice è individuabile accanto a manoscritti di matematica, astronomia e musica, a confermare una certa

10 Omont 1887; Castellani 1896-97.

11 Cecchetti 1886, 166-67; Hobson 1949.

12 Mioni 1985, 59-60.

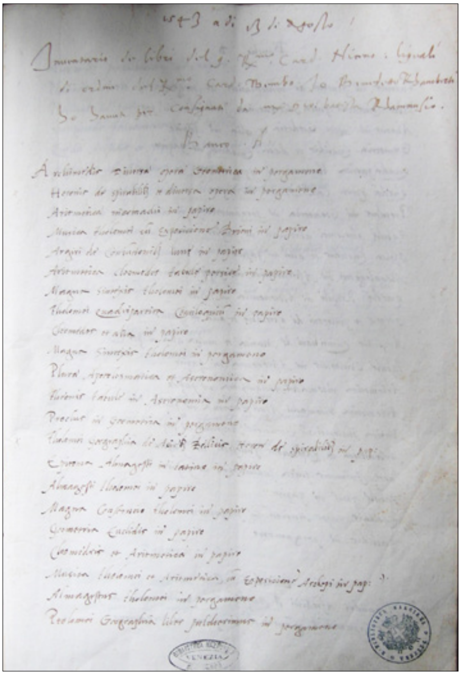

Figura 2 . *Inventario del 1543*. Venezia, BNM, Lat. XIV, 17 (= 4236), f. 2*r*

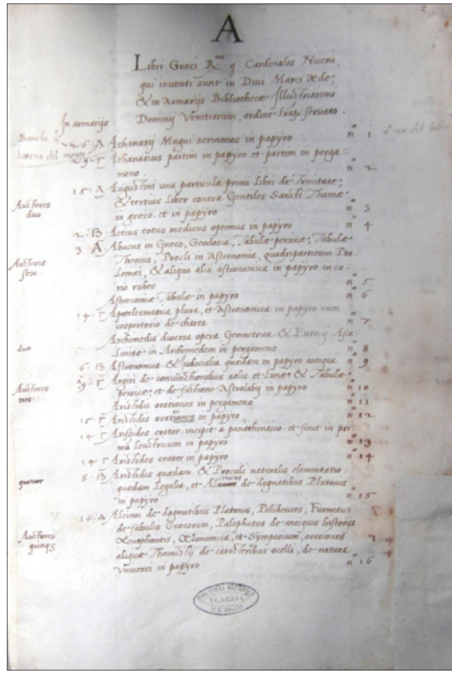

Figura 3. *Inventario del 1545-1546*. Venezia, BNM, Lat. XIV, 111 (= 4057), f. 2*r*

organizzazione dell’elenco per materia (Labowsky 1979, 167 nr. 254). Esso si ripresenta nell’invio del 1474, all’interno della cassa segnata ‘G’ in compagnia con codici di geometria aritmetica e astronomia (Labowsky 1979, 197 nr. 114). Nel 1524, *in capsa viridi signata B* si trova, ancora una volta, entro un insieme in qualche modo coerente, di contenuto secolare, o scientifico (Labowsky 1979, 246 nr. 28). Infine, esso non è stato individuato nell’inventario del 1543. Dunque, il codice in questione, che abbiamo tenuto come esemplare, presenta un posizionamento fisico coerente all’interno di una disposizione sistematica.

Appare meno organica la sistemazione dei pochi esemplari di *astronomica* in lingua latina. Il latino *Ioannis Blanchini Tabulae astronomicae*, Lat. Z. 341 (= 1988), un membranaceo coevo alla raccolta bessarionea, presenta nell’*ex libris* il topos 36 (fig. 5).[13] A ragione non può trovarsi nell’elenco del *munus*, poiché nell’*ex libris* Bessarione è definito cardinale Sabinense e dunque la sua acquisizione fu più tarda. Esso si riconosce nell’inventario

13 Valentinelli 1871, 255

Figura 4a-c. *Tabulae astronomicae*. Venezia, BNM, Gr. Z. 331 (= 552), coperta, controguardia, f. 1*r* del 1474 *in capsa signata N*, che tuttavia presenta ulteriori titoli di materia giuridica (Labowsky 1979, 232 nr. 764). Nel 1524 si trova inserito *in capsis ferratis signatis K et L*, accanto sia ad opere di aritmetica sia alle varie copie *dell'In calumniatorem Platonis* dello stesso Bessarione e ad altre opere di soggetto prevalentemente profano (Labowsky 1979, 283 nr. 801). L'inventario del 1543 lo colloca nel 'Numero 8' con vicini analoghi a quelli che si trovava accanto nell'elenco precedente (Labowsky 1979, 307 nr. 451).

4 La Libreria Sansoviniana, 'Libreria nuova'

Il riordino degli anni Quaranta del Cinquecento, che abbiamo considerato, aveva preparato la nuova concezione della Libreria. L'assetto della Libreria di San Marco, costruita davanti all'imponente mole del Palazzo Ducale, risulta ormai delineato. Per l'edificio si scelse un linguaggio di modello classico, nello stile romanista interpretato elegantemente da Jacopo Sansovino che lo disegnò lungo gli anni Trenta del Cinquecento e lo portò a compimento intorno al 1553. Lo spostamento dei volumi nella nuova sede a loro dedicata avvenne solo dopo il 1559 e si compì entro il 1565. Nel 1559-1560 la *Sapienza* di Tiziano, incastonata nel soffitto dell'Antisala, aveva completato i cicli figurativi della Libreria, e la Sala era pronta per accogliere i dotti e i potenti, mostrando loro per figure, lungo la scala e sui soffitti, come lo Studio, il Sapere, la Vita pia e la Bellezza siano necessari alla buona condotta umana e alla vita attiva del patrizio veneziano.

L'elenco dei volumi tramandato dalla copia nel manoscritto pinelliano dell'Ambrosiana, D 341 inf, e parzialmente nel marc. Lat. XIV, 18 (= 4321) (fig. 6), è l'inventario realizzato per la consegna dei volumi da parte del bibliotecario Bernardino Loredan al proprio successore Alvise Gradenigo nel 1575. Vi si mostra il contenuto librario della Sala Sansoviniana (inventario 'F' della Labowsky), disposto in 38 «scamna», ossia banchi, di cui 22 (dal numero 38 al 17) riservati ai codici greci, e 16 (dal numero 16 all'1) ai manoscritti latini e ai libri a stampa. I volumi sono ripartiti tra i plutei secondo raggruppamenti sistematici. In tale disposizione per materia, le matematiche e l'astronomia occupano i banchi 29 e 28.

Appunto il numero '28' si legge apposto sul primo foglio del manoscritto Gr. Z. 331 (= 552), che abbiamo osservato all'interno delle liste inventariali.

Figura 5. *Ioannis Blanchini Tabulae astronomicae*. Venezia, BNM, Lat. Z. 341 (= 1988), f. I*v*

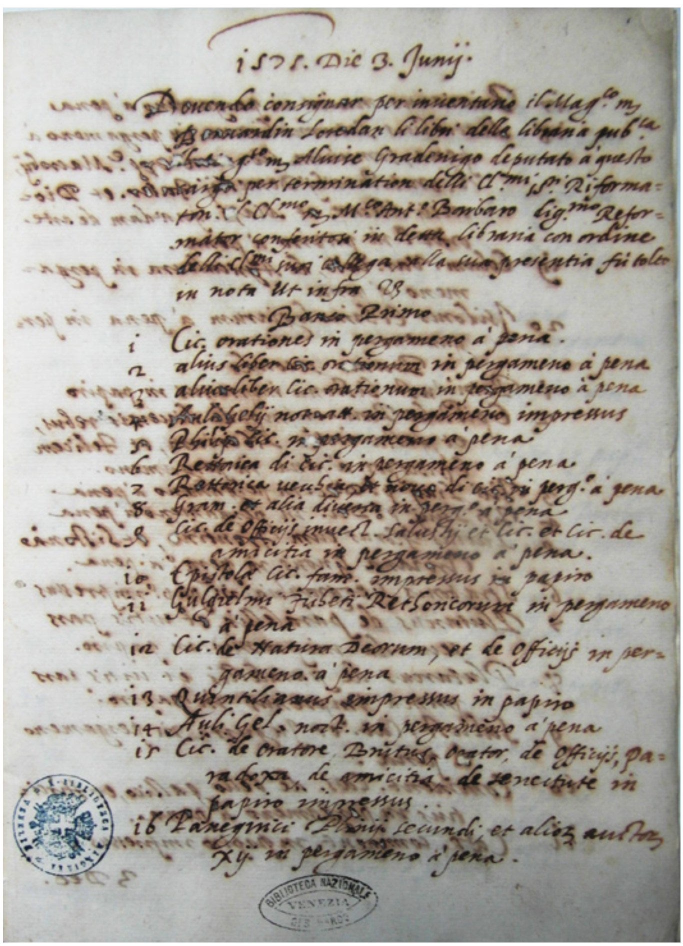

Figura 6. *Inventario del 1575*. Venezia, BNM, Lat. XIV, 18 (= 4321), f. 1*r*

5 La Libreria nel Seicento

L'intervento che fu effettuato su tutti i volumi nel Settecento purtroppo ci nasconde eventuali cambiamenti operati nel momento dell'allestimento medio e tardo cinquecentesco della Sala della Libreria. Ne possiamo indovinare solo qualche traccia. In particolare, non sappiamo se nel medio Cinquecento i libri abbiano subito adattamenti fisici, quando, come abbiamo considerato, furono disposti fuori dalle casse e poi trasportati nella nuova Libreria, dove trovarono collocazione nei, o sui, banchi. Come «banchi de nogara» sono indicati in un documento del 1558 relativo al pavimento, «scamna» nell'inventario del 1575 indicato qui sopra.[14] Francesco Sansovino descrive sinteticamente come la Libreria fosse «copiosa di cose singolari, et compartita con diversi banchi dalla diritta e dalla sinistra».[15]

L'inventario del 1637 compilato dal custode Santo Damiani, nel manoscritto marc. Lat. XIV, 19 (= 4322) (fig. 7), elenca i medesimi 38 plutei, ai quali si aggiungono nuovi armadi contenenti soprattutto gli accrescimenti. Questo inventario corrisponde all'edizione curata dal custode della Libreria e sovrintendente alle stampe Giovanni Sozomeno dopo il 1624 circa[16] e a quello relativo ai manoscritti *Cardinalis Bessarionis* – ma anche ai codici aggiunti – nelle *Bibliothecae Venetae* del Tomasini edite nel 1650.[17] Gli accrescimenti erano stati pochissimi per quanto riguarda i manoscritti, che si possono conteggiare in nove più dei bessarionei, mentre più di duemila erano ormai i libri stampati, grazie in particolare alla liberalità del dotto medico tedesco Melchiorre Guilandino (morto nel dicembre 1589). L'inventario del 1637 mostra chiaramente che in quei 38 plutei e armadi le opere erano raggruppate per materia. L'intestazione riguardante i ff. 7-55 recita «Index catenatorum in pluteis», e quella per i ff. 58-250 «Index repositorum in armariis». Il termine qui è «pluteus», ripreso poi dal Tomasini, corrispondente a quello che nella stampa attribuita al Sozomeno era detto «in scamno». Non sfuggirà l'apparire dell'indicazione di incatenamento, che possiamo interpretare letteralmente come l'aggiunta di catene ai codici.[18]

Questa disposizione fisica è confermata nella *Pictura Venetae urbis* di padre Francisco Macedo, che nel 1670, nella *Tabula sexta* dedicata a Bat-

14 Zorzi 1987, 159-61, 551; Rossi Minutelli 2004, 425.

15 Sansovino 1581, f. 114*r*.

16 *Catalogus librorum manuscriptorum ex legato reverendissimi cardinalis Bessarionis*, seguito dall'*Index librorum impressorum in classes distributus secundum materias*. S.l.: s.n.; Zorzi 1987, 214-16, 476-77; Marcon 1994, 184-85; Rossi Minutelli 2004, 423-28.

17 Tomasini 1650, 31-55.

18 Delle catene: Marcon 2013.

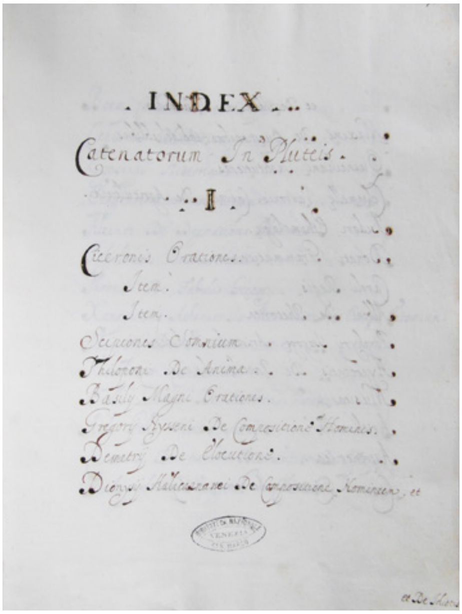

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Figura 7. *Inventario del 1637*.
Venezia, BNM, Lat. XIV, 19 (= 4322), f. 7*r*

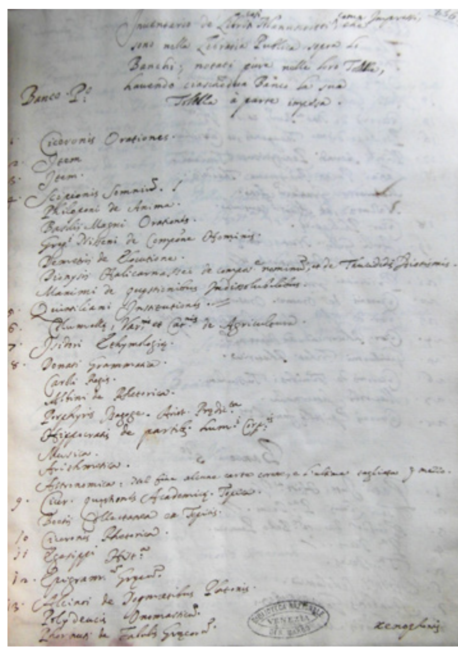

Figura 8a-b. *Inventario del 1679*. Venezia, BNM, Lat. XIV, 20 (= 4323), ff. 1*r*, 836*r* tista Nani bibliotecario del tempo, descrive a parole la Libreria veneziana, con grande efficacia visiva. Questa fonte letteraria costituisce per noi una preziosa testimonianza. Egli osserva come erano posti i volumi nella Sala ornatissima, entrando nella quale si vedeva nel fondo la sezione individuata come di Teologia e Patristica, e come i libri corressero intorno alla Sala disposti per materie ben individuate dalle legende, ossia i libri erano posti in serie: «ligneis distincti columellis currunt, nomine facultatum, ad quas pertinent, scripto». Permanevano i plutei, ai quali i libri erano legati con catene:

> A porta via quaedam media inter pluteos a dextra laevaque extantes patet, ea libere discurrit, cum alligati hinc inde suis repositoriis libri contineantur, catenis pendentibus: quae sonitu moneant liberos homines, si in litteris velint proficere, fore debere librorum mancipia.

Il testo prosegue:

> Plutei omnes, si numerentur, octo supra triginta efficiunt numerum, librorum vero argumenta suis inscripta tabellis in singulis scamnis appenduntur.[19]

Dunque i 38 plutei portavano l'indicazione del contenuto, distinti per materia.

Cinquant'anni più tardi rispetto al catalogo che abbiamo considerato sopra, ma in stretta corrispondenza con la descrizione di padre Macedo, avvenne un importante rinnovamento, nell'epoca del nuovo bibliotecario Silvestro Valier (dal 1679 al 1694). Lamentando i danneggiamenti intervenuti, e per ovviare ai disordini, egli provvide subito a far redigere un inventario aggiornato, e nel 1680 progettò di eliminare i banchi per proteggere i volumi dentro armadi, accompagnandoli con «quattro gran tavole». L'eliminazione dei plutei dovette essere attuata progressivamente negli anni successivi.[20]

Intanto, in questo inventario del 1679 concernente tutti i libri, manoscritti e a stampa, compaiono i medesimi 38 «scamna», accanto ad armadi ormai prevalenti, dal momento che erano intervenuti accrescimenti del patrimonio librario e alcuni spostamenti dai plutei. Si tratta del manoscritto Lat. XIV, 20 (= 4323) (fig. 8), redatto dal custode abate Ambrogio Gradenigo per ordine del bibliotecario Silvestro Valier, futuro doge: alle pagine 856-900 si legge l'elenco delle opere poste nei 38 'banchi'. Il titolo di quest'ultima parte conferma la descrizione di padre Macedo, poiché recita «Inventario de libri [così (sovrascritto)] manuscripti [co-

19 Macedo 1670, 51-59. Le citazioni sono tratte da p. 55.

20 Zorzi 1987, 229-32.

me impressi (sovrascritto)], sono nella Libreria Publica sopra li Banchi; notati pure nelle loro Tolelle, havendo ciaschedun Banco la sua Tolella a parte impressa».

Tutti gli altri libri si trovano in armadi. La disposizione di ciascun volume è per 'Armer', 'Theca': 3 per il primo armadio, 'Ordine': 4 per la prima theca del primo armer, e 'Numero': una vera e propria collocazione fisica, che persisterà nel tempo e della quale si trova ancora traccia nei manoscritti.

6 Il riordino settecentesco «custos vel ultor». La formalizzazione delle segnature marciane

I tempi del bibliotecario Girolamo Venier (in carica dal 1709 al 1735) e di Lorenzo Tiepolo (bibliotecario dal 1735 al 1742) portarono a una rinnovata volontà di riordino e di tutela dei documenti, e un ritrovato orgoglio.[21] Ne conseguirono cambiamenti sostanziali ai manoscritti e agli stampati preziosi. Si volle renderli parte di un insieme riconoscibile come appartenente alla Libreria pubblica e alle collezioni della Serenissima, mediante un'azione invasiva e irreversibile che oggi ci impedisce, almeno in parte, la possibilità di conoscerne lo stato precedente. Si rese uniforme l'intera collezione eliminando le coperte antiche (a volte insieme alle guardie antiche) e apponendo, anche per i codici greci, coperte leggere tutte uguali, dai quadranti di cartone, nervi alla latina e dorso collato, contrassegnate dal leone in moleca impresso sulla pelle chiara. La nuova legatura rendeva i volumi rispondenti al gusto del tempo, e adatti alla conservazione in verticale entro armadi.

Si tutelarono i volumi mediante l'apposizione del nuovo *ex libris*, inciso da Andrea (?) Zucchi, portante la figura del leone guerresco «custos vel ultor». Il leone alato (simbolo di san Marco), in una posizione a mezzo tra quella rampante e quella frontale (quest'ultima forma è denominata leone in moleca), brandisce la spada (leone ensifero, in connessione con la figura di Venezia come Giustizia), tiene il Libro (del Vangelo, come gli compete) ma anche altri numerosi libri (figurazione ampliata in relazione al tema specifico) sui quali domina per custodirli con forza e, se del caso, prontamente vendicare (di qui il motto).[22]

Si generarono nuovi cataloghi, concepiti secondo dettami aggiornati. Si costituirono le segnature che permangono tuttora: rispettando la fondamentale divisione per lingua, il riordino mantenne una serie di codici greci

21 Sulla funzione della raccolta libraria all'interno dello Stato veneziano riflettono Pesenti 1990; Raines 2010.

22 Marcon 2007.

e una di codici latini. La catalogazione sistematica dei fondi manoscritti uscì a stampa nel 1740 e 1741.

La sostituzione delle coperte e la catalogazione furono anche, indubbiamente, un gesto di doverosa omologazione alle grandi collezioni reali europee che avevano già preso o stavano venendo a decisioni analoghe, come le biblioteche reali di Parigi e di Vienna, a partire dalla seconda metà del Seicento. Per la Biblioteca Cesarea di Vienna il catalogo dei codici, che fu concepito come completo, ma si dovette limitare alla descrizione, peraltro particolarmente ricca, dei codici greci, era stato pubblicato già nel 1665-1679 da Peter Lambeck. Seguì, esemplare, l'impresa dotta del paleografo maurino Bernard de Montfaucon, dedicata ai codici greci di Henry-Charles de Coislin vescovo di Metz, nel 1715. La brevità e la riduzione della descrizione agli elementi fondamentali caldeggiata da quest'ultimo ispirarono certamente le scelte catalografiche marciane, mentre il catalogo della Biblioteca Regia parigina, stampato fra il 1739 e il 1744, seguì il modello viennese, in una stagione di produzione catalografica in tutta Europa. Quanto a Venezia, gli esempi del catalogo della biblioteca del cardinale Imperiali redatto da Giusto Fontanini e stampato a Roma nel 1711, nonché l'elenco relativo alla Biblioteca Universitaria di Padova, compilato tra il 1721 e il 1728, avevano decretato la necessità di nuove catalogazioni anche per la Biblioteca di San Marco.

Con i due cataloghi a stampa si chiuse quello che oggi denominiamo usualmente Fondo Antico. Furono redatti con criteri uguali, che vedono evidenziata la segnatura e l'eventuale indicazione della provenienza, seguite da un'area dedicata ad alcuni elementi basilari di descrizione fisica e dall'identificazione dei testi contenuti. Sui manoscritti si appose una numerazione sistematica dei fogli, che venne seguita nella descrizione. La catalogazione fu portata a termine in breve tempo, per i codici greci fra il 1736 e il 1738, dai due firmatari della prefazione, il vicentino grecista Antonio Bongiovanni (1712-1762) e l'erudito veneziano Anton Maria Zanetti il Giovane (1705-1778), che Lorenzo Tiepolo volle fosse nominato bibliotecario di San Marco dal 1736 appunto, e che ricoprì tale carica sino alla morte. L'antiporta incisa, e la figurazione nella pagina del titolo, saranno ristampate all'inizio del catalogo dei codici latini che uscirà l'anno successivo. L'antiporta architettonica dal bel tratto disegnativo e dall'incisione chiaroscurata, porta nel frontone il San Marco in forma di leone alato e nimbato, che regge il libro aperto inscritto delle parole che la leggenda tramanda l'angelo avesse pronunciato all'arrivo del corpo di Marco nelle lagune (fig. 9). Al centro è contenuto l'omaggio al cardinale Bessarione, che si vede nell'abito del monaco basiliano, e con l'attributo del cappello cardinalizio, sulla scorta del ritratto belliniano che si conservava presso la Scuola Grande della Carità. Il disegno dell'incisione, dall'equilibrio classicista, è di Giambattista Moretti, ornatista e quadraturista che fu iscritto nel

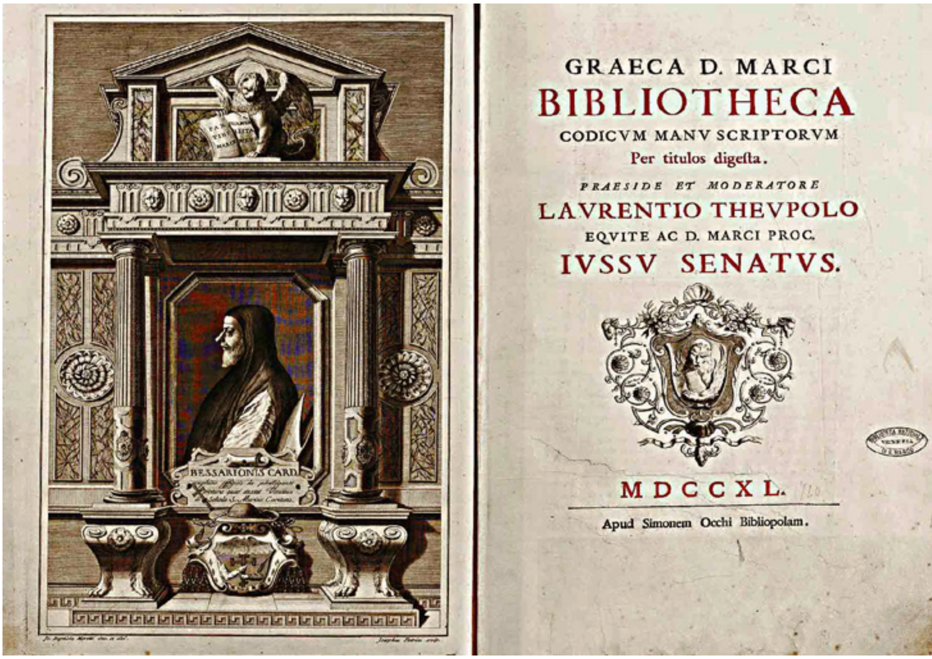

Figura 9. Anton Maria Zanetti il Giovane e Antonio Bongiovanni, *Graeca D. Marci Bibliotheca codicum manu scriptorum per titulos digesta*. [Venetiis], Apud Simonem Occhi Bibliopolam, 1740. Frontespizio

libro della Fraglia veneziana dei pittori dal 1732 al 1744,[23] e che partecipò all'elaborazione dei decori a stucco e intaglio, avviati nel 1736, della Sala aggiuntiva assegnata alla Libreria per accoglierne i volumi ormai straripanti. A favore della nuova sala lo stesso 'custode' Anton Maria Zanetti il Giovane aveva ideato gli armadi e gli ornamenti in collaborazione con il marangon veneziano Battista Gafforello; Giambattista Moretti aveva fornito i disegni, lo scultore agordino Giovanni Marchiori aveva eseguito gli intagli lignei, mentre l'invenzione e l'esecuzione del soffitto a stucco fu dei celebri plasticatori luganesi Abbondio Stazio e Carpoforo Mazzetti detto il Tencalla. Perduti interamente gli armadi e la decorazione, ne conserva il ricordo solamente una nota in un manoscritto che raccoglie le memorie relative alla Biblioteca (Ris. 113,150-51).[24]

23 Favaro 1975, 159.

24 Venezia, Biblioteca nazionale Marciana, Ris. 113: *Raccolta de' Decreti et altre carte concernenti la Publica Libreria, e tutto ciò che in essa si conserva. Fatta unire da missier Lorenzo Tiepolo Cav. e Proc. Bibliotecario nell'anno MDCCXXXVI*. Per i riferimenti interni

Come si è detto, porta la data del 1740 il catalogo dei codici greci redatto da Anton Maria Zanetti il Giovane e da Antonio Bongiovanni, *Graeca D. Marci Bibliotheca codicum manu scriptorum per titulos digesta*, [Venetiis], Apud Simonem Occhi Bibliopolam, 1740. Si tratta dell'inventario dei 533 manoscritti greci provenienti dalla donazione del cardinale Bessarione cui si aggiungono i manoscritti giunti in Biblioteca con legati successivi, in particolare di Iacopo Gallicio (1624), di Iacopo Contarini (1595, con effetto nel 1713) e di Giovan Battista Recanati (1734).

Questo nuovo catalogo è ordinato per classi, ma designa i manoscritti con un'unica serie di catena. Le classi sono 13, dalle opere sacre a quelle profane e infine miscellanee: I *Biblia sacra et interpretes*, codd. 1-38; II *Patres et scriptores ecclesiastici*, codd. 39-163; III *Concilia et canones*, codd. 164-171; IV *Ius civile*, codd. 172-183; V *Philosophi*, codd. 184-268; VI *Medici*, codd. 269-299; VII *Mathematici et astronomi*, codd. 300-336; VIII *Historia ecclesiastica et vitae sanctorum*, codd. 337-363; IX *Historia profana*, codd. 364-414; X *Rhetores*, codd. 415-452; XI *Poetae*, codd. 453-481; XII *Grammatici*, codd. 482-493; XIII *Miscellanea*, codd. 494-533; *Appendix graecorum codicum ex legato Jacobi Contareni, Jo. Bapt. Recanati aliorumque*, codd. 534-625. Lo scarno indice finale è redatto per nomi d'autore.

Osserviamo come la classe settima, dedicata insieme alla matematica e all'astronomia (ma anche alla teoria musicale), contenga 37 codici. Come abbiamo accennato in apertura, si tratta di manoscritti provenienti esclusivamente dal cardinale Bessarione, che risulta quindi essere stato fortemente interessato alla materia e alle sue fonti greche.

Si procedette velocemente anche con il catalogo dei codici latini, analogo per aspetto e modello catalografico. La descrizione dei codici latini fu portata a termine fra il 1738 e 1741 e uscì subito a stampa, con la prefazione firmata dal solo erudito Anton Maria Zanetti il Giovane; ma questi dovette essere aiutato nella stesura del catalogo da Giacomo Vezzi.[25] In questo catalogo di [Anton Maria Zanetti e Jacopo Vezzi], *Latina et italica D. Marci Bibliotheca codicum manu scriptorum per titulos digesta*, [Venetiis], Apud Simonem Occhi Bibliopolam, 1741, sono descritti 550 manoscritti latini, seguiti da 86 italiani e da 25 in lingua francese antica.

Il catalogo è ordinato per classi, in unica serie di catena, con lievi varianti rispetto alla catalogazione dei codici greci: si aggiunge una classe di Theologi, e le classi quindi sono quattordici: I *Biblia sacra et interpretes*, codd. 1-37; II *Patres et scriptores ecclesiastici*, codd. 38-93; III *Theologi*, codd. 94-162; IV *Concilia et ius canonicum*, codd. 163-199; V *Ius civile*,

al codice, che contiene svariata documentazione su quanto stiamo considerando, rinvio a Zorzi 1987, in questo caso alla p. 493.

25 Il nome di Iacopo Vezzi compare solamente nella prefazione dell'esemplare manoscritto datato 1740, conservato nella Biblioteca Marciana con segnatura Lat. XIV, 110c (= 4533).

codd. 200-224; VI *Philosophi*, codd. 225-312; VII *Medici*, codd. 313-326; VIII *Mathematici et astronomi*, codd. 327-344; IX *Historia ecclesiastica*, codd. 345-360; X *Historia profana*, codd. 361-410; XI *Rhetores*, codd. 411-437; XII *Poetae*, codd. 438-461; XIII *Philologi et grammatici*, codd. 462-489; XIV *Miscellanea*, codd. 490-504; Segue un'appendice relativa ai codici «qui nuper (1739) in parte superiori ducalis ecclesiae inventi sunt», codd. 505-550. Lo scarno indice finale è redatto per nome d'autori e titoli di opere anonime.

Abbiamo già osservato sopra come la classe ottava, dedicata insieme alla matematica e all'astronomia, contenga un esiguo numero di codici, ossia 18, comprendenti anche la teoria musicale: come dicevamo, la presenza tra essi di codici bessarionei è molto ridotta.

7 Le cosiddette Appendici

Per la catalogazione fondamentale del 1740-1741 si scelse in buona sostanza una continuità con la disposizione bessarionea per lingua e (come si intravvede negli inventari) sistematica.

Anche negli accrescimenti intervenuti, i contenuti continuavano ad essere di tipo letterario, filosofico e patristico e di testimonianza della cultura antica, medievale e soprattutto umanistico-rinascimentale. Le acquisizioni successive al 1740 furono dovute principalmente a lasciti o acquisti di collezioni e all'incameramento dei beni delle mani morte, ossia provenienti dai soppressi ordini religiosi. Vi si testimonia una continuità negli interessi fondamentali, arricchiti da incrementi di materia veneta o concernenti Venezia, e di opere chiesastiche o religiose. Proprio a seguito di tali significativi incrementi nelle collezioni si dovette pensare ad aprire nuovi cataloghi, che furono designati come *Appendici* al Fondo Antico che si era chiuso con i cataloghi dello Zanetti. Si tratta del catalogo tuttora corrente e aperto.

La registrazione dei numerosi doni e acquisizioni che si erano avuti dopo la chiusura dei cataloghi a stampa – e molte furono in particolare le acquisizioni conseguenti alle soppressioni delle case religiose a partire dal 1784 – era stata effettuata in maniera in qualche modo disordinata, sino alla decisione di generare nuovi cataloghi. La redazione ordinata del nuovo catalogo, voluta dai Procuratori *de supra* e dal bibliotecario Iacopo Morelli, fu stilata autografa in questi volumi da Pietro Bettio che, assunto allo scopo di compilare cataloghi, diede dapprima un elenco ordinato di tutti gli stampati nel 1795-1796, e, a seguire, redasse i cataloghi dei manoscritti, divisi per lingua e per classi, e corredati da indici. Il veneziano Pietro Bettio (1769-1846) fu vice-custode della Biblioteca dal 1794, e bibliotecario alla morte del Morelli (1819). Il considerevole lavoro del Bettio produsse la serie ordinatissima dei cataloghi manoscritti delle *Appendici*.

Figura 10. *Opera astronomica*. Venezia, BNM, Gr. VI, 9 (= 1066), controguardia

Egli iniziò e continuò per buona parte a compilare le descrizioni e gli indici del *Catalogo dell'Appendice ai codici greci*, del *Catalogo dell'Appendice ai codici latini*, del *Catalogo dell'Appendice ai codici italiani*, e compilò il *Catalogo dei codici orientali*. Varie mani di bibliotecari marciani hanno in seguito inserito le nuove voci, relative ai codici che venivano man mano aggiungendosi ai fondi della Biblioteca.

Ci si attenne comunque all'ordinamento settecentesco: la fondamentale suddivisione per lingue si articola in classi. Tuttavia, essendo aumentato il numero dei manoscritti, e poiché si trattava di un catalogo che nasceva come aperto alle nuove acquisizioni, si generò una serie di catena diversa per ogni classe.

Il *Catalogo dell'Appendice ai codici greci* consta di un volume, con indici contenuti in un volume separato. I manoscritti sono divisi in classi che corrispondono a quelle del catalogo Zanetti-Bongiovanni, salvo che per l'eliminazione di una classe separata di *Ius civile* e per la riunificazione della *Historia profana* a quella *sacra*. Le classi sono undici: I *Biblia sacra et interpretes*; II *Patres et scriptores ecclesiastici*; III *Concilia et canones*;

Figura 11. *Liber de astronomia*. Venezia, BNM, Lat. VIII, 22 (= 2760), f. 1*r*

IV *Philosophi*; V *Medici*; VI *Mathematici [et musici]*; VII *Historia sacra et profana*; VIII *Rhetores*; IX *Poetae*; X *Grammatici*; XI *Miscellanea*.

Osserviamo che la classe sesta ha preso il nome dei prevalenti codici di contenuto matematico e musicale, benché continui a contenere anche gli *astrologica*.

Consideriamo come esempio il codice cartaceo secentesco Gr. VI, 9 (= 1066) (fig. 10): *Opera astronomica*, entrato in Biblioteca con le raccolte di Jacopo Nani (legato del 1797). Il numero della collezione naniana, 272, è presente nel manoscritto al f. 1*r*, e riportato nel catalogo a penna delle Appendici.[26] In quest'ultimo volume, a lato della breve descrizione, sono state riportate due collocazioni di armadiature, la prima delle quali è cassata (verosimilmente appartenennero agli armadi nella Libreria, e dopo il 1812 a quelli in Palazzo Ducale), e la collocazione fisica attuale 1066 generata nel 1904.

26 Mioni 1960, 11-12.

Analoghi i criteri delle appendici ai codici latini. I codici sono divisi in classi che corrispondono a quelle del catalogo Zanetti, i numeri di catena sono separati per ciascuna partizione. Il catalogo, corposo, si presenta fisicamente in quattro volumi. Quattordici le classi: I *Biblia sacra et interpretes*; II *Patres et scriptores ecclesiastici*; III: *Theologi*; IV *Concilia et ius canonicum;* V *Ius civile*; VI *Philosophi*; VII *Medici*; VIII *Mathematici et astronomi*; IX *Historia ecclesiastica*; X *Historia profana*; XI *Rhetores*; XII *Poetae;* XIII *Philologi et grammatici*; XIV *Miscellanea*.

La classe ottava, situata come d'abitudine in quello spazio centrale dell'ordine, dove trova posto la scienza in qualche modo misurabile, dopo le materie religiose e chiesastiche e prima di quelle storiche e letterarie, si denomina in base ai prevalenti codici matematici ma comprende quelli astronomici e anche la teoria musicale.

Osserviamo ad esempio il membranaceo *Liber de astronomia* Lat. VIII, 22 (= 2760), che era raffigurato nella locandina del nostro convegno Marciano, e proviene dalle collezioni a prevalente carattere letterario di Tommaso Giuseppe Farsetti (legato del 1792) (fig. 11).[27] Nel catalogo, a lato della voce descrittiva, compaiono tre collocazioni progressive, analogamente che per il codice greco appena preso in considerazione. Il manoscritto venne descritto da Giuseppe Valentinelli nel volume IV della *Biblioteca manuscripta,* stampato nel 1871, alla p. 255 come codice nr. 73 della sua classe undecima.

8 Il catalogo dei codici latini di Giuseppe Valentinelli

Con la catalogazione del medio Settecento, sostanzialmente rispecchiata dalla catalogazione nelle Appendici, si erano sviluppati gli accessi tematici ai codici marciani, mediante una chiara disposizione per classi e con una indicizzazione dei nomi. È interessante considerare come la catalogazione 'moderna' dei codici latini redatta da Giuseppe Valentinelli e data alle stampe negli anni 1868-1873 in sei volumi, ha catalograficamente esasperato l'accesso sistematico, moltiplicando la distinzione per classi, e ha aggiunto articolazione all'accesso per indici, suddividendoli nelle tre serie dei nomi personali, dei soggetti (*rerum*) e dei luoghi.[28] Giuseppe Valentinelli (1805-1874) fu vicebibliotecario presso la Biblioteca Marciana dal 1842, e bibliotecario dal 1846, dopo Pietro Bettio, sino alla morte. Gli fu accanto ad aiuto Giovanni Veludo, che gli sarebbe subentrato nella direzione della Biblioteca.

La distinzione per classi adottata dal Valentinelli è un riferimento catalografico, e non va confusa con la segnatura di biblioteca, che nelle voci

27 Valentinelli 1871, 255.

28 Valentinelli 1868-73, in sei volumi usciti uno per anno.

dedicate ai singoli manoscritti nel suo catalogo viene indicata nell'intestazione, fra parentesi quadre. Nell'opera di Valentinelli sono descritti gran parte dei codici del Fondo Antico e delle prime dieci classi dell'Appendice dei manoscritti latini marciani, per un totale che è stato conteggiato in 2.238 voci catalografiche, su circa 3.000 codici latini. Valentinelli non poté portare a termine la descrizione dei restanti codici, appartenenti per la maggior parte alle ultime classi marciane (dall'undecima alla quattordicesima) a carattere prevalentemente letterario.[29]

Nel catalogo del Valentinelli le divisioni per materia sono denominate classi, e corrispondono sostanzialmente a quelle che abbiamo considerato sopra, ma sono moltiplicate sino a ventidue, e più numerose sarebbero diventate se egli avesse potuto occuparsi anche delle classi letterarie: Volume primo: I *Hagiographia*; II *Liturgica*; volume secondo: III *Patres et scriptores ecclesiastici*; IV *Theologi*; V *Polemici*; VI *Homiletici*; VII *Ascetici*; VIII *Ius canonicum*; volume terzo: IX *Ius civile*; volume quarto: X *Philosophia*; XI *Mathesis*, *Astronomia*, *Astrologia*; volume quinto: XII *Physica*; XIII *Historia naturalis*; XIV *Medicina*; XV *Medicina veterinaria*; XVI *Alchimia*; XVII *Agricultura*; XVIII *Architectura*; XIX *Ars militaris*; XX *Musica*; XXI *Historia ecclesiastica*; volume sesto: XXII *Historia profana*.

La classe catalografica undecima di Valentinelli contiene esplicitamente le materie di matematica, astronomia e astrologia, e comprende (tra Fondo Antico e Appendici) ben 112 manoscritti. Nella sistematizzazione del Valentinelli, la materia musicale costituisce invece una classe separata.

9 I manoscritti in lingua italiana

Nulla di diverso da quanto si è detto in precedenza vale per quanto concerne i codici in lingua italiana, eccettuato l'esiguo numero di codici compresi entro il catalogo Zanetti del 1741. Le Appendici sono composte di sei volumi, cui si aggiungono i tre tomi dell'indice redatto in unica serie per nomi d'autori, toponimi, e titoli di opere anonime. I manoscritti sono distribuiti in undici classi, e numerati con serie distinte per ciascuna classe: I *Bibbia sacra e scrittori ecclesiastici*; II *Giurisprudenza e filosofia*; III *Medicina, Istoria naturale*; IV *Matematici ed arti del disegno e musica*; V *Istoria ecclesiastica*; VI *Istoria civile e geografia*; VII *Istoria ecclesiastica*

29 Negli anni intorno al decennio 1940-1950 il bibliotecario Pietro Zorzanello ha completato la descrizione dei codici latini della Biblioteca, catalogando quelli che non erano stati presi in considerazione dal Valentinelli, premorto al compimento dell'impresa. L'ordinamento delle schede è quello anche ora adottato per i cataloghi generali delle collezioni, ossia quello di sequenza della segnatura. Le schede relative sono state edite in facsimile e dotate di indici: Zorzanello 1980-1985. Vol. I: Fondo antico, Classi I-X, Classe XI, codici 1-100; vol. II: Classe XI, codici 101-162, Classi XII-XIII; vol. III: Classe XIV. In appendice, 18 manoscritti acquisiti dal 1953 al 1981.

e civile veneziana; VIII *Oratori*; IX *Poeti*; X *Grammatici, filologi ed epistolografi*; XI *Miscellanea.*

Le opere di astronomia rientrano in un accorpamento più moderno che le colloca all'interno di una classe numerosa, quella classe quarta che comprende arti del disegno e della musica, e dunque tutta la nuova scienza naturale, il disegno architettonico e quello geografico, ma anche le numerosissime nuove partiture e spartiti musicali. La catalogazione di questa classe quarta, uscita a stampa nel 1911 ad opera dei bibliotecari Carlo Frati e Arnaldo Segarizzi, presenta un indice articolato nel quale compare anche la voce astrologia. Nel soggetto 'astronomia' entrano ormai anche le opere di Giuseppe Poleni e di Simone Stratico.[30] Il catalogo segue l'uso delle catalogazioni generali attuali, ordinando le voci secondo le segnature che i codici portano in Biblioteca. Compilato dopo il 1904, esso riporta anche le attuali collocazioni fisiche dei manoscritti. Carlo Frati (1863-1930), allievo di Giosuè Carducci e specialista di testi in lingua, diresse la Biblioteca dal gennaio 1906 (proveniente dalla Biblioteca Nazionale di Torino) al 1913, ed ebbe modo di portare a termine la catalogazione di circa mille codici italiani, con la collaborazione del sottobibliotecario Arnaldo Segarizzi (1872-1924).

10 Le collocazioni fisiche

Nell'esaminare la struttura logica delle segnature, sono emerse alcune serie di collocazioni fisiche, la cui effettiva corrispondenza a stanze, armadi, scaffali e raggruppamenti specifici potrà essere meglio chiarita solamente dopo aver generato sequenze e tavole ordinate.

Abbiamo considerato le collocazioni dei codici negli armadi, strutturate per armadio, teca, ordine, libro (Armer, Techa, Ordine, e Libro), adottate accanto alla collocazione nei plutei, quando non esisteva ancora una segnatura distinta dalla loro collocazione fisica. Abbiamo fatto cenno anche alle collocazioni fisiche che hanno accompagnato, mobili nel tempo, la segnatura fissa.

La copia di consultazione dei cataloghi Zanetti, ora disponibile alla consultazione in linea entro Cataloghi storici,[31] riporta per i codici una serie di collocazioni fisiche strutturate con numero romano e serie araba, segnate a penna accanto all'intestazione (ossia alla segnatura) di ciascun documen-

30 Frati-Segarizzi 1909-1911. Volume primo: Fondo antico, Classi I codici 1-105, II codici 1-173, III codici 1-156. Volume secondo: Classi IV codici 1-696 esclusi i manoscritti musicali, V codici 1-130.

31 Tanto gli esemplari postillati dei cataloghi a stampa settencenteschi, quanto le *Appendici* manoscritte sono consultabili in linea: `http://cataloghistorici.bdi.sbn.it/indice_cataloghi.php` to. Sono apposte nella stessa maniera anche all'interno dei volumi delle Appendici. L'una e l'altra trovano corrispondenza con i numeri segnati usualmente sulle guardie anteriori dei manoscritti. Quando vi sono due riferimenti, dei quali uno cassato, dobbiamo pensare si tratti della diversa collocazione che i manoscritti ebbero nelle armadiature del Salone Sansoviniano e poi all'interno del Palazzo Ducale, dove la Biblioteca si spostò nel 1812 per lasciare spazio alla Residenza reale.

Le vicende dell'impegnativo riadattamento dei locali che erano appartenuti anticamente alla Zecca dello Stato veneziano, e del trasporto dei volumi costituenti l'intera Biblioteca di San Marco dalla sede provvisoria ottocentesca di Palazzo Ducale al nuovo edificio, sono state narrate partitamente dai bibliotecari protagonisti, lo storico Giulio Coggiola (1878-1919) e il filologo Salomone Morpurgo (1860-1942).[32] Nella nuova sede, anche i manoscritti ebbero una diversa collocazione fisica.

La collocazione fisica elaborata nel 1904 consiste in un numero arabo che corre in una sola serie continua. Il fatto che i volumi si trovino ordinati in serie della medesima altezza ci dice che per elaborare la sequenza si tenne conto di criteri bibliometrici, ossia dell'ampiezza dei palchetti disponibili. I volumi vi mantengono anche fisicamente la distinzione per lingua: prima si collocano i greci, poi i latini e infine gli italiani. Un ordine che in seguito fu tradito, dal momento che il numero ininterrotto non permise, in seguito, l'interpolazione sequenziale delle nuove acquisizioni. Nella nuova sede i manoscritti trovarono posto nelle scaffalature che erano state già nelle tre Sale d'Arte del Palazzo Ducale e che furono adattate per arredare le pareti delle nuove stanze della Direzione e della Sala Manoscritti al primo piano (ora detta Sala Bessarione), e nelle Sale di Consultazione al piano terra. Quei mobili erano stati in gran parte costruiti dalla Ditta Dal Tedesco nel 1874, e furono affidati alla medesima ditta per la necessaria riduzione.

All'evidenza, l'attuale completa separazione tra i magazzini librari e la sala di lettura ha reso del tutto desueto e inapplicato il criterio di corrispondenza tra segnatura di tipo sistematico e collocazione fisica. L'accorpamento per materie e la reperibilità dei manoscritti a partire dal loro contenuto e dalle loro caratteristiche fisiche sono oggi affidate completamente ai cataloghi e all'indicizzazione.

32 Coggiola, Morpurgo 1906; Zorzi 1987, 397-98, 545-46; Marcon 2007.

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Certissima signa
A Venice Conference on Greek and Latin Astronomical Texts
edited by Filippomaria Pontani

Astronomica Marciana
Astronomia greca e latina nel fondo antico a stampa della Biblioteca Nazionale Marciana

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Abstract How does one search for and investigate Greek and Latin astronomical texts in the Marciana's collection of rare printed books? Some examples are given, with special references to the identification of owners and readers of books of ancient astronomy in the 15th and 16th centuries.

Sommario 1 Introduzione. – 2 Su alcuni possessori di libri astronomici.

Keywords Marciana National Library, Venice. Astronomical ancient printed books. Owners and provenances.

1 Introduzione

All'interno del fondo antico a stampa della Biblioteca Nazionale Marciana (BNM) è possibile rintracciare un non piccolo numero di edizioni di autori classici greci e latini di argomento astronomico e astrologico. Benché nella catalogazione all'interno del Servizio Bibliotecario Nazionale (SBN) non sia prevista alcuna forma né di classificazione, né di soggettazione, la ricerca per soggetto o per classe, all'interno del fondo dei libri antichi a stampa, è sempre possibile.

La gran parte delle biblioteche di antica fondazione è stata organizzata per classi, per i fondi manoscritti così come per quelli a stampa; tali classi, o materie, risentono inevitabilmente dell'epoca in cui furono per la prima volta applicate, ma una volta ricostruita la chiave di lettura è possibile muoversi abbastanza agevolmente attraverso di esse. Senonché, al contrario di molte biblioteche italiane che conservano fondi librari antichi, la Biblioteca Nazionale Marciana, benché di origine quattrocentesca, non ha goduto di quella continuità di sede che altrove ha consentito di perpetuare nelle stesse collocazioni librarie le antiche divisioni dei saperi. Così è avvenuto ad esempio a Roma per la Biblioteca Angelica, dove le colonne del salone vanvitelliano sono lo specchio delle classificazioni settecentesche, o per la Casanatense o per la Vallicelliana.

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La stessa Marciana riverbera la storia delle classificazioni non già nelle collocazioni fisiche dei volumi, ma nelle segnature dei manoscritti. Purtroppo, lo spostamento della sede a Palazzo Ducale nell'Ottocento e poi di nuovo nella Zecca e nell'antica Libreria ha impedito la conservazione delle antiche collocazioni – se pure tali collocazioni esistettero in tutti i casi, giacché è pur da considerare che tra la fine del Settecento e l'inizio dell'Ottocento la Marciana dovette incamerare con la soppressione delle corporazioni religiose un'enorme quantità di libri, la quale solo in parte – se non per nulla – trovò spazio negli scaffali librari, mentre una porzione ben più grande di essa rimase custodita in casse, in sede o in depositi staccati, in attesa di trovare adeguata sistemazione.[1]

A tal proposito, i cataloghi antichi della Biblioteca Marciana consentono di ricavare alcune, sia pur parziali, notizie; il codice Marc. Lat. XIV, 19 (= 4322) contiene il catalogo dei libri manoscritti e a stampa della Biblioteca Marciana fino al 1637, mentre il Lat. XIV, 20 (= 4323) contiene un catalogo dei libri datato al 1679. Nel primo i libri astronomici si rintracciano nei Plutei ai numeri 9, 26-8, dove compaiono mescolati ad altri testi scientifici e filosofici – fatta eccezione per la medicina – e negli Armarij[2] mescolati ai libri definiti come *Philosophi*, *Graeci* e *Redundantes*. Nel secondo catalogo, i testi astronomici compaiono ancora nei Plutei 9, 26-9, ma sembrano essere in numero assai più cospicuo negli Armarij, in particolare nel quindicesimo (soprattutto nel settimo ordine) e nel sedicesimo (soprattutto nel terzo e sesto ordine). Nel catalogo a stampa della Biblioteca Marciana, riferibile al 1624,[3] l'astronomia è inserita nella Classe di *Mathematica* (volumi in quarto e in ottavo), ma anche nella classe *Sphaera et Astrologia* (in folio, in quarto e in octavo).

Inoltre, esiste, ed è ancora in consultazione in sala, un catalogo sistematico, voluto da Giuseppe Valentinelli, progettato tra il 1854 e il 1856 e aggiornato e rimaneggiato sino al 1975; organizzato secondo la *Table méthodique* di Jacques Charles Brunet, questo catalogo sistematico consente di affrontare la ricerca per classi – con i limiti delle difficoltà dovute alla sua organizzazione – all'interno del fondo antico della biblioteca. L'astronomia si trova compresa tra le classi identificate dai numeri 61Ib-g, 61IIh-l, 62Ia (cassette 43-6);[4] all'interno di essa si trovano le sottoclassi

1 Per una documentata storia della Biblioteca Nazionale Marciana di Venezia (BNM) si veda Zorzi 1987.

2 Sino all'epoca dei cataloghi citati i libri si trovavano collocati nella Libreria Sansoviniana divisi in Plutei e in Armarij; i primi erano i banchi per la consultazione sui quali e dentro i quali erano conservati libri, i secondi erano armadi – destinati ad aumentare nel tempo, verisimilmente collocati addossati alle mura della Libreria.

3 Giovanni Sozomeno, *Catalogus librorum Bibliothecae Venetae. Quae statutis diebus publice studiosorum commoditati aperietur*, [Venezia], non prima del 1624, 126-38 (BNM, 101 C 10).

4 Rossi Minutelli 2002, 1804.

Storia dell'Astronomia (61Ib), Astronomi antichi greci e arabi e loro espositori (61Ic), Trattati elementari e generali (61Id), Astronomi moderni (61Ie), Sistemi del mondo, fisica e meccanica celeste, atlanti celesti (61If), Specialità: sole, pianeti e loro satelliti (61Ig), Comete (61IIh), Osservazioni astronomiche, effemeridi (61Ii), Tavole astronomiche (61IIl);[5] ciascuna classe e sottoclasse contiene schede di libri a stampa con la relativa collocazione.

Infine, per rintracciare i libri a stampa di carattere astronomico, un'altra possibilità consiste nel selezionare gli autori di interesse e procedere alla ricerca attraverso il catalogo manoscritto per autori, il catalogo a schede, l'OPAC. Con l'occasione della presente indagine si è proceduto pure alla catalogazione in SBN delle edizioni, e al contestuale inserimento degli esemplari nella nuova base dati Archivio possessori;[6] quest'ultimo è un progetto di censimento e riconoscimento dei contrassegni di possesso presenti nei libri, avviato dalla Marciana nel 2014, allo scopo di ricostruire la storia delle collezioni librarie.[7] Così procedendo ci si è accorti che libri di astronomia o più in generale i libri che attengono a discipline affini sono spesso collocati negli attuali depositi gli uni accanto agli altri. L'attuale assetto dei depositi è basato sul principio bibliometrico – ossia per massima occupazione degli spazi – deciso dopo il 1904, con il trasferimento della biblioteca da Palazzo Ducale alla Zecca, cui poi si aggiunsero gli ambienti della Libreria e alcuni del Palazzo Reale.[8] L'accostamento fisico di libri appartenenti alla medesima classe si verifica non solo per l'astronomia, ma anche per altri soggetti. Non si sa se la ragione di queste collocazioni ravvicinate si debba cercare in lacerti delle collocazioni antiche per classi della Biblioteca Marciana, o in residui delle collocazioni delle librerie dei conventi soppressi che con il trasferimento alla Zecca finalmente trovarono una disposizione definitiva; ciò che appare evidente è che tali collocazioni sono spesso accompagnate dalla consecutività dei numeri di inventario, i cosiddetti 'numeri chiave', che – insieme ai topografici – potrebbero costituire un ulteriore spunto per rintracciare gli stampati antichi per classi.[9]

5 Bravetti 2007.

6 Tutti i libri citati in questa sede sono catalogati in SBN con i relativi dati di esemplare; tutti i possessori sono censiti nell'Archivio dei possessori: `http://marciana.venezia.sbn.it/la-biblioteca/cataloghi/archivio-possessori`. Ultima consultazione 2 ottobre 2016.

7 Il progetto, che conta ad oggi più di un migliaio di notizie, coinvolge anche la Biblioteca della Fondazione Giorgio Cini e la Biblioteca Universitaria di Padova. È stato presentato al Convegno IRCDL 2016 (12th Italian Research Conference on Digital Libraries, Firenze 4-5 febbrario 2016), i cui atti sono in stampa; si vedano per ora: `http://www.micc.unifi.it/ircdl/wp-content/uploads/2016/01/ircdl2016_paper_13.pdf`; e `http://www.micc.unifi.it/ircdl/wp-content/uploads/2016/01/presentation_13.pdf`.

8 Su tutta questa vicenda cf. Zorzi 1987, 363-64, 397-401.

9 Simonetti 2007, 13.

2 Su alcuni possessori di libri astronomici

A voler considerare il posseduto di stampati antichi della Biblioteca Nazionale Marciana in materia di astronomia, ne risulta un panorama fatto di vuoti e di pieni. I libri di astronomia greci e latini, ma anche quelli di astronomia moderna, non mancano certo, sebbene una più ampia messe di libri scientifici proveniente dalle soppressioni delle istituzioni religiose si trovi oggi alla Biblioteca Universitaria di Padova, ove tendenzialmente furono inviati a partire dalla fine del secolo XVIII, privilegiando per la Marciana le materie umanistiche. Gli stampati astronomici conservati alla Marciana sembrano pervenire in larga parte da biblioteche di collezionisti, da biblioteche a carattere enciclopedico, e soprattutto sembrano essere stati – particolarmente i classici greci e latini – ben poco letti. Un caso particolare sono le due edizioni di Aldo Manuzio e Francesco Mazzali degli *Scriptores astronomici*, di cui si parla altrove in questa sede.[10]

Molti libri appartennero, ad esempio, alla più enciclopedica delle collezioni private veneziane, quella di Apostolo Zeno. Tra di essi un volume che contiene, legati insieme, un'edizione di Codino[11] e una raccolta astronomica stampata ad Heidelberg nel 1589;[12] o l'edizione dei testi astronomici greci di Anversa del 1553-1554;[13] quest'ultimo, appartenne in precedenza all'umanista olandese Joan van Broekhuizen (1649-1707),[14] che appone la sua nota di possesso manoscritta sul frontespizio.[15] Un'edizione di Manilio

10 Si veda il saggio di Pontani e Lugato, in questo volume.

11 Γεωργίου τοῦ Κωδινοῦ Παρεκβολαὶ ἐκ τῆς βίβλου τοῦ χρονικοῦ, περὶ τῶν πατρίων Κωνσταντινουπόλεως. *Georgii Codini Selecta de originibus Costantinopolitanis, nunc primum in lucem edita; interprete Georgio Dousa*..., [Heidelberg], apud Hieronymum Commelinum, 1596 (BNM, 39 D 232.2).

12 *Astronomica veterum scripta isagogica Graeca & Latina. Auct. Graeci, Procli Sphaera. Arati Solensis Phaenomena, & Prognostica. Leontius Mechanicus de constructione Arateae Spaerae... Latini. Aratea Phaenomena com poetica interpretatione. M.T. Ciceronis, Festi Rufi Auieni, Germanici Caes., cum commentariis incerti auct. Veterum poetarum Fragmenta astronomica. C. Iuli Hygini Poeticon astronomicon. Opus non astronomiae solum, sed & poeseos studiosis apprime utile*, [Heidelberg], in officina Sanctandreana, 1589 (BNM, 39 D 232.1).

13 *Procli de Sphaera liber. Cleomedis de mundo, sive circularis inspectionis meteororum libri duo. Arati Solensis Phaenomena, sive apparentia. Dionysij Aphri descriptio orbis habitabilis. Omnia Graece & Latine ita coniuncta, ut conferri ab utriusque linguae studiosis, in quorum gratiam eduntur, possint: adiectis etiam Annotationibus*, Antverpiae, ex officina Ioannis Loei, 1553 (BNM, 27 D 227).

14 *Nouvelle biographie universelle* 1853, 7, *Boulen-Bzovius,* 471.

15 Joan van Broekhuizen possedette anche alcuni volumi in British Library: Alston 1994, 269, 281, 350, 566; `http://marciana.venezia.sbn.it/immagini-possessori/934-broekhuizen-johan-van`.

del 1474[16] – fu della dispersa biblioteca Albani; un commento a Manilio del 1484[17] – fece parte della raccolta di Domenico Grimani.

Fu Edward Spencer Dodgson a donare nel 1890 alla Marciana un esemplare dell'edizione di Basilea del 1523 di Dionigi Periegeta, Arato e Proclo.[18]

La maggior parte di questi volumi tuttavia non presenta traccia alcuna di utilizzo; parrebbe che spesso non fossero acquistati per esser letti. Timothy Scott – possessore di un'edizione di Basilea del 1547 di una raccolta di astronomi greci – non trova di meglio che scrivervi sopra una lista della spesa.[19] All'edizione milanese del 1489 di Manilio,[20] completamente priva di tracce di lettura, è stato aggiunto un intero fascicolo greco manoscritto di scoli all'orazione XXI di Demostene.[21]

Evidentemente sin dal Quattrocento, com'era prevedibile, gli studi scientifici non si fondarono più sulla lettura e il commento dell'astronomia classica antica; dopo la riscoperta umanistica della matematica antica, proseguirono sul fondamento della matematica coeva e del metodo sperimentale. La lettura e il possesso di testi classici astronomici greci e latini fu limitata a interessi più squisitamente umanistici, letterari o bibliofili. Ad esempio, un Leonardo Negri, canonico regolare lateranense, postilla fittamente l'edizione del 1488 della *Sphaera mundi* di Giovanni de Sacrobosco;[22] costui è da identificare con il frate lateranense del Convento

16 *Marci Manlii poetae clarissimi Astronomicon ad Caesarem Augustum liber primus*, Bononiæ: impressum per me Ugonem Rugerium et Doninum Berthocum, 1474 die uigesima Martii (BNM, Inc. 424) `http://marciana.venezia.sbn.it/immagini-possessori/785-bibliotheca-albana`.

17 *[L]Aurentij Bonincontrij Miniatensis In. C. Manilium commentum incipit feliciter*, Rome impressum, 1484 sedente Innocente octauo Pontifice maximo. Anno eius Primo. Die uero vigesimasexta Mensis Octobris (BNM, Inc. 556), `http://marciana.venezia.sbn.it/immagini-possessori/235-grimani-domenico`.

18 Διονυσίου οἰκουμένης περιήγησις. Ἀράτου φαινόμενα. Πρόκλου σφαίρα. *Dionysij orbis descriptio. Arati astronomicon. Procli sphaera. Cum scholijs Ceporini*, Basileae, apud Ioannem Bebellium, 1523 (BNM, 115 D 200); `http://marciana.venezia.sbn.it/immagini-possessori/935-dodgson-edward-spencer`.

19 *Procli De sphaera liber. Cleomedis De mundo, siue Circularis inspectionis meteororum libri duo. Arati Solensis Phaenomena, siue Apparentia. Dionysii Afri Descriptio orbis habitabilis. Omnia graecé & latinè ita coniuncta, ut conferri ab utriusque linguae studiosis, in quorum gratiam eduntur, possint: adiectis etiam annotationibus*, Basileae, per Henricum Petri, 1547 (BNM, 33 D 255); `http://marciana.venezia.sbn.it/immagini-possessori/936-scott-thimoty`.

20 *Marci Manilii... Astronomicon ad Caesarem Augustum liber primus [-quintus]*, Impressum fuit in ciuitate inclyta Mediolani, per Antonium Zarotum Parmensem, 1489 quinto Idus nouenbris [*sic*] (BNM, Inc. 366).

21 Già segnalato in Mioni 1985, 10.

22 *Spaerae mundi compendium foeliciter inchoat. Nouiciis adolescentibus: ad astronomicam remp. capessendam... Iohannis de sacro busto sphaericum opuscolum una cum additionibus... Contraque cremonensia in planetarum theoricas delyramenta Iohannis de monte regio disputationes... Nec non Georgii purbachii in eorundem motus planetarum accuratiss.*

di Sant'Agostino a Conegliano, autore anche di un itinerario di viaggio manoscritto *Viaggio fatto da Venezia a Roma dal r. padre don Leonardo Negri veneziano*, datato 1581, e conservato presso la Biblioteca del Museo Correr, Wcovich–Lazzari B. 36 n. 5.[23] Le sue osservazioni sono tuttavia di stampo squisitamente letterario più che scientifico, giacché si limitano a richiami di *loci paralleli* negli autori classici. Leggere astronomia significava piuttosto leggere testi contemporanei, dei quali la Marciana conserva molti esemplari, tra cui anche un autografo di dedica di Tycho Brahe.[24]

Tracce di interessi di natura astronomica si ritrovano, al contrario, nei libri più disparati; ad esempio nell'edizione aldina degli *Asolani* di Pietro Bembo del 1505,[25] dove una mano anonima segnala di aver osservato il 22 di novembre 1577 alle ore 5 e 38 del pomeriggio il fenomeno astronomico dell'iride della luna, a Padova nella casa del matematico Giuseppe Moleti.

In un volume contenente l'edizione del 1558 delle *Istituzioni armoniche di Zarlino* e *L'antica musica ridotta alla moderna prattica* di Nicola Vicentino, stampato nel 1555, legati insieme, Melchiorre Guilandino[26] – che dovette possedere anche altri libri di astronomia in via di identificazione – nell'ultima carta di guardia ha segnato tutti gli orari di levata del sole da gennaio a dicembre.[27]

theoricae: dicatum opus..., Venetiis, Santritter helbronna lucili ex urbe Iohannes schemata..., pridie calendis Aprilis [31 III] 1488 (BNM, Inc. V. 758).

23 Donazzolo 1930, 163-64.

24 *Tychonis Brahe Astronomiae instauratae mechanica*, Impressum Wandesburgi in arce Ranzoviana prope Hamburgum sita, propria authoris typographia, opera Philippi de Ohr chalcographi Hamburgensis, 1598 (Marc. Lat. VIII,36 [= 2686]).

25 *Gli Asolani di messer Pietro Bembo*, Impressi in Venetia, nelle case d'Aldo Romano, nel anno 1505 del mese di Marzo [BNM, 393 D 165]; `http://marciana.venezia.sbn.it/immagini-possessori/284-non-identificati`.

26 Melchior Wieland fu un botanico di origine tedesca. Nel 1589 lasciò i libri a stampa della propria biblioteca personale alla Biblioteca Marciana: Ferrari 1959. L'inventario della biblioteca di Melchiorre Guilandino è conservato presso l'Archivio di Stato di Venezia, Miscellanea di carte non appartenenti ad alcun archivio, b. 15, 2 gennaio 1590.

27 *Le istitutioni harmoniche di M. Gioseffo Zarlino da Chioggia: nelle quali; oltra le materie appartenenti alla musica; si trouano dichiarati molti luoghi di poeti, historici, & di filosofi; si come nel leggerle si potra chiaramente vedere*, In Venetia, Pietro da Fino, 1558; *L'Antica musica ridotta alla moderna prattica, con la dichiaratione, et con gli essempi de i tre generi, con le loro spetie. Et con l'inuentione di vno nuouo stromento, nel quale si contiene tutta la perfetta musica, con molti segreti musicali. Nuouamente mess'in luce, dal reuerendo M. don Nicola Vicentino*, In Roma, appresso Antonio Barre, 1555. Che il libro sia stato di Melchiorre Guilandino, lo si deduce anche dal titolo scritto in lettere maiuscole, con parole separate da punti, sul taglio inferiore (BNM, Musica 124); `http://marciana.venezia.sbn.it/immagini-possessori/207-wieland-melchior`. La biblioteca privata di Melchiorre Guilandino è oggetto di uno studio monografico di prossima pubblicazione da parte di Silvia Pugliese, che qui si ringrazia.

Raramente dunque questi libri risultano studiati, e per lo più da mani apparentemente destinate a rimanere anonime. Gli studiosi interessati all'astronomia come scienza, più spesso, già dal Cinquecento si dedicarono alla lettura dei libri dei contemporanei, piuttosto che a quella dei classici, rimanendo quest'ultima relegata all'interesse umanistico o antiquario.

Ad esempio nel Raro 293, un'edizione viennese del 1514 delle *Tabulae eclypsium* del Peuerbach e della *Tabula primi mobilis* del Regiomontano,[28] è postillata in modo puntuale da un Pietro Pitati che dichiara di aver comprato il volume per quattro lire a Venezia nel 1530. Costui è l'astronomo veronese Pietro Pitati (1490-1567), conosciuto nell'Accademia dei Filarmonici come Filuranio, che lavorò tra i primi alla correzione del calendario giuliano, per giungere a un nuovo corretto computo pasquale. I suoi interessi astronomici sono anche ampiamente testimoniati dalle postille su un esemplare dello *Spherae tractatus* pubblicato a Venezia per i Giunti nel 1531,[29] oggi conservato alla Beinecke Library di Yale. Questo esemplare marciano è per ora l'unico altro libro noto dell'astronomo veronese.

Infine, è stato possibile ricostruire l'identità di colui che segna nei margini un'edizione giuntina della traduzione latina di Trapezunzio dell'*Almagesto* di Claudio Tolemeo, edita nel 1528.[30]

Nell'esemplare in questione alle cc. 20*v*-21*r* compare una lunga osservazione sulla tavola degli angoli meridiani, datata «Firenze, dicembre 1573». In essa l'autore adopera alcuni termini non molto comuni nel linguaggio scientifico italiano, in particolare la parola Azimutte, utilizzata dallo scienziato e astronomo domenicano Egnazio Danti (1536-1586),[31] nel suo *Trattato dell'uso et della fabbrica dell'astrolabio*, pubblicato per la prima volta a Firenze nel 1568.

28 *Tabulae eclypsium magistri Georgij Peurbachij. Tabula primi mobilis Ioannis de Monteregio. Indices praeterea monumentorum quae clarissimi uiri studii Viennensis alumni in astronomia & aliis mathematicis disciplinis scripta reliquerunt...*, [Vienna], arte & industria... Ioannis Winterburger. Impensis vero Leonardi & Lucae alantse fratrum ciuium Viennensium, 1514 Idibus Aprilibus (BNM, Rari 293); `http://marciana.venezia.sbn.it/immagini-possessori/919-pitati-pietro`.

29 *Spherae tractatus. Ioannis de Sacrobusto Anglici viri clariss. Gerardi Cremonensis Theoricae planetarum veteres. Georgii Purbachii Theoricae planetarum nouae... Alpetragii Arabi Theorica Planetarum nuperrime Latinis mandata literis a calo calonymos hebreo neapolitano*,... Venetiis, in aedibus Luceantonii Iunte Florentini, 1531 mense Ianuario (Beineke Library 1980 +27); `http://hdl.handle.net/10079/bibid/3468543`.

30 Claudii Ptolemaei Pheludiensis Alexandrini *Almagestum seu magnae constructionis mathematicae opus plane diuinum Latina donatum lingua ab Georgio Trapezuntio... Per Lucam Gauricum Neapolit... recognitum anno salutis 1528 labente*, In urbe Veneta..., Luceantonii Iunta officina aere proprio, ac typis excussa, horoscopante Iouia stella in calce febru..., 1528 (BNM, 118 D 6); `http://marciana.venezia.sbn.it/immagini-possessori/882-danti-egnazio`.

31 Al secolo Carlo Pellegrino, poi dal 1555, entrando nell'Ordine Domenicano, Egnazio.

Le altre postille, piuttosto frequenti, sono correzioni di disegni, in particolare delle lettere che contraddistinguono gli angoli delle figure geometriche, ma anche disegni fatti ex novo, e correzioni della traduzione. Un confronto con gli autografi noti di Egnazio Danti ha consentito di riconoscerne la mano nell'esemplare postillato della Marciana. Il confronto è stato effettuato con l'autografo manoscritto di Bologna, Biblioteca dell'Archiginnasio, Gozzadini 171,[32] un'opera a carattere topografico sulla zona di Bologna. La sua mano si riconosce anche nella lettera autografa e firmata, datata Bologna 25 settembre 1576, conservata presso la Biblioteca Oliveriana di Pesaro, ms. 1575, fasc. XI.[33] Egnazio Danti lavorò a Firenze presso Cosimo I, ove curò l'esecuzione secondo l'ordine di Tolomeo dei dipinti cartografici delle regioni del mondo sugli sportelli degli armadi del guardaroba di Palazzo Vecchio; a Firenze tenne dal 1571 anche la cattedra di matematica presso lo Studio e costruì un quadrante astronomico marmoreo sulla facciata di Santa Maria Novella. Dopo la morte di Cosimo I fu trasferito a Bologna, ove ebbe la cattedra di matematica e si dedicò alla topografia. Nel 1580 fu chiamato da Papa Gregorio XIII a Roma come cosmografo e qui lavorò per la riforma del calendario e ai cartoni per la Galleria delle carte geografiche del Belvedere in Vaticano. Fu infine vescovo di Alatri. Lasciò la sua biblioteca al nipote Giulio, che la disperse.[34] È piuttosto verisimile che le postille sull'esemplare marciano siano da riconnettersi alla sua attività di insegnamento, nonché alle opere da lui pubblicate nel giro degli anni fiorentini.

32 Gozzadini 171, *Dissegni di alcune prospettive di Palazzi Ville e Chiese del Bolognese fatti nel tempo del Sig. Cardinale Paleotti Arcivescovo di Bologna. 1578*, Cenacchi 1937, 129-30; Roversi 1973.

33 Viterbo 1931, 95-96.

34 Fiore 1986.

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Non-Eratosthenic Astral Myths in the *Catasterisms*

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Abstract Two astral myths are studied in order to show that a catasterismic tradition ran parallel to the Eratosthenic one in Antiquity. Eratosthenes absorbed these interpretations into his mythographical handbook by cancelling those elements that contained a religious or a philosophical significance.

Summary 1 Introduction. – 2 The *Ursae* and the 'hands of Rhea'. – 3 Orpheus, Apollo, Dionysus, and the Sun.

Keywords Eratosthenes. Castasterism. Pythagoreanism. Astral Mythology.

1 Introduction

In this paper, I shall address a particular, even marginal, aspect of astral mythology. Eratosthenes' *Catasterisms* have long been instrumental in defining and interpreting astral lore concerning constellations. I myself have emphasized the role played by Eratosthenes of Cyrene in the shaping of this peculiar subgenre of mythography. In my view, catasterismic accounts are a literary product that needs to be explained within the history of Greek literature. Although a few catasterisms are attested well before the Hellenistic Age, Eratosthenes is credited with producing a majority of them. To do so, Eratosthenes drew on a number of accounts from the Greek mythical heritage, to which he appended an astral dénouement. I have struggled to prove that Eratosthenes' handbook has to be seen as an intertextual crossroads typical for its place of production – the Library of Alexandria.[1] As stated in the introduction of our Budé edition of the *Catastérismes*, written together with Arnaud Zucker,

> le récit de métamorphose que nous connaissons sous le nom de catastérisme, ne s'inscrit pas dans une tradition de type religieux ou cultuel et constitue simplement l'aboutissement d'une tradition littéraire. (Pàmias, Zucker, 2013, xcv)

1 See, in this regard, Pàmias 2014.

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By the same token, it can be assumed that interpretations of Eratosthenic myths based on allegorical or symbolic readings of the *Catasterisms* are not germane to the pragmatic and raw presentation of these mythical accounts. The influence of the Eratosthenic tradition – as it is to be found in Hyginus' *Astronomia*, for instance – has pervaded so intensively the reception of Greek astral mythology that it has obscured other traditions dealing with the same subject.

It is my contention that these traditions run parallel to, and independent from, the Eratosthenic one. But they may also eventually cross with it. In that case, it would seem that Eratosthenes has absorbed these interpretations into his literary artifact by filtering out those elements that contain a religious or a philosophical significance. Accordingly, Eratosthenes normally points to external authorities when referring to these traditions. I will focus on two episodes.

2 The *Ursae* and the 'hands of Rhea'

As I will argue, one of these ancient traditions is the Pythagorean one. Under the type of the so-called *akoúsmata* or *symbola* 'oral sayings' fall some Pythagorean identifications of constellations with mythical figures:

> ἔλεγε δέ τινα καὶ μυστικῷ τρόπῳ συμβολικῶς, ἃ δὴ ἐπὶ πλέον Ἀριστοτέλης ἀνέγραψεν· οἷον ὅτι τὴν θάλατταν μὲν ἐκάλει εἶναι δάκρυον, τὰς δ' ἄρκτους Ῥέας χεῖρας, τὴν δὲ πλειάδα μουσῶν λύραν, τοὺς δὲ πλανήτας κύνας τῆς Φερσεφόνης (Arist. fr. 159 Gigon = Porph. *VP* 41)
>
> But he [Pythagoras, sc.] also said certain things in a mysterious way symbolically, which Aristotle has recorded in greater detail. For instance, he called the sea "the tears [of Kronos]", and [the constellations] Ursae [Major and Minor] he called "the hands of Rhea", the Pleiades "the Muses' lyre", and the planets "Persephone's dogs".

Oral sayings or *akoúsmata*, also known as *symbola*, are the oldest forms of transmission of Pythagoras' doctrines. As long as these orally transmitted maxims follow the question-answer mode (for instance, "what are the tears of Kronos? The sea. What are Rhea's hands? Ursae Major and Minor"), they look like early forms of allegories. They decode the true, real meaning in a (figurative) mythical mode of expression.[2] I shall address the second of these interpretations – the Ursae being identified with the hands of Rhea – as it can be taken as a particular primitive form of a catasterismic

2 See Riedweg 2005, 74. On Pythagorean *akoúsmata*, see Burkert 1972, 166-92.

myth that, as it would appear at first sight, has not found a place within the Eratosthenic collection.

To start with, this interpretation does not remain isolated within the boundaries of Pythagorean religious secrecy. Like other contemporary σοφοί, Pythagoras collected sayings and precepts from diverse sources, which were subsequently reworked and adapted.[3] The Pythagorean 'hands of Rhea' can be put in relation to a Cretan tradition (κρητικὸς μῦθος) that accounted for Zeus infant being nourished in Crete by two nurses whom the god transformed into bears in order to conceal them from Cronus. As long as the nurses took care of Zeus, they can be seen as replacing Zeus' mother and hence the bears can be described symbolically (or mystically, as Aristotle would put it) as her hands.

Let us examine the textual evidence for this Cretan myth. We can reconstruct it from late and marginal literature of scholiographic nature. One of these testimonia is to be found in a Marcianus manuscript of Aratus:

> I) ὁ γὰρ ἀρκτικὸς κύκλος περιέχει τὰς Ἄρκτους καὶ τὸν Δράκοντα, περὶ ὧν φέρεται ἱστορία ἥδε· τὸν Δία ἐν Κρήτῃ τεχθέντα δύο νύμφαι ἐκεῖσε ἀνέτρεφον. καὶ ἡ μὲν Ἑλίκη ὠνομάζετο, ἡ δὲ Κυνόσουρα. Κρόνου δὲ ἐπελθόντος ποτὲ ὁ Ζεὺς τὸν ἑαυτοῦ πατέρα παραλογισάμενος τὰς μὲν νύμφας μετέβαλεν εἰς ἄρκτους, αὐτὸς δὲ εἰς δράκοντα μετεβλήθη. εἶτα τῆς βασιλείας ἀντιλαβόμενος τὸ σχῆμα ἀνεστήριξε, φημὶ δὴ τὰς νύμφας καὶ ἑαυτόν. (Sch. Arat. [*Excerpta Varia*], 543-4 Martin)[4]
>
> The Arctic Circle contains the constellations of Ursae and Draco. Their story runs as follows. When Zeus was born in Crete, two nymphs attended him there. One of them was called Helike; the other, Kynosoura. But when Cronus came suddenly upon him, Zeus transformed the nymphs into bears, in order to delude his father. And he transformed himself into a snake. Later on, when he came to power, he set up their figure in the sky, i.e., the two nurses and himself.

The story, with some variants, is also attested by other supplementary texts belonging to the Aratean corpus, that is to say, those auxiliary texts that were transmitted along with the *Phaenomena* as part of the exegetic material that facilitated the reading of this poem from the Hellenistic age onwards:

3 Cf. Thom 2013, 97-98.

4 This text (preserved by the manuscripts *Marcianus* gr. 476, *Matritensis* 4629, *Vaticanus* gr. 1910, *Parisinus* gr. 2403, and *Estensis* α.T.9.14) has also reached the tradition of the Homeric scholia (cf. Sch. Hom. *Od.* 5.273, 79 ed. Pontani), as Filippomaria Pontani points to me. Cf. Sch. Arat. [*Prolegomena*], 30 Martin (from the *Parisinus* Suppl. gr. 607a).

> II) φέρεται δὲ περὶ τοῦ Δράκοντος κρητικὸς μῦθος· ἐπιόντος ποτὲ τοῦ Κρόνου, ὁ Ζεὺς εὐλαβηθεὶς ἑαυτὸν μὲν εἰς δράκοντα μετεμόρφωσε, τὰς δὲ τροφοὺς εἰς ἄρκτους, καὶ ἀπατήσας τὸν πατέρα, μετὰ τὸ παραλαβεῖν τὴν βασιλείαν, τὸ συμβὰν ἑαυτῷ τε καὶ ταῖς τροφοῖς τῷ ἀρκτικῷ ἐνεστήριξε κύκλῳ (Sch. Arat. 46 [MQDΔKVUA], 92 Martin)
>
> III) φασὶν ὅτι ὁ Ζεὺς ἐν Κρήτῃ τιθηνούμενος, εἶτα φοβηθεὶς τὸν Κρόνον μετεσχηματίσθη αὐτὸς μὲν εἰς δράκοντα, τὰς δὲ μαίας μετεποίησεν εἰς ἄρκτους. (Sch. Arat. 46 [*Vat. gr.* 1087], 93 Martin)

This mythical chapter has aroused some controversy over its origins. According to some scholars, this story goes back to Epimenides' Κρητικά (fr. 36 Bernabé = *FVS* 3B23). It was Ernst Maass who attributed the κρητικὸς μῦθος of the Aratean scholium (cf. text II) to Epimenides of Crete. This attribution has found the support of Diels, Gundel, and Colli. Also Fowler considers this ascription "non sine specie veri".[5] The story was also developed by Aratus in his *Phaenomena*.

> Εἰ ἐτεὸν δή,
> Κρήτηθεν κεῖναί γε Διὸς μεγάλου ἰότητι
> οὐρανὸν εἰσανέβησαν, ὅ μιν τότε κουρίζοντα
> Λύκτῳ ἐν εὐώδει, ὄρεος σχεδὸν Ἰδαίοιο,
> ἄντρῳ ἔνι κατέθεντο καὶ ἔτρεφον εἰς ἐνιαυτόν,
> Δικταῖοι Κούρητες ὅτε Κρόνον ἐψεύδοντο.
> (30-35 Epimenid. fr. 49 Bernabé = *FVS* 3B22).
>
> If the tale is true, these Bears ascended to the sky from Crete by the will of great Zeus, because when he was a child then in fragrant Lyctus near Mount Ida, they deposited him in a cave and tended him for a year, while the Curetes of Dicte kept Cronus deceived. (Trans. by Kidd 1997)

On the other hand, the Aratean scholar Jean Martin argues that this 'Cretan' myth is nothing else than a late elaboration based on a misconception of the Aratean lines just quoted. In other words, the catasterismic myth of Zeus being turned into a snake, and his nurses into bears, was assembled to complete the *Phaenomena*, which does mention the catasterism of the two Bears but not the *aition* for the constellation Dragon.[6]

5 Maass 1892, 342; Gundel (1912, 2858) assumes that "Epimenides hat zuerst den kretischen Mythus von der Ernährung des Zeus durch die Nymphen H[elike] und Kynosoura mit dem großen und kleinen Bären in Verbindung gebracht"; Colli 1978, 270; Fowler 2000, 101.

6 Cf. Martin 1998, 162-66. See also Schwabl 1978, 1212.

However, the emphasis of ἐτεόν with δή, immediately followed by Κρήτηθεν in Aratus' line 31, may well point to Epimenides' well known motto Κρῆτες ἀεὶ ψεῦσται (fr. 41 Bernabé = Call. *Iou.* 8).[7] Besides, it is not altogether unreasonable to find a bear nurturing Zeus infant. Other animals took care of him according to diverse traditions (a goat, a pig, a bitch, a bee).[8] And ancient writers emphasize the strong maternal instincts of mother bears.[9] Since Bachofen, at least, we are well aware of the strong conceptual link connecting bear and motherhood.[10] All this encourages not to reject the antiquity and originality of this myth. Rather, there is a strong possibility that, in fact, this story goes back to Epimenides and hence to a Pythagorean tradition, as stated before.

Indeed, in ancient literature Pythagoras is often found in connection with the purification priest Epimenides, in whose company Pythagoras is supposed to have descended into the cave on Mount Ida in Crete.[11] Ancient (secondary) sources identify Epimenides as a pupil or the teacher of Pythagoras.[12] The connection of the Epimenidean myth with the Pythagorean Ursae as the 'hands of Rhea' becomes even more glaring if we take into consideration the fact that Epimenides was a priest of Zeus and Rhea.[13]

If we now turn to the Eratosthenic *Catasterisms*, differences emerge. On the one hand, analysis of the vocabulary found in the extant texts suggests that the Cretan myth is independent from the Eratosthenic tradition. The verbs μεταβάλλω 'transform' (text I), μετασχηματίζω, and μεταποιέω (text III) are absent in the transformation stories of the *Catasterisms*. And the verbs ἀναστηρίζω (text I) and ἐνστηρίζω (text II) are not used by Eratosthenes to describe the process of bringing the constellation into the sky. One could be tempted to think that the Cretan tradition has run parallel to Eratosthenes.

However, if we read chapter 2 of the *Catasterisms*, besides the 'canonical' Eratosthenic interpretation of the Little Bear as Callisto, the maiden transformed into a bear and subsequently into a constellation (a version that is presented straightforward by Eratosthenes without any reference to a literary authority), we find two further mythical *interpretationes*. Contrary to the first one (i.e. Callisto), these other two are attributed

7 Cf. Kidd 1997, 185.

8 Hadzisteliou Price 1978, 73.

9 Arist. *HA* 579a; Ael. *NA* 2.19; Plu. 494c (cf. Cole 1984, 241; Bodson 1978, 143-44).

10 Bachofen 1863. Finally there is a parallel myth in Cyzicus in the Propontis, which is unrelated to the Aratean tradition (Sch. A.R. 1.936).

11 D.L. 8.3; Riedweg 2005, 32.

12 See, for instance, Iambl. *VP* 104 and 122. Cf. Burkert 1972, 152.

13 Strataridaki 1991, 218.

to a particular author. On the one hand, the Aratean interpretation is mentioned, and Eratosthenes alludes in passing to the passage of the *Phaenomena* quoted above. On the other hand, a reference is made to an obscure local historian of Naxos, Aglaosthenes, who provides a story of Zeus' nurse that must go back to the same tradition we have been discussing:

> Ἀγλαοσθένης δὲ ἐν τοῖς Ναξικοῖς φησὶ τροφὸν γεγονέναι τοῦ Διὸς Κυνόσουραν, εἶναι <μίαν> τῶν Ἰδαίων νυμφῶν· ἀφ' ἧς ἐν μὲν τῇ πόλει τῇ καλουμένῃ Ἱστοῖς, ἣν οἱ περὶ Νικόστρατον ἔκτισαν, [δὲ] καὶ τὸν ἐν αὐτῇ λιμένα καὶ τὸν περὶ αὐτὴν τόπον Κυνόσουραν [τὸν τόπον] κληθῆναι· ἐλθεῖν δὲ μετὰ τῶν Τελχίνων, οὓς εἶναι τῆς Ῥέας παραστάτας, ὥσπερ Κουρῆτας καὶ Ἰδαίους Δακτύλους. (Eratosth. *Cat.* 2 [*Fragmenta Vaticana*]. Cf. Aglaosthenes, *FGH* 499F1)

> Aglaosthenes claims, in the *History of Naxos*, that it was a nurse of Zeus, Kynosura, and that she was one of the nymphs on Mount Ida, after whom, in the city called Histoi, which Nicostratus' people had founded, both the port there and the surrounding area were named Kynosoura. She came with the Telchines, who are the assistants of Rhea, as the Couretes and the Ideaen Dactyloi.

In Aglaosthenes' account, as preserved by Eratosthenes, the nurse Kynosoura is said to have come to Crete to tend Zeus among other assistants of Zeus infant. In my opinion, the fact that Aglaosthenes calls the nurse and Rhea's assistant Kynosoura (an ancient name of the constellation that was secondarily transferred to the nurse) suggests that this historian had in mind the same Pythagorean tradition of the bears as Rhea's hands.[14] Therefore, it is by the intermediary of this Naxian *Lokalhistoriker*, Aglaosthenes, that the Pythagorean lore has found its place within Eratosthenes' *Catasterisms*. As a result, the ancient, sacred Pythagorean oral saying has been stripped of its religious or philosophical meaning and reduced to a mythographical, purely factual narrative.

14 Cf. Scherer 1953, 177: "Das [Kynosoura, sc.] ist ein „natürlicher" Sternbildname".

3 Orpheus, Apollo, Dionysus, and the Sun

The second passage to be discussed is a fragment concerning the constellation Lyre. On this occasion, Eratosthenes provides a mythical account dealing with the origins of the lyre and its transfer from Hermes to Apollo and from Apollo to Orpheus. A reference is made to Orpheus' *katabasis* and at this point Aeschylus is mentioned as the source:

> διὰ δὲ τὴν γυναῖκα εἰς Ἅιδου καταβὰς καὶ ἰδὼν τὰ ἐκεῖ οἷα ἦν τὸν μὲν Διόνυσον οὐκ ἐτίμα, ὑφ' οὗ ἦν δεδοξασμένος, τὸν δὲ Ἥλιον μέγιστον τῶν θεῶν ἐνόμισεν, ὃν καὶ Ἀπόλλωνα προσηγόρευσεν· ἐπεγειρόμενός τε τὴν νύκτα [κατὰ] ἕωθεν κατὰ τὸ ὄρος τὸ καλούμενον Πάγγαιον προσέμενε τὰς ἀνατολάς, ἵνα ἴδῃ <τὸν Ἥλιον> πρῶτος· ὅθεν ὁ Διόνυσος ὀργισθεὶς αὐτῷ ἔπεμψε τὰς Βάσσαρας, ὥς φησιν Αἰσχύλος ὁ τῶν τραγῳδιῶν ποιητής, αἳ διέσπασαν αὐτὸν καὶ τὰ μέλη ἔρριψαν χωρὶς ἕκαστον. (Eratosth. *Cat.* 24, *Fragmenta Vaticana* = A. fr. 59 Radt)

> Since he descended into Hades for his spouse and saw what was there, Orpheus stopped honouring Dionysus, to whom he owed his fame, and believed that the greatest god was the Sun, whom he named also Apollo. Waking up, at night, towards dawn, he would climb the mount called Pangaion and wait for the sunrise, so that he would be the first to see it. Therefore Dionysus, enraged, sent against him the Bassarids, as the tragediographer Aeschylus says. The Bassarides tore him into pieces and scattered his limbs here and there.

This Eratosthenic chapter attributed to Aeschylus has also raised some controversy. It is not altogether clear whether the whole passage quoted above goes back to the tragedian, as some scholars have pointed. More particularly, the reference to a solar worship and the identification of Apollo with the sun have been considered suspicious.[15]

As a matter of fact, astral cults seem to be rather uncommon in Greece. Heliolatry is often labelled as barbaric by Classical authors.[16] At the same time, however, a divinized sun enjoys esteem among some 'philosophers' or 'intellectuals'. Sophocles, for instance, attests for heliolatry among the σοφοί.[17] A public recognition to the divine nature of the sun can also be deduced from the process against Anaxagoras for his impious views on

15 Sceptical: Garzya 2000, 170-71.

16 Barbaric: Ar. *Pax* 406-07; Pl. *Cra.* 397d; specifically Thracian: S. fr. 582 Radt (on the context of this Sophoclean fragment see Fitzpatrick 2001, 93).

17 οἱ σοφοί: S. fr. 752 Radt.

the sun.[18] And sun worship is attested in some Greek cities, notably in Rhodes, where the solar god has an anthropomorphic aspect.[19]

On the other hand, in the Archaic period Helios and Apollo appear as separate figures both in the mythical accounts and in early art.[20] Indeed, the 19th-century theory which claimed that Apollo was originally a sun-god has been henceforth abandoned.[21] However, the links connecting Apollo and Helios are solid, notably from the 5th century BCE onwards. This connection was manifest in the context of mystery religion as well as in popular traditions, according to the author of the *Homeric Allegories*:

> Ὅτι μὲν τοίνυν ὁ αὐτὸς Ἀπόλλων ἡλίῳ, καὶ θεὸς εἷς δυσὶν ὀνόμασι κοσμεῖται, σαφὲς ἡμῖν ἔκ τε τῶν μυστικῶν λόγων, οὓς αἱ ἀπόρρητοι τελεταὶ θεολογοῦσι, καὶ τὸ δημῶδες ἄνω καὶ κάτω θρυλούμενον· "ἥλιος Ἀπόλλων, ὁ δέ γε Ἀπόλλων ἥλιος". (Heraclit. *All.* 6.6)
>
> That Apollo is identical with the Sun, and that one god is honored under two names, is confirmed both by mystical doctrines taught by secret initiations and by the popular and widely quoted line, "the sun is Apollo, and Apollo is the sun".

Notwithstanding this text, a cultic identity between both entities is controversial. But an equation between the sun and Apollo is well attested as early as the Archaic Age among the Pre-Socratic philosophers. This identification finds a continuation from Stoicism (Cleanthes: *SVF* 1.542) up to Neo-Platonism. Indeed Theagenes of Rhegion equated Helios and Apollo (*FVS*, frag. 2) through their relationship to fire. Other Pre-Socratic philosophers rationalize the figure of Apollo by identifying him with the sun.[22] Quite interestingly for our purposes, this connection was originally established by the Pythagoreans, according to some scholars like Boyancé.[23] This notion may also have influenced Plato and Euripides. And the Orphic account preserved by Eratosthenes shows that Aeschylus might have been already familiar with it, which can be put in relation with Aeschylus' contact with Pythagoreanism during his stay in Sicily.[24]

18 X. *Mem.* 4.7.7; see also S. *OT* 660.

19 See Hamdorf 1964, 18; Burkert 1985, 175. The Colossus of Rhodes represents the Sun. On the solar cult in Corinth see Paus. 2.1.6.

20 See Gantz 1993, 88.

21 On Roscher's Apollo as a solar god, see Versnel 1993, 289-92.

22 Parmenides (*FVS* 28A20) and Empedocles (*FVS* 31A23).

23 See notably Boyancé 1966.

24 See Herington 1967, 81.

In this context, another fact should be mentioned: solar cults can be found among the so-called Orphic texts.[25] An excellent example is the inscription (ca. 300 BCE) on an Attic black-figure vase from the 5th century BCE, coming from Pontic Olbia. A sequence of words is inscribed on it, including the terms Helios and Apollo:

> Βίος-Βίος, Ἀπόλλων-Ἀπόλλων, Ἥλιο[ς]-Ἥλιος, Κόσμος-Κ[όσ]μος, Φῶς-Φῶς (fr. 537 Bernabé)

If Riedweg is right, the Pythagorean theories of nature developed through the interpretation of 'sacral' Orphic poetry.[26] And the identification of the sun as Apollo by Orpheus in the catasterismic account can be seen as an indirect reflection of such an operation. As in the case of the Little Bear Kynosoura taken as the nurse of Zeus above, Eratosthenes is making use of a *Mittelquelle* (first Aglaosthenes, now Aeschylus) to disseminate earlier, most probably Pythagorean, astral doctrines through his mythographical narratives. And again, as in the case above, the mythographical form given by Eratosthenes may be seen as a literary strategy to filter out those elements containing a religious or a philosophical significance.

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25 Tortorelli Ghidini 2013, 152.

26 Riedweg 2005, 74. Kahn (2001, 21-22), on the other hand, emphasizes the differences between Orphic and Pythagorean doctrines.

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Astronomy and Geography
Some Unexplored Connections in Ptolemy

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Abstract The authors discuss the so-called 'zenith star method', first mentioned in Ptolemy's *Geography* (ca. AD 150), from an astronomical and historical perspective. They reach the conclusion that the exact representation in some texts, i.e. that the distance between the two points of culmination is 1°, does not in fact concern a pair of stars culminating at the zenith but only *one* star which is measured at an angle of 1° from the zenith. This peculiar condition points to a historical measurement carried out by an unknown Greek astronomer: it makes use of the fact that the bright star Pollux (*β Geminorum*) culminated at Alexandria with an angle distance of 1° from the zenith or (which is equivalent) culminated at the zenith over a place 1° south of Alexandria (ca. 110 km). Although a scholium to Ptolemy's *Geography* claims this, the unknown author of the experiment is in all probability not Hipparchus of Nicaea.

Keywords Hipparchus. Ptolemy. Circumference of the earth. Zenith star method.

1 Introduction

Geography and astronomy shared a much closer relationship in Antiquity than today.[1] Not only did they employ the same instruments and aimed at producing lists and maps of their objects, scientists in Antiquity worked quite often in both fields. To name just a few: Anaximander, who is credited with the invention of the gnomon, was also the first to draw a map of the *oikoumene*; Eudoxus of Cnidos, whose star catalogue was versified by the Hellenistic poet Aratus, not only wrote several treatises about astronomy

1 We should like to thank Renate Burri, Filippomaria Pontani, Anna Santoni, Søren Lund Sørensen and Vasileios Tsiotras for valuable remarks and help.

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and constructed a sundial, but also authored a *Ges periodos* (probably with a map); the polymath Eratosthenes did the same, writing books about astronomy and geography, drafting a map of the *oikoumene* and constructing a star globe. Hipparchus, arguably the best astronomer of ancient times, also worked in the field of geography, writing a commentary on Eratosthenes' geographical achievements. But the best known example is surely Claudius Ptolemaeus (Ptolemy), who wrote classical handbooks in the fields of both astronomy and geography, compiled long lists of stars and toponyms, drafted maps and developed new instruments such as the astrolabe and the meteoroscope.[2]

This link between astronomy and geography is not fully explored yet. In fact, the gap between these disciplines in the present sometimes prevents modern scholars from understanding the methods, aims and objectives of the Greek and Roman scientists. Ptolemy's *Geography*, for example, cannot be understood without some astronomical and mathematical knowledge, a fact to which the author himself refers in his introduction (see, especially, 1, 2-3). Still, modern scholars tend to read his works like a cultural geography in the vein of Strabo, trying to make sense of Ptolemy's coordinates, and lament his alleged 'inability' and 'ignorance' of geographical matters, when at a loss.[3]

For sure, this bias in the consideration of Ptolemy's *Geography* already started in late antiquity, when the first 'reader-friendly' translations, epitomae, revisions, and commentaries were produced. Most of these are lost forever, but even the few traces and hints which have survived, are rarely studied. This is especially true for the scholia to Ptolemy's *Geography*. The last two critical editions, that of Müller (1883-1901) and that of Stückelberger, Grasshoff (2006), do not even print them in their text.[4] One needs to go back to Nobbe's outdated edition (1843-1845) or even to the manuscripts themselves.

The aim of our paper is, among other things, to analyze one of these *scholia*.[5] The scholium in question is concerned with Ptolemy's claim that in order

2 Our list of ancient scientists could be expanded easily. A nearly complete inventory of ancient astronomers and geographers can be found in Keyser, Irby-Maissie 2008, 995-96, 999-1002. Leonid Zhmud (St. Petersburg) is currently working on a database of ancient scientists.

3 For a recent criticism of this approach, see Geus 2013, for another one Tupikova, Geus 2014.

4 Of course, the main goal of these editors was to produce a reliable edition of the original text of Ptolemy, not of its ancient commentaries, scholia, and glosses. Stückelberger, Grasshoff (2006, II, 914-17), however, do print and translate two small texts related to *Geography*, 8, 29.

5 The research on Ptolemy's scholia is meagre, to say the least (but see Tsiotras 2006), and often focuses on pictorial aspects and questions of authorship. This is especially true for mss. Marcianus Graecus Z. 388 (333, siglum p) and Marcianus Graecus Z. 516 (904, siglum R). The former has, next to some of the scholia, some beautifully drawn miniatures, while the latter is not only one of the most important manuscripts within the stemma of

to understand the extent of our *oikoumene*, we must first of all determine the circumference of the Earth. And this has to be done through astronomy.

2 The Zenith Star Method in Ptolemy's *Geography*

Ptolemy (*Geography*, 1, 3) writes:[6]

> (1) Οἱ μὲν οὖν πρὸ ἡμῶν οὐκ ἰθυτενῆ μόνον ἐζήτουν ἐν τῇ γῇ διάστασιν, ἵνα μεγίστου κύκλου ποιῇ περιφέρειαν, ἀλλὰ καὶ τὴν θέσιν ἔχουσαν ἐν ἑνὸς ἐπιπέδῳ μεσημβρινοῦ. καὶ τηροῦντες διὰ τῶν σκιοθήρων τὰ κατὰ κορυφὴν σημεῖα τῶν δύο τῆς διαστάσεως περάτων, αὐτόθεν τὴν ἀπολαμβανομένην ὑπ' αὐτῶν τοῦ μεσημβρινοῦ περιφέρειαν ὁμοίαν εἶχον τῇ τῆς πορείας, διά τε τὸ καθ' ἑνός, ὡς ἔφαμεν, ἐπιπέδου ταῦτα συνίστασθαι, τῶν ἐκβαλλομένων εὐθειῶν, διὰ τῶν περάτων ἐπὶ τὰ κατὰ κορυφὴν σημεῖα συμπιπτουσῶν ἀλλήλαις, καὶ διὰ τὸ κοινὸν εἶναι τῶν κύκλων κέντρον τὸ τῆς συμπτώσεως σημεῖον.(2) Ὅσον οὖν ἐφαίνετο μέρος, οὖσα τοῦ διὰ τῶν πόλων κύκλου ἡ μεταξὺ τῶν κατὰ κορυφὴν σημείων περιφέρεια, τοσοῦτον ὑπετίθεντο καὶ τὴν ἐν τῇ γῇ διάστασιν τῆς ὅλης περιμέτρου.
>
> (1) The [astronomers] before us looked not only for a rectilinear interval on the earth, so that it may make an arc of a great circle, but also one that would lie in the plane of a single meridian. Using shadow-catching instruments, they observed the zenith points at both ends of the interval and obtained from there the arc of the meridian cut off by these [zenith points], which was [proportionally] similar to the journey [between the two locations on earth]; this is because these [points] were set up – as we mentioned – in a single plane, since the lines drawn through the two ends to the zenith points intersect, and since the intersection point is the common centre of the circles. (2) They therefore assumed that the fraction that the arc between the zenith points was seen to be of the circle through the [celestial] poles was the same fraction that the interval on the earth was of the whole [earth's] circumference. (Transl. by Berggren, Jones [2000, 61] with several adaptations)

Ptolemy's *Geography*, but also exhibits interesting comments on mapmaking, probably from late antique and medieval times. See, e.g., Fischer 1932, 253-61, 275-84; Bernardinello 1996-97; Mittenhuber 2009, 326-28 and 2010, 111; Burri 2013, 446-47, nos. 457, 499, on the Africa 4 map. For the pictures and the 'Arabian inscription' see Olshausen 1880 and Burri 2013, 450-51, 456-57.

6 Since we have already dealt with this passage in Geus, Tupikova 2013, we take up the opportunity to highlight and add some aspects.

This method attributed by Ptolemy to anonymous ‘predecessors’, makes use of the fact that some pairs of stars achieve their highest positions in the heavens at the same time. It is reminiscent of two other measurements of the earth, those of Eratosthenes and Posidonius. In fact, all of them are based on the same principle, namely that of comparing an arc in the heavens with a terrestrial distance along a great circle. The method described by Ptolemy is in fact superior to the other two. It can be employed easily with simple astronomical instruments at any time of the year. The refraction at the zenith is much lower than on the horizon, thus enabling better measurements. Finally, if you pick two stars and two observation points along a meridian, you avoid a potential error in longitude. Such an error indeed happened in earlier measurements, as, e.g., Alexandria and Syene or Rhodes and Alexandria do not lie exactly on the same meridian.

3 Ancient and Modern Commentaries on the Zenith Star Method

However, the method described by Ptolemy is not without pitfalls either, and it requires a critical evaluation: *skiothera*, ‘shadow-chasing’ instruments, are not well equipped to observe zenith points in the sky – at least not at night when no shadow is cast at all. Basically, you can use any instrument which has a vertical axis, to determine the zenith direction. The crucial problem is, however, that you must know not only the zenith point at your own observation point, but also the zenith point at the other place in order to measure the corresponding arc in the heavens and on the earth’s surface. Zenith points are not fixed but relative to the observation points. And the other zenith point is not *a priori* marked in the sky, as it can only be observed when a star culminates there. The main difficulty lies in the selection of a pair of stars, preferably bright ones, which may be easily observed with the naked eye, and culminate in Greece or in areas inhabited by Greeks, ideally at famous observation places like Alexandria, Rhodes, Syene or Lysimachia. These two criteria eliminate most of the stars observable by the Greeks in antiquity. The number of candidates is further reduced if we apply a third criterion not attested in Ptolemy’s text but in two late antique commentaries on Aristotle: the distance between the two zenith stars has to be of one degree.[7] Simplicius in his *Commentary on Aristotle’s On the Heavens* (298a15 [CAG 7, 549, 1-10]) writes:

> Ἐπειδὴ δὲ τοῦ μέτρου τῆς γῆς ἐμνημόνευσεν ὁ Ἀριστοτέλης τετταράκοντα μυριάδων αὐτῆς λέγεσθαι τὴν περιφέρειαν εἰπών, καλῶς ἂν ἔχοι καὶ

7 For the other, shorter, text – John Philoponus in his *Commentary on the First Book of Aristotle’s Meteorology*, 15, 5-8, – see Lewis 2001, 334.

διὰ τοὺς ἀπιστοῦντας τῇ σοφίᾳ τῶν παλαιῶν ἀνδρῶν τὴν μέθοδον τῆς μετρήσεως συντόμως προσαναγράψαι. λαβόντες ἀπὸ διόπτρας δύο τῶν ἀπλανῶν ἀστέρων μοιριαῖον ἀλλήλων ἀπέχοντας διάστημα, τουτέστι τριακοσιοστοεξηκοστὸν μέρος τοῦ μεγίστου ἐν τῇ ἀπλανεῖ κύκλου, καὶ εὑρόντες ἀπὸ διόπτρας τόπους, οἷς κατὰ κορυφήν εἰσιν οἱ δύο ἀστέρες, καὶ τὸ μεταξὺ διάστημα διὰ ὁδομέτρου μετρήσαντες, πεντακοσίων ηὗρον αὐτὸ σταδίων. ἐξ οὗ συνάγεται, ὅτι ὁ μέγιστος τῶν ἐν τῇ γῇ κύκλων περίμετρον ἔχει μυριάδων δεκαοκτώ, ὡς ὁ Πτολεμαῖος ἐν τῇ Γεωγραφίᾳ ἀνελογίσατο.

Since Aristotle referred to the size of the earth and said that its circumference is 400,000 stades,[8] it may be fitting (for the benefit of those who mistrust the wisdom of the ancients) to add a short description of the measuring method: taking by dioptra two fixed stars distanced from each other by one degree, which is one 360th of the greatest circle in the fixed sphere, they [i.e. the ancients] located the places, at which the two stars culminated, by dioptra, while taking two stars one degree apart, they measured the line they subtended on earth by hodometer, and found it to be a distance of 500 stades. It follows that the greatest circle on earth has a circumference of 180,000 stades, as Ptolemy reckoned in this *Geography*.

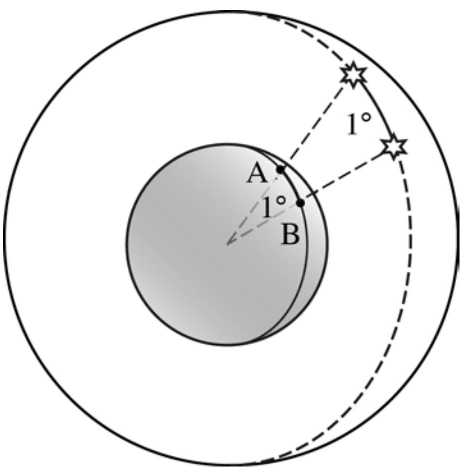

Figure 1.[9] Special case of the zenith star method: one star culminates at the zenith of the observation point A, another star at the same time at the zenith of B.
The zenith distance is 1°. Consequently, the distance between A and B on a meridian of the earth is 1°[10]

8 Cf. Arist., *De caelo*, II 14, 298a15.

9 A somewhat rudimentary scheme can already be found in some manuscripts, e.g. in X, S, B, r, n, and g. See Burri 2013, 125-26.

10 Due to the great distance between the observation point on the earth and the sphere of the fixed stars, the angular distance between both stars, measured on the earth's surface can be considered to be equal to a central angle subtending the meridianal arc AB.

The simultaneous culmination of two stars at the zenith at a distance of 1° also defines two locations on earth which are lying 1° apart on the same meridian. Since 1° is the 360th part of a full circle and 1° corresponds to 500 stades, the whole circumference of the Earth amounts to 180,000 stades (360 × 500 stades).

From an astronomical point of view, this third criterion – fixing the distance of the pair of stars to exactly 1 degree – is striking. By choosing a larger distance than 1°, one could achieve a higher precision. In principle, each pair of stars can be used for such a measurement, provided they culminate for the observers at the same time. Perhaps in the short commentary, an intermediate step is omitted and the ideal case of 1° is mentioned for didactic purposes. The adverb συντόμως in Simplicius' text may point to that.

In the next step, we searched for a possible historical background to this special case and tried to identify such a pair of stars. The scenario must fulfil the following preconditions:

- Visibility of the pair of stars in the Greek *oikoumene* in Hellenistic and Imperial times
- Culmination of this pair at the zenith with an angular distance of 1°
- The same right ascension (*rectascension*, α)[11]

We used Ptolemy's star catalogue in his *Almagest* for identifying such a pair of stars. The result is shown in table 1.

Table 1. Pair of stars in Ptolemy's *Almagest* which culminate with approximately 1° in declination

constellation	star number	right ascension (Almagest)	declination (Almagest)	magnitude
ν UMa	31	141;40	42;41	3
ξ UMa	32	141;50	41;45	3
ν Crb	97	208;57	38;47	> 4
ο Crb	98	208;56	37;37	5
ν Lyr	153	271;13	37;30	4
θ Her	154	271;02	36;29	4
ν And	352	358;19	31;16	4
τ And	353	358;33	30;14	4

For any possible combination of pairs or stars (in his *Almagest* Ptolemy lists more than 1,000 visible stars), only four pairs culminate in the ancient Mediterranean under the required preconditions. The best candidates for

11 The same right ascension (α) guarantees that the stars culminate simultaneously on the same celestial meridian. Thus the problem of the synchronous time-keeping is bypassed.

our pair of stars are ν and ξ in Ursa maior (the first pair in table 1). They are not only part of the most famous and important constellation, they also have a magnitude of 3 and hence make up the brightest stars among our short list of candidates.

Still our preliminary result is far from convincing. A magnitude of 3 for both stars is insignificant. And while it is true that one star, ν, culminates almost exactly at the zenith of Lysimachia, a known observation point in antiquity, the second star, ξ, cannot be assigned to any city to the south of Lysimachia, at least not to any attested in the *Geography* of Ptolemy. Another problem is that ν indeed culminated over Lysimachia at the time of Ptolemy, but not at the time of his unknown 'predecessors'. At the time of the Hellenistic astronomer Hipparchus, for example, this condition would not be met.

Hence, we have reached a dead end. None of the four pairs of stars fulfils our criteria properly. This speaks in favor of a thought experiment, i.e. a theoretical or ideal case without a practical or historical background.

But there may be another solution. It is interesting to see that Ptolemy is speaking of zenith points (σημεῖα) and not of zenith stars (ἀστέρες), as Simplicius does. What at first sight looks like a meaningless stylistic variation, proves to be important on closer inspection.

Ptolemy or rather his predecessor was probably thinking not only of the case when two stars culminate at a distance of 1°, but also when a single star culminates, and at an angular distance of 1° relative to the zenith of the observer and at a known place. Using a suitable instrument you can easily observe any distance from the zenith point. In other words: the arc segment, which we need for the measurement, can be marked not only by two different stars, but by one single star. The correct reformulation of the astronomical and historical problem would read as follows: find a bright star, which culminates at an angular distance of 1° relative to the zenith of a prominent observation point of the Greek *oikoumene*.

We have used the case of an angular value of 1° to respect the special condition mentioned in the text of Simplicius.[12] As prominent sites we tried Lysimachia, Rhodes, Alexandria and Syene, since these are attested for ancient astronomers who were concerned with the measurement of the Earth. Of the more than 1,000 stars in Ptolemy's catalogue, we considered only those with a brightness of 3 or higher. Our search for a suitable candidate yields a better result now.

12 Using a larger value would produce more alternatives, of course.

Table 2. The single star in Ptolemy's *Almagest*, which fulfils all the required preconditions

constellation	star name	right ascension (Almagest)	declination (Almagest)	magnitude
β Gem	Pollux	86;10	30;03	1.16

At the time of both Ptolemy and Hipparchus one of the brightest and most significant stars culminated at a zenith distance of almost exactly 1° to the south of Alexandria. This is the brightest star of the constellation *Gemini*: the giant star called Pollux.[13]

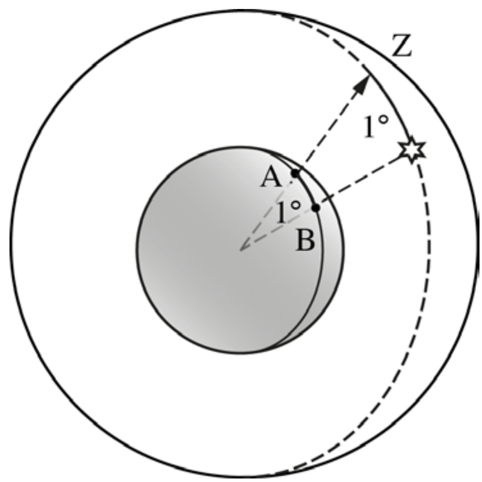

Figure 2. Observation of a zenith star, alternative interpretation. Pollux was culminating with almost exactly 1° zenith distance from Alexandria at the time of Ptolemy and was at the zenith over a location 111 km to the south

To sum up: of all ancient attempts to determine the measurement of the earth, the zenith star method is the easiest and most reliable one. In all likelihood, the observation was not made with a pair of stars which culminated at the zenith at the same time, but rather with one single star, the culmination distance of which was measured from the zenith. That this distance should be exactly 1°, was not only a didactic or theoretical requirement, but rather a historical one. The observation procedure utilized the fact that 1° to the south of Alexandria the bright star Pollux culminated at the zenith. The terrestrial distance of 500 stades (ca. 110 km) between the two points then results in the circumference of the earth being of 180,000 stades.[14]

13 For the constellation *Gemini* in Antiquity, see, e.g., Ross 2015, Zucker 2016, 188-91.

14 The procedure is comparable, *paris passibus*, with the famous measurement of al-Mahmun.

4 Hipparchus as Inventor of the Zenith Star Method?

One last question remains: who was the ingenious forerunner of Ptolemy who invented this method?

An answer to this question is provided by the vastly neglected scholium to *Geography* 1.3.3 to which we alluded in our introduction.[15] The crucial passage reads as follows:[16]

> †Πολλάκις γάρ εἰσι τόποι καὶ ὡς ἐπὶ τὸ πλεῖστον μὴ ἐπ’ εὐθείας καὶ ἀδυνάτου περιπίπτειν†.[17] ἐπὶ δὲ κύκλου τμήματος δυνατόν ἐστιν εἰπεῖν, τὸ μεταξὺ διάστημα τίνα λόγον ἔχει πρὸς τὸν ἐν αὐτῇ γραφόμενον μέγιστον κύκλον. Τοὺς γὰρ κατὰ κορυφὴν ὄντας, καθὼς ἐμαρτυρήθη Ἱππάρχῳ καὶ αὐτῷ Πτολεμαίῳ, λαμβάνοντες καὶ τὰς μεταξὺ διαστάσεις ὅσων εἰσὶ μοιρῶν, εὑρήσομεν, τίνα λόγον ἔχει πρὸς τὸν μέγιστον κύκλον. ὁμοίως καὶ ἐπὶ τῆς γῆς· ὁμοίας γὰρ περιφερείας περιέξουσιν ὅ τε τῶν οὐρανίων κύκλος καὶ ὁ ἐν τῇ γῇ γραφόμενος.[18] ἔστω γὰρ[19] κύκλος ὁ αβ τῶν οὐρανίων καὶ ὁ ἐν τῇ γῇ γδ, οἱ δὲ δοθέντες τόποι εζ, οἱ δὲ κατὰ κορυφὴν οἱ[20] ηθ, ὧν σημεῖα εὑρήσομεν, ἐὰν ζεύξωμεν[21] εἰς τὸ ἑξῆς τὴν καταγραφὴν τοῦ κύκλου. Εὑρόντες γὰρ τὴν πρὸς ἀλλήλους διάστασιν[22] τῶν ἀστέρων διὰ τοῦ μετεωροσκόπου πόσας μοίρας ἀφεστήκασιν, ἕξομεν καὶ ἐν σταδίοις πόσον ἀφεστήκασιν.[23] Ἐν γὰρ τοῖς δοθεῖσι τόποις γενόμενοι, καὶ λαβόντες τὰ κατὰ κορυφὴν διὰ τοῦ ὀργάνου, εὑρήσομεν κἀν τῇ γῇ τὸ αὐτὸ διάστημα ἀπέχοντας, ὅσον καὶ ἡ ὑποκειμένη ἑκάστη μοῖρα ἔχει τὸν σταδιασμόν, καὶ οὐκ ἔστι χρεία ποιεῖν τὸν λόγον πρὸς τὴν περίμετρον τῆς ὅλης γῆς· τοῦτο δὲ ἔσται, ἐὰν καὶ μὴ ἐπ’ εὐθείας καὶ ἰθυτενὴς ᾖ ἡ ὁδὸς ἡ δοθεῖσα.

15 We do not know much about the provenance of this scholium, usually referred to as ‘Nobbe 3’. It is transmitted, e.g., in mss. D (BNF, Paris. gr. 1402, mid-15th century) and f (BNF, Paris. Coisl. 337, early 14th century). According to Burri (2013, 350), the scholia in ms. f are written “vielleicht von einem wohl zeitgenössischen gebildeten Leser”.

16 We give the Greek text as printed by Nobbe, with some corrections and additions based on inspection of ms. f, fols 1*v*-2*r*. Vasileios Tsiotras is currently working on an edition of the scholia vetera to Ptolemy´s *Geography*. Our translation is in part based on Lewis’ (2001, 334) incomplete one. We thank Filippomaria Pontani for some suggestions.

17 This sentence is clearly corrupt.

18 κύκλος *add f.*

19 γὰρ *om. f.*

20 οἱ *om. f.*

21 ζεύξαντες *f.*

22 διάστασιν *scripsimus*, *om. Nobbe*, τιήστ (?) *f.*

23 ἕξομεν … ἀφεστήκασιν *om. f.*

> †For sure, there are often *topoi* and most times they do not work by way of straight demonstration or reduction to the absurd†. For the segment of a circle it is possible to say what proportion the distance between [two points] has in regard to the greatest circle drawn on it [the earth]. If, as Hipparchus and Ptolemy himself bear witness, we take stars at the zenith and the distance between them in degrees, we will find what proportion it is of the greatest circle. The proportion will also be the same on the earth, for the circle of the heavens and the circle drawn on the earth have the same circumferences. Let AB be a circle of the heavens and GD one on earth, and EZ be the given places, and HT be the points at the zenith whose positions we will find if we project [the radii through E and Z] to the line of the circle. Now, having discovered with the meteoroscope the distance in degrees between the stars, we will also know the [distance] in stades. If we stand at the given places and with the instrument take the stars at the zenith, we will also find that the distance on earth between them is the same according to the number of stades pertaining to each terrestrial degree. There is no need to relate this figure to the circumference of the whole earth and this will be true even if the given journey is not straight and direct.

In this paragraph Hipparchus is mentioned next to Ptolemy in connection to the zenith star method. Is he our wanted astronomer? As tantalizing as such an idea may appear, there are some serious objections to it.

1. If Hipparchus was meant, Ptolemy would surely have stated this. In fact, he mentioned him shortly afterwards in the next chapter – not for the zenith star method but for a list of latitudes.
2. The method described in the scholium mentions stars, thus changing – or rather simplifying – the original argument.
3. The final statement of the scholium (from καὶ οὐκ to δοθεῖσα) is wrong from a mathematical point of view. It contradicts the earlier sentence "For having discovered with meteoroscope the distance in degrees between the stars, we will also know the distance in stades". In other words: it is possible to measure the circumference of the earth, but only if you know the relation between degree and stades *beforehand*. The author is simply paraphrasing a passage of Ptolemy here.[24] Such a misunderstanding cannot be attributed to a mathematical and astronomical genius of Hipparchus' caliber.
4. The fourth, and most important, argument is that the result of the zenith star method ends up with a circumference of 180,000 stades.

24 Ptol. *Geogr.* 1, 3, 5: Διὰ δὲ λοιπὸν καὶ τοὺς τῶν ἄλλων χωρὶς ἀναμετρήσεως, κἂν μὴ δι' ὅλων ἰθυτενεῖς μηδ' ὑπὸ τὸν αὐτὸν μεσημβρινὸν ἢ παράλληλον (…) Διὰ γὰρ τοῦ λόγου πάλιν τῆς ὑποτεινούσης τὴν διάστασιν περιφερείας πρὸς τὸν μέγιστον κύκλον καὶ τὸ τῶν σταδίων πλῆθος ἀπὸ τοῦ κατειλημμένου τῆς ὅλης περιμέτρου προχείρως ἔνεστιν ἐπιλογίζεσθαι.

> But we know from several other sources that Hipparchus himself subscribed to Eratosthenes' method which resulted in 250,000 or 252,000 stades.[25]

The author of the scholium clearly mixed up some information he found scattered in and next to Ptolemy's text. We have already mentioned the name-dropping of Hipparchus and the ill-fitting quote of Ptolemy. Another hint is the mention of the meteoroscope for the zenith star method: that instrument was invented by Ptolemy himself[26] and was therefore unavailable to his 'predecessors'. In other words: there is no evidence that the author of the scholium had access to external evidence for this method.

Thus, we must conclude with a positive and negative result. While we have shed some light on the zenith star method mentioned by Ptolemy, we are unable to attach it to any known astronomer from Alexandria between the time of Hipparchus and that of Ptolemy.[27]

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25 Strab. 1, 4, 1, C 62; 2, 6, 7, C 113; 2, 5, 34, C 131-32; Ptol. *Synt.* 1, 67, 22; Theo Alex. *Comm.* (2, 528 Rome) (= fr. 35; 36; 39; 41 Dicks), but see Plin. *Nat.* 2, 108 (= fr. 38 Dicks).

26 Ptol. *Geogr.* 1, 3, 3: παρεστήσαμεν ἡμεῖς διὰ κατασκευῆς ὀργάνου μετεωροσκοπικοῦ. For the meteoroscope, see Rome 1927.

27 Since astronomers before Hipparchus and Hypsicles segmented the full circle into "sixtieths", the wanted predecessor belongs in all probability to the 1st century BC or AD. Posidonius is ruled out by Lewis 2001, 40. Aujac's (1993, 313) claim that the procedure is similar to that of Eratosthenes is to be taken with a pinch of salt.

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L'astronomie dans les *Harmonica* de Manuel Bryenne

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Abstract There is not much about astronomy in Manuel Bryennius' *Harmonica*, but it is not unimportant to the text. In two chapters we find a discussion about the harmony of the spheres, where the author tries to establish in which direction the planets move around the earth from the planet's mean longitudinal motion. These observations are not sufficient, hence the author uses philosophical and analogical arguments that are strongly linked to the figures associated with the text. The last figure, a diagram connecting the musical scales with the moon phases, probably does not belong to Manuel Bryennius' *Harmonica*, but it is taken from one branch of the text of Ptolemy's *Harmonica*. This is important for a better understanding of the history of the textual tradition of Bryennius' *Harmonica*.

Keywords Manuel Bryenne. Ptolemy. Harmonica. Astronomy. Harmony of the spheres. Ancient Greek Music. Diagram. Manuscripts.

Nous savons peu de choses de la vie de Manuel Bryenne. L'introduction des *Éléments d'astronomie* de Théodore Métochite fait référence aux cours d'astronomie qu'il prit auprès d'un certain Manuel Bryenne en 1303,[1] bien qu'on ne s'accorde pas sur le niveau ni sur l'ampleur de cet enseignement.[2] Homme politique d'abord – il devient Grand Logothète en 1321 – mais aussi érudit et fin lettré, Métochite entreprend assez tard l'étude de l'astronomie, et on lui doit de l'avoir détachée de l'astrologie. Il fut à son tour le professeur de Nicéphore Grégoras, le plus grand astronome byzantin du XIVe siècle: on lui doit notamment un traité *Sur l'astrolabe*[3] et

1 Sathas 1872-94, 1: 20 et 98 sqq.

2 Acerbi, Pérez-Martín 2015, 103: «Manuele Briennio fu attivo nella Costantinopoli a cavallo tra i secoli XIII e XIV. Egli è noto principalmente come l'insegnante di astronomia di Teodoro Metochita, anche se non c'è accordo sul livello e sulla misura di un tale insegnamento».

3 Delatte 1939, 195-208.

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un *Calcul de l'éclipse de soleil du 16 juillet 1330*.[4] Quand on considère le rôle joué par Théodore Métochite d'abord puis Nicéphore Grégoras dans le développement et l'essor de l'astronomie byzantine au XIVe siècle, on voudrait imaginer ce que les cours de Manuel Bryenne, 'père' intellectuel de cette lignée, pourraient avoir eu, sinon d'extraordinaire, du moins de stimulant.[5]

Pourtant, aucune trace directe ne nous est parvenue ni de cet enseignement, ni des recherches astronomiques de Manuel Bryenne en général, à deux exceptions près – et c'est là tout ce que nous possédons de sa main: quelques scholies autographes[6] en marge d'une copie de l'*Almageste*, le *Paris. Gr. 2390*, et un traité mathématique, les *Harmonica,*[7] dont l'autographe semble perdu. Il faut souligner d'emblée un paradoxe concernant le traité des *Harmonica*: si l'objet d'étude qu'est l'harmonie n'appelle pas nécessairement de développement astronomique, celle-ci est pourtant abordée à deux reprises. C'est précisément parce que la question astronomique est reprise au cours du livre II qu'il nous semble intéressant de dégager l'importance qu'elle pouvait avoir pour son auteur, et ce que cela peut apporter à notre connaissance du scientifique qu'était Manuel Bryenne.

1 Le traité des *Harmonica*

Le traité des *Harmonica* est de date incertaine, mais il semble avoir été écrit au tournant des XIIIe et XIVe siècles. Il traite de la théorie harmonique grecque antique, et il s'appuie sur de nombreuses autorités, parfois par de longues citations très précises, allant d'Aristoxène de Tarente à Ptolémée, soit du IVe siècle av. J.-C. au IIe ap. J.-C. En ce sens, on décrit souvent l'ouvrage de Bryenne comme un compendium, une somme des connaissances harmoniques grecques. Mais c'est oublier trop vite les distorsions inévitables dans la compréhension même du sujet de l'Harmonie lorsque plus d'un millénaire sépare notre auteur de ceux qu'il lit. Depuis la perspective de Byzance, et surtout celle de la renaissance paléologue, Aristoxène et Ptolémée ne sont plus les représentants inconciliables de

4 Mogenet et al. 1983. Dans le Marc. Gr. 325, qui contient le texte et que J. Mogenet a découvert en 1970, on trouve des scholies de la main même de Grégoras.

5 Pour un tableau des études d'astronomie à Byzance, on pourra consulter le recueil d'articles d'Anne Tihon regroupé sous le titre *Études d'Astronomie byzantine,* 1994, ainsi que l'article «L'astronomie byzantine à l'aube de la Renaissance (de 1352 à la fin du XVe siècle)» 1996.

6 Pour l'édition de ces scholies, on se reportera à Acerbi, Pérez-Martín 2015.

7 *Editio princeps*: Wallis 1699. Deuxième édition: Jonker 1970.

deux écoles et deux approches radicalement opposées, mais deux autorités établies qui trouvent naturellement une place de choix: ainsi, le Livre II des *Harmonica* se constitue-t-il pour une grande part de calculs pythagoriciens, alors que l'ouvrage s'achève sur une longue citation d'Aristoxène de Tarente.

Plus encore, parce que la langue de Bryenne semble la même que celle de ses auteurs de référence, les glissements sémantiques pour les termes techniques sont fréquents, comme on le verra. Il n'est pas rare qu'un développement à partir d'une définition ancienne s'achève par un commentaire qui n'est pertinent que pour la musique byzantine, c'est-à-dire la musique *contemporaine* de Manuel Bryenne. L'ouvrage opère ainsi une double synthèse, pas toujours très claire ni très convaincante, entre, d'une part, les deux approches principales antiques (acousticiens et pythagoriciens) et, de l'autre, la construction byzantine de la musique.

Dans ce contexte, la présence d'éléments d'astronomie ne doit pas surprendre. La musique comme l'astronomie relèvent des sciences mathématiques, elles forment les deux disciplines sensibles, ou appliquées, du domaine des mathématiques, correspondant respectivement à l'arithmétique et à la géométrie, qui couvrent les champs purs, ou absolus.

Dans le texte des *Harmonica*, l'astronomie intervient en deux endroits: au Livre I, chap. 1 et au Livre II chap. 5. Dans les deux cas, il est question de l'harmonie des sphères, et le texte est accompagné d'un schéma explicatif.

2 Le problème de l'harmonie des sphères

2.1 Livre I, chapitre 1, 58-60[8]

La première occurrence de ce thème précède une citation de Nicomaque de Gérasa (241, 1-18 sqq) établissant pourquoi la course des planètes doit produire un son et justifiant ainsi la théorie de l'harmonie des sphères.

Cette association entre les planètes et des notes de musique peut nous sembler arbitraire, mais sa survivance peut être suivie[9] sans interruption au moins jusqu'au traité de Kepler *Harmonices mundi*.[10] Elle se fonde en réalité autant sur la doctrine pythagoricienne que sur une simple observation. Les Anciens avaient déjà observé le lien entre vitesse du mouvement et hauteur de son – autrement dit, ils savaient qu'un mouvement plus rapide produit un son plus aigu. L'expérience toute simple du rhombe, qui produit

8 Nous donnerons toujours la pagination de l'édition Jonker.

9 L'un des grands jalons de la Renaissance est par exemple l'ouvrage de Pontus de Tyard, *Solitaire Second ou prose de la musique*, Lyon, 1555.

10 *Ioannis Keppleri Harmonices mundi libri V*, Linz, 1619.

un son plus aigu à mesure qu'on le fait tourner plus vite, pouvait suffire à établir cette corrélation.[11] Les Anciens se représentent l'espace dans lequel évoluent les planètes, c'est-à-dire le continuum entre le monde sublunaire et supra-lunaire contenu par la sphère des fixes, pour reprendre la terminologie aristotélicienne, comme un milieu transparent, donc comme de la matière, au même titre que l'air qui nous environne. L'emploi du terme κυμαίνω «se gonfler de vagues, ondoyer» par Nicomaque suggère même que ce non-vide transparent possède des qualités qui l'apparentent à un milieu humide. Puisque les planètes évoluent dans un espace de matière, il faut nécessairement concevoir (θεωρεῖν) que les planètes produisent par définition un son lors de leur mouvement, que la hauteur du son est fonction de la vitesse de mouvement, et que ce son est inaudible pour nous, sauf *intellectuellement*:

> παναρμόνιόν τι καὶ θεῖον μέλος συνεξυφαίνεται, οὗ πάντες ἀκούειν οὐ δύνανται, ἀλλὰ μόνοι ἐκεῖνοι, ὅσοι γε δὴ τὰς τῆς ψυχῆς νοερὰς ἀκοὰς δι' ἄκραν εὐζωΐαν ἐκάθηραν· οἱ γὰρ τῷ ὄντι γενεσιουργοὶ τῶν θείων σωμάτων, ὥς φασιν, ἦχοι ἐπικήροις ἀκοαῖς οὐδαμῶς ἀκουστοὶ καθεστήκασιν. (56, ll. 17-21)
>
> se tisse une sorte d'harmonie universelle et divine mélodie que tout le monde ne peut pas entendre, mais seulement ceux qui ont purifié par une vie vertueuse l'ouïe intellectuelle de leur âme; car les sons véritablement génératifs produits par les corps célestes, comme on dit, sont absolument inaudibles aux oreilles des mortels.[12]

Dès lors, une fois que l'on sait quelle est la planète la plus rapide, ou la plus lente, il suffit de proposer une équivalence avec le nom des sept notes

11 Manuel Bryenne ne consacre qu'un bref passage aux questions acoustiques, et à la définition de la nature du son: I, 4, 90-92. La question de la vitesse n'y est pas abordée.

12 Cette dernière phrase est une reprise du commentaire de Simplicius au *Traité du Ciel* d'Aristote. On lit en effet en 7.469.6 ὅτι ὁ τῶν θείων σωμάτων ἦχος ταῖς ἐπικήροις ἀκοαῖς οὐκ ἔστιν ἀκουστός (parce que le son produit par les corps célestes est inaudible pour les oreilles des mortels) et en 7. 469.11-14: θείων δὲ καὶ ἀΰλων σωμάτων κἂν εἰ γίνηταί τις ψόφος, οὔτε πληκτικὸς οὔτε ἀποκναίων γίνεται, ἀλλὰ τῶν γενεσιουργῶν ἤχων διεγείρει τὰς δυνάμεις καὶ τὰς ἐνεργείας καὶ τὴν σύστοιχον αἴσθησιν τελειοῖ (et si parmi des corps divins et immatériels se produisait un son, il ne serait en rien de nature à frapper ou effrayer, mais éveillerait les puissances et les énergies des sons génératifs et parachèverait une perception de même nature). Simplicius discute le livre II du *de Caelo*, où Aristote réfute les thèses pythagoriciennes sur l'existence d'une harmonie des sphères, celle justement que défend Bryenne. Le vocabulaire repris ici est propre à Simplicius, dont le commentaire développe la question bien plus que ne le fait Aristote. Son développement émet des doutes quant à la validité des arguments pythagoriciens, mais ne défend pas pour autant clairement la réfutation d'Aristote. Rien ici ne nous permet d'affirmer que Bryenne aurait lu seulement Simplicius, ou au contraire à la fois Aristote et son commentateur.

du système heptacorde, selon le principe d'analogie mathématique.

Juste avant de fonder sur Nicomaque les raisons de cette analogie, Manuel Bryenne expose, sans indiquer de source, qu'Hermès a nommé les sept notes de la lyre heptacorde d'après les sept planètes, associant la plus aiguë à la planète la plus rapide et la plus grave à la planète la plus lente. Ainsi la Lune, la plus lente, est associée à l'*hypate*, et Saturne, la plus rapide, à la *nète*. Cette relation est explicitée dans un diagramme (fig. 1) circulaire assez simple qui inscrit, dans des cercles concentriques, le symbole de chaque planète à côté du nom des sept notes correspondantes.

> Ὅθεν οὗτος τὴν μὲν πρώτην καὶ βαρύφθογγον αὐτῆς χορδήν, ἣν ὑπάτην ἐκάλεσε διὰ τὸ ὕπατον τὸ πρῶτον παρὰ τοῖς παλαιοῖς καλεῖσθαι, τῇ τῆς Σελήνης σφαίρᾳ οὐκ ἀπεικότως παρείκασεν, ἐπειδήπερ καὶ ὁ ἀπ'αὐτῆς φθόγγος τῶν ἀπὸ τῶν ἄλλων πλανωμένων βαρύτατος· τὴν δὲ ἑβδόμην καὶ ὀξύφθογγον, ἣν πάλιν νήτην ἐκάλεσε διὰ τὸ νέατον τὸ ἔσχατον παρὰ τοῖς παλαιοῖς καλεῖσθαι, τῇ τοῦ Κρόνου, ἐπειδήπερ καὶ ὁ ἀπ'αὐτοῦ φθόγγος τῶν ἀπὸ τῶν ἄλλων ὀξύτατος· (58, ll. 20-25)

> D'où celui-ci (Hermès) fit à bon droit de la première corde de la lyre, la plus grave – celle qu'il appela hypate parce que ce mot veut dire chez les Anciens 'premier' – l'équivalent de la sphère de la Lune, puisque le son rendu par celle-ci est plus grave que tous ceux rendus par les autres planètes ; de la septième corde, la plus aiguë – celle qu'il appela nète parce que le mot *neaton* veut dire 'dernier' chez les Anciens – l'équivalent de la sphère de Saturne, puisque le son qu'elle rend est le plus aigu…

Sans que cela soit explicite, Bryenne fait mine, à moins que ce ne soit un effet de la composition du texte, d'attribuer cette ordonnance des notes et des planètes à Nicomaque. Or, en II, 5, Bryenne réexpose l'ordonnancement de Nicomaque, et ce sera exactement le contraire. De plus, telle quelle, la disposition exposée au Livre I et explicitée dans le diagramme circulaire est en contradiction avec la définition, donnée quelques lignes plus haut, des *astres errants* (c'est-à-dire les cinq planètes connues avec la lune et le soleil):

> οἳ καλοῦνται πλανώμενοι διὰ τὸ ἀπὸ δυσμῶν ἐπ' ἀνατολὰς ἐναντίως τῷ παντὶ ποιεῖσθαι τὴν κίνησιν. (56, ll. 15-16)

> (astres) qui sont dits errants parce qu'ils se meuvent du Couchant au Levant, contrairement à l'univers.

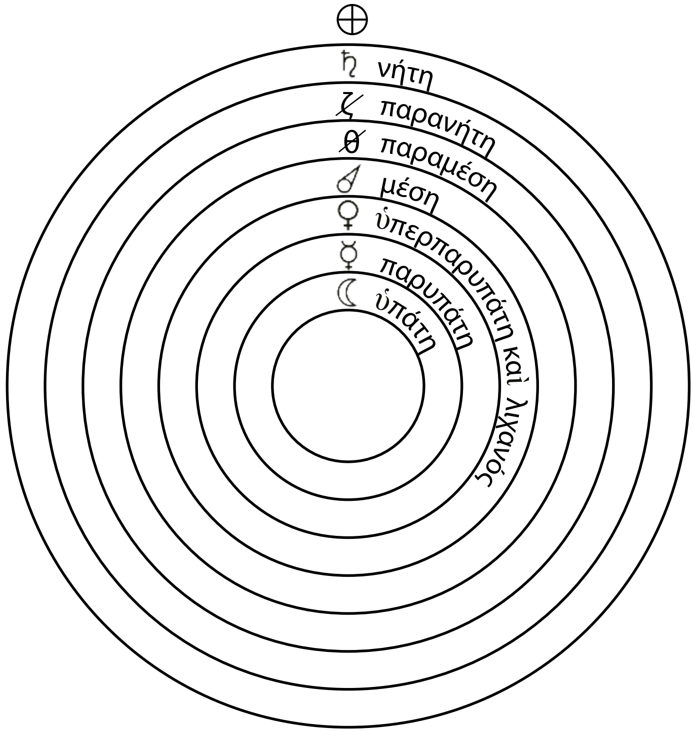

Figure 1. Diagramme livre I, chap. 1

2.2 Livre II, Chapitre 5, 164-70

La mention de la question de l'harmonie des sphères au cours du premier livre pourrait n'être qu'anecdotique. Manuel Bryenne en effet tente de remonter aux origines, et expose tout ce qu'il a pu découvrir à ce sujet. L'ordonnancement parallèle des notes de musique et des planètes, cité directement d'après l'une de ses sources principales, aurait pu rester un élément de 'préhistoire' de la musique parmi d'autres, au même titre que l'image de Pythagore découvrant en Égypte la lyre d'Orphée déposée là par Terpandre. Or Manuel Bryenne revient sur cette question bien plus loin dans son texte, d'une manière assez décousue au premier abord, à un moment où son but principal est de déterminer quelle harmonie on nommera 'première', 'deuxième' etc… On reconnaît là une préoccupation fondée sur la pratique du chant byzantin, qu'il va tenter de justifier par des arguments d'ordre astronomique qui reprennent la question de l'harmonie des sphères.

En I, 1, seule une lecture attentive, éclairée à rebours par le chapitre 5 du Livre II, permet de déceler la contradiction. Confusion de l'auteur, confusion des sources, ou problème d'établissement du texte? Voilà ce qu'il faudra déterminer.

Au début du chapitre, Bryenne rappelle ce qu'il a déjà dit au début du Livre I: Hermès, dans l'accord de la lyre heptacorde, a posé l'équivalence Saturne-Nète et Lune-Hypate. Mais, ajoute-t-il,

> pour ceux qui estiment que Saturne est la planète la plus rapide de toutes et la Lune au contraire la plus lente, il est cohérent qu'ils comprennent le son rendu par la nète comme le plus aigu de tous et celui de l'hypate comme le plus grave. Pour ceux qui pensent le contraire, eux comprennent le son rendu par l'hypate comme le plus aigu de tous, et celui de la nète comme le plus grave. Quant au fait que certains des Anciens se sont efforcés de prouver par des hypothèses vraisemblables que Saturne est la planète la plus rapide et la lune la plus lente, et que d'autres en revanche aient compris le contraire, on pourrait estimer que ce n'est pas le lieu de traiter la question. Il nous a cependant paru justifié de dire ici quelques mots même à ce sujet.[13]

La manière dont cette question va être traitée dans un premier temps fait sans doute écho à une querelle contemporaine,[14] à propos de la question suivante: dans quel sens les planètes tournent-elles autour de la Terre? La raison d'être de cette question est que, selon la réponse qu'on lui donne, la Lune est soit la planète la plus rapide, soit la plus lente.

On pense alors dans un système géocentrique, comme le prouvent bien les schémas concentriques, et l'astronomie antique est exclusivement tributaire des observations effectuées depuis la Terre. Le raisonnement est le suivant: les sept planètes se meuvent à un rythme régulier le long de l'écliptique, c'est ce qu'on appelle le mouvement longitudinal moyen quotidien (τὸ ὁμαλὸν ἡμερήσιον κατὰ μῆκος κίνημα). L'écliptique désigne une ligne imaginaire sur la voûte céleste, sur laquelle sont disposées les constellations du zodiaque, et correspond au cercle apparent décrit par le

13 εἰκότως καὶ ὅσοις μὲν ὁ Κρόνος ταχύτατος εἶναι τῶν ἄλλων πλανωμένων δοκεῖ, ἡ δὲ Σελήνη πάλιν βραδυτάτη, ἐκείνοις πάντως ὁ μὲν τῆς νήτης φθόγγος τῶν ἄλλων φθόγγων ὀξύτατος εἶναι ὑπείληπται, ὁ δὲ τῆς ὑπάτης βαρύτατος· ὅσοις δὲ τοὐναντίον, ἐκείνοις πάλιν ὁ <μὲν> τῆς ὑπάτης φθόγγος τῶν ἄλλων φθόγγων ὀξύτατος, ὁ δὲ τῆς νήτης βαρύτατος. Ὅτι δ᾽ ἔνιοι μὲν τῶν παλαιῶν διὰ πιθανῶν ὑποθέσεων ἀποδεικνύειν πειρῶνται τὸν μὲν Κρόνον ταχύτατον εἶναι τῶν ἄλλων πλανωμένων, τὴν δὲ Σελήνην βραδυτάτην, ἔνιοι δὲ πάλιν τοὐναντίον περὶ αὐτῶν ὑπειλήφασιν, οὐ τοῦ παρόντος ἂν εἴη καιροῦ περὶ τούτου διαλαβεῖν· ὅμως μέντοι γε εἰκὸς ἡμῖν ἔδοξε καὶ περὶ τούτου βραχέα ἄττα διεξελθεῖν τὸ παρόν (164-66, ll. 25-28).

14 Acerbi, Pérez-Martín 2015, 104. Il est fait allusion à une polémique dans la lettre 33 (66-67 Leone) de Maxime Planude à Bryenne (probablement Manuel Bryenne), dans laquelle Planude soutient son ami. Il attaque ainsi les détracteurs d'un ouvrage de Bryenne pourtant sur 'les sept astres errants' (ll. 15-18).

soleil sur le ciel au cours d'une année. Le seul point de repère temporel universel, dans l'antiquité, est la position du soleil sur l'écliptique, qui se mesure en fonction des constellations du zodiaque. Dans le cas particulier du soleil, parce qu'il masque les étoiles derrière lui, c'est en observant quelle constellation est visible à l'horizon juste avant son lever, ou juste après son coucher, que l'on sait où il se situe sur l'écliptique. Pour déterminer l'emplacement d'une planète, ou mesurer son déplacement quotidien, il faut comme pour le soleil établir sa position au moyen d'un repère fixe, d'une étoile (de la 'sphère des fixes'), des constellations de l'écliptique.

Comme le soleil parcourt le cercle entier de l'écliptique en l'espace d'un an, il parcourt donc 360 degrés en 365 jours. Logiquement, le déplacement longitudinal moyen quotidien du soleil représente un tout petit peu moins d'un degré par jour. Les Anciens ont mesuré pour chaque planète son déplacement quotidien (apparent) sur l'écliptique, en prenant une étoile fixe comme repère à une heure fixe. Ils obtiennent les résultats suivants:

Lune 13°14′
Mercure 59′
Vénus 59′
Soleil 59′
Mars 31′
Jupiter 5′
Saturne 2′

Il faut lire ces mesures de la manière suivante: chaque jour, la Lune se trouve à 13 degrés 14 minutes plus à l'ouest sur l'écliptique que la veille, ce qui est un mouvement de très grande ampleur. En revanche, Saturne n'apparaîtra qu'à 2 degrés plus à l'ouest de jour en jour, déplacement assez négligeable vu de la Terre.

Ces mesures sont assez exactes, mais il faut les interpréter, et c'est tout l'objet de ce chapitre 5. Si les planètes se trouvent chaque jour un peu plus à l'orient du jour précédent (on fera abstraction ici du problème de la rétrogradation apparente des planètes, qui n'est pas même mentionné par Bryenne, évacué comme une anomalie qui n'affecte pas le mouvement général), et qu'elles tournent effectivement d'ouest en est, alors il s'ensuit que l'astre qui marque le plus grand décalage prend de l'avance sur les autres, et qu'il est donc le plus rapide. Inversement, si les astres errants tournent dans l'autre sens, d'est en ouest, ils ne vont pas faire un tour complet et sont chaque jour un peu en retard sur le point de la veille. Dès lors, l'astre le plus à l'orient prend du retard sur les autres, il est donc le plus lent.

Ainsi, pour les uns, les planètes suivent le même sens de rotation que les étoiles, c'est-à-dire d'Est en Ouest, et donc la Lune est l'astre le plus lent équivalent de l'hypate, et Saturne le plus rapide équivalent de la nète ;

pour les autres, c’est exactement le contraire: le sens de rotation réel des astres va à l’encontre du mouvement du ciel, donc d’ouest en est, la Lune est l’astre le plus rapide équivalent de la nète et Saturne le plus rapide, équivalent de l’hypate.

Il est clair que cette question ne peut être tranchée par l’observation, puisqu’il faudrait un point de vue qui puisse utiliser la Terre comme référentiel, mais en se tenant en dehors, en position d’observateur à la fois de la terre et des planètes. Dès lors, Bryenne recourt à un nouvel ordre d’arguments:

> Ὅτι δὲ τῶν παλαιῶν ἔνιοι μὲν ἀπὸ δυσμῶν ἐπ’ ἀνατολὰς ἐναντίως τῷ κόσμῳ τοὺς πλανωμένους τὴν κίνησιν ποιεῖσθαι δοξάζουσιν, ἔνιοι δὲ κατὰ ταὐτὰ τούτῳ ἤτοι ἀπ’ ἀνατολῶν ἐπὶ δυσμάς, οἴδασιν ἀκριβῶς ὁπόσοι ταῖς περὶ τῶν φαινομένων πραγματείαις αὐτῶν, ὡς προσῆκεν, ἐνέτυχον.
>
> Καὶ γὰρ ὁ ἐκ Γεράσσης Νικόμαχος ἐν τῷ Ἐγχειριδίῳ τῆς Ἀρμονικῆς, ἔνθα δὴ λέγει ἑκάστου φθόγγου τῆς ἀρχαιοτρόπου ἑπταχόρδου λύρας καὶ τάξιν καὶ ὄνομα, ὑπάτην μέν φησι κεκλῆσθαι τὴν ἀνωτάτω καὶ πρώτην χορδήν, ἐπειδήπερ καὶ ὁ Κρόνος ὕπατος καὶ πρῶτος ἀπὸ τῆς ἀπλανοῦς, νήτην δὲ τὴν Σελήνην ὡς οὖσαν ἐσχάτην τῶν ἄλλων σφαιρῶν, μέσην δὲ τὸν Ἥλιον· […] ἀλλ’ οὗτος μὲν τῇδε περὶ τῆς τάξεως τῶν ἑπτὰ φθόγγων τῆς ἀρχαιοτρόπου λύρας ἀποφαίνεται ὡς ἀπὸ δυσμῶν ἐπ’ ἀνατολὰς τοὺς πλανωμένους ἀληθῶς κινεῖσθαι ἡγούμενος. (168, ll. 6-20)

> Qui a lu convenablement les traités des Anciens sur les phénomènes célestes sait bien que parmi eux, certains défendent l’opinion selon laquelle les planètes font leur révolution du Couchant au Levant, contrairement au reste de l’univers, alors que d’autres disent le contraire, donc qu’elles vont du Levant au Couchant.
>
> Nicomaque de Gérasa en effet, dans son *Manuel d’Harmonique*, indique la place et le nom de chacune des notes de l’ancienne lyre heptacorde, et dit qu’on appelle hypate la première corde, la plus haute, puisque Saturne est également la plus haute et la première à partir (de la sphère) des fixes, qu’on appelle nète la Lune, dans la mesure où elle est la dernière de toutes les sphères, et le Soleil *mèse* ; (…) Mais c’est l’opinion défendue par celui-ci (Nicomaque) à propos de la disposition des sept notes de l’ancienne lyre heptacorde, dans la mesure où il estime que les planètes se meuvent en réalité du Couchant au Levant.

Suit le raisonnement analogue inverse pour démontrer l’opinion contraire:

> Οἱ δέ γε πρῶτον ἀπὸ τῶν πρὸς ἡμᾶς ἀρξάμενοι ὑπάτην μέν φασιν ἐναντίως τὸν πρῶτον τὸν τῆς Σελήνης ὡς οὖσαν ἀρχὴν φθόγγων, νήτην δὲ ὡς ἐσχάτην ἀφ’ ἡμῶν τὸν τοῦ Κρόνου. (168, ll. 20-23)

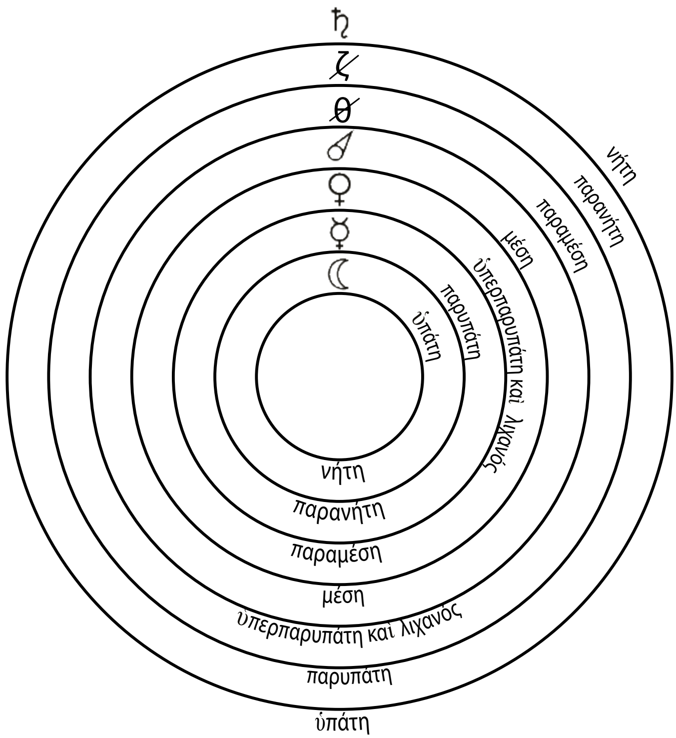

Figure 2.
Diagramme livre II, chap. 5

> Ceux qui partent d'abord de ce qui nous est le plus proche appellent hypate au contraire le premier son, celui de la Lune, en ce qu'elle est le départ (de l'échelle) des notes, et nète celui de Saturne, la dernière en partant de nous.

Ces deux interprétations sont explicitées dans un nouveau diagramme, qui semble une reprise du précédent, mais augmenté de la seconde hypothèse (fig. 2).

Nous voyons dans ce passage l'attribution à Nicomaque de l'ordonnancement exactement contraire à celui expliqué au Livre I: c'est maintenant la Lune qui devient la nète et Saturne l'hypate. Plus encore, le critère de *vitesse* de la planète est subitement évacué, au profit d'un ordre spatial et géographique qui se traduit en termes de *haut* et de *bas*. Bryenne suit une nouvelle logique, qui repose sur l'étymologie proposée pour hypate signifiant 'premier' et nète signifiant 'dernier'. Ce qui est le plus éloigné du centre (de la Terre) est en haut, et inversement, le plus proche de la Terre est en bas. Il faut se garder ici de calquer sur la représentation grecque la terminologie française contemporaine, qui appelle haut l'aigu et bas le grave. Sans doute cette analogie spatiale se fonde-t-elle dans l'esprit de Bryenne sur la manière de désigner la place des cordes sur un instrument byzantin, où la note physiquement la plus 'haute' est la plus grave, et inversement. Mais, plus simplement peut-être, il est vraisemblable qu'il songe à ce moment au diagramme circulaire déjà évoqué, le convertissant en trois dimensions: il superpose pour ainsi dire les planètes au-dessus de sa tête, et la définition de 'haut' et 'bas' est alors le reflet de l'influence du diagramme sur sa pensée.

Après l'échec des arguments d'observation, on passe aux arguments d'analogie, mais eux aussi se heurtent aux limites de la représentation mentale de l'univers. Que doit-on définir comme *haut* et *bas* dans un système circulaire? Qu'appelle-t-on *haut* et *bas* en musique? Outre que là encore, les deux thèses opposées s'affrontent sans qu'on puisse trancher, la manière de poser la question n'est pas très convaincante, et Manuel Bryenne achève de perdre son lecteur en intercalant cette remarque, *dans la mesure où [Nicomaque] estime que les planètes se meuvent en réalité du Couchant au Levant*. Cette remarque semble un ajout, comme si l'auteur avait subitement pris conscience, un peu tard, que le point de vue de Nicomaque implique un mouvement des planètes contraire à la définition donnée en I, 1, alors que la question de la vitesse, et donc du sens de rotation des planètes, a déjà été traitée. On ne peut exclure qu'il s'agirait d'un ajout marginal dans une copie de travail, ce qui expliquerait la place un peu incohérente ici.

En dernier recours, c'est la doctrine philosophique qui prend le relais, et qui vient renforcer le dernier point de vue exprimé: les contradicteurs de Nicomaque (c'est ainsi que Bryenne le présente) se sont efforcés s'appuyer leur opinion sur le système aristotélicien. L'hypate serait plus proche de la Terre, *parce que le multiple est plus faible,*[15] et que l'hypate (c'est ce que le lecteur doit tirer du passage) est plus 'faible'.

Ce qui est multiple est terrestre, i.e. mêlé, i.e. sujet à changements. Plus on s'éloigne de la Terre, plus les éléments sont purs. Le grave s'apparente donc au monde sublunaire, et par conséquent, la note la plus grave doit être celle de la Lune. Plus on s'en éloigne, plus on s'approche de la sphère des fixes, plus les éléments sont purs, plus les sons sont aigus. Que le grave (musical) soit bas (physiquement) se voit par analogie dans le corps chantant: la voix du chanteur se positionne dans le bas du corps (les 'flancs') pour le grave, et de plus en plus haute dans la tête à mesure qu'il monte. Comme le grave est à la base de l'échelle musicale, comme le bas du corps est la base de la tête, de même la Lune est l'astre le plus proche de nous, le premier à la base de l'ordonnancement des planètes.

15 Ἡ μὲν γὰρ ὑπάτη τοῖς γενητοῖς οἰκειοτέρα, διότι ἐν πολλῇ οὐσίᾳ δύναμις ἐλάττων (168, l. 23).

Cette dernière analogie repose sur une homonymie: βαρύς signifie à la fois 'grave' (comme contraire d'aigu) et lourd. En dernier lieu, c'est un rapport linguistique venu renforcer la physique aristotélicienne qui tranche la question en faveur d'une corrélation de la Lune avec l'hypate et de Saturne avec la nète.

À ce point, le texte de Manuel Bryenne revient une dernière fois à la question initiale: si la Lune est multiple, équivalente de l'hypate, elle est donc la plus lente, et Saturne la plus rapide. Dans une forme de boucle, Bryenne revient à des considérations astronomiques:

> ὁ μὲν γὰρ Κρόνος μάλιστα ἐγγυτέρω τῆς ἀπλανοῦς τυγχάνει τριακοστῷ μοίρας ὑπολειπόμενος ὥστε ἐν ὁμαλῷ κινήματι δύο λεπτὰ ἡμερήσια ὑπολείπεσθαι τῆς ὅλης περιφορᾶς τοῦ παντός, ὃ δὴ τριακοστὸν μέρος ἐστὶ τῆς μοίρας· τὴν δὲ Σελήνην τῷ ὁμαλῷ κινήματι αὐτῆς καὶ μέσῳ ἐξετάζοντας εὑρίσκειν ἔστιν ὑπολειπομένην μοίρας μὲν τρισκαίδεκα, λεπτὰ δὲ πρῶτα τεσσαρακαίδεκα· ὥστε εὐλόγως τὸν μὲν εἶναι πάντων ὀξύτατον, τὴν δὲ πάντων βραδυτέραν. (170, ll. 5-10)
>
> Saturne, la plus proche de la sphère des fixes, présente un retard d'un trentième de degré, si bien que, dans le mouvement moyen longitudinal, elle est en retard de 2 minutes quotidiennes sur la révolution de l'univers, ce qui est précisément un trentième de degré ; si l'on examine le mouvement longitudinal moyen de la Lune, on peut trouver qu'elle retarde de 13 degrés 14 minutes, si bien que c'est à juste titre que la première est la plus aigue de toutes, et la dernière la plus lente.

Il semble donc que toute la partie intermédiaire que nous venons d'examiner constitue en réalité la recherche d'un argument décisif afin de trancher le débat initial sur la vitesse des planètes. Le processus, à première lecture assez confus, suit une logique rigoureuse: en dernier lieu, devant l'insuffisance des observations astronomiques pour trancher la question, il a fallu à Bryenne un détour par la physique aristotélicienne et une homonymie pour établir la corrélation entre la Lune et l'hypate, Saturne et la nète, et en inférer le sens de rotation des astres. Un lecteur moderne peut être heurté par le fait que ces arguments sont d'ordres tout à fait hétérogènes, mais dans l'esprit de l'auteur, il y a une certaine logique à changer d'ordre d'argument chaque fois que l'ordre précédent s'avère insuffisant.

Tout le procédé argumentatif peut se résumer dans le tableau suivant:

Critère	**Vitesse des astres**		**Position géographique, haut/bas**		**Physique aristotélicienne**
Application	Rotation vers l'est	Rotation vers l'ouest	On part de la sphère des fixes	On part de la Terre	
Lune	Nète	Hypate	Nète	Hypate	Hypate
Saturne	Hypate	Nète	Hypate	Nète	Nète

La fin du texte est assez confuse, et un doute subsiste si Bryenne se rallie pleinement à cette dernière thèse, si l'adverbe εὐλόγως est à mettre littéralement à son compte, ou s'il reste dans le cadre strict d'un ordre d'argumentation qui ne serait peut-être pas le sien, mais celui des détracteurs de Nicomaque. Si ce dernier ordre d'arguments prévaut, alors il vient renforcer le premier chapitre du Livre I, puisqu'on retrouve exactement l'ordonnance attribuée à Hermès. Le premier diagramme reste alors valide, le second ne venant qu'expliciter les termes du débat au Livre II. En revanche, Bryenne prendrait donc le contre-pied de Nicomaque, alors qu'il le cite par ailleurs largement dans son ouvrage, sans jamais le critiquer. Par ailleurs, s'il se rallie à l'hypothèse d'une Lune plus lente que Saturne, cela implique une rotation des planètes allant d'est en ouest, donc identique et non contraire au mouvement général de la sphère céleste, et dès lors, la définition donnée tout au début des 'astres errants' est caduque.

Le dernier paragraphe de ce chapitre, qui met l'accent sur l'importance de ces questions et vient justifier la digression astronomique dans un traité d'harmonique, est l'un de ces nombreux moments où Manuel Bryenne glisse subrepticement vers un concept issu de la musique byzantine qui lui est contemporaine, système dans lequel les différentes échelles harmoniques sont seulement numérotées et où il faut donc effectivement savoir dans quel sens on compte. Dans le système byzantin, la question de savoir quels sont les *premier* et *dernier* tons prend une importance majeure, alors qu'elle n'a pas de sens dans la théorie antique. L'identité de langue et de mots, sans égard pour le sens spécifique des termes techniques, induit Manuel Bryenne à une pensée analogique et des spéculations qui ne sont plus de l'ordre de la théorie harmonique antique, mais une forme de synthèse générale sur 'la musique'.

La difficulté scientifique de déterminer le sens de rotation des planètes est indéniable, et ne pouvait être résolue par les seuls moyens de l'observation. En revanche, on ne peut que s'étonner de l'inconséquence de notre auteur, qui semble ne pas voir les contradictions des définitions qu'il donne d'un côté et des résultats qu'il semble défendre d'un autre. On peut se demander finalement si tout cela était très clair dans l'esprit même de Bryenne – répondre par la négative ne donne pas de lui l'image d'un astronome très avancé.

3 Le diagramme astronomique

Dans l'édition de G.H. Jonker, les diagrammes sont reproduits rigoureusement à l'identique d'après l'*editio princeps*, seule autre édition précédente. Comme chez Wallis, pas le moindre commentaire n'est fait à leur propos, ni en termes d'édition critique, ni au regard du lien entre le texte même et ces figures.

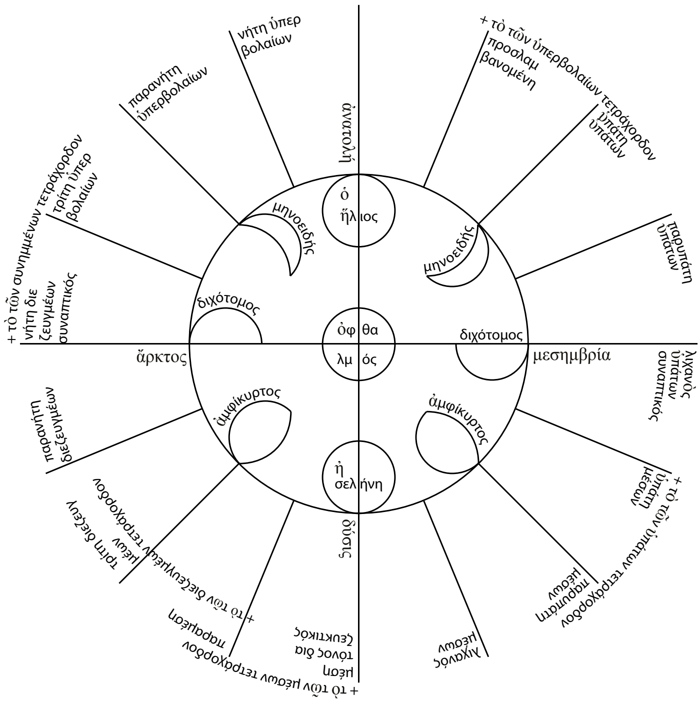

Figure 3.
Diagramme astronomique

Les deux éditions comportent 73 diagrammes. L'examen partiel de la tradition manuscrite montre que certaines branches comportent jusqu'à deux ou trois diagrammes supplémentaires. En revanche, le dernier diagramme édité, qui est aussi le troisième diagramme 'astronomique' édité par Jonker (372), n'est pas présent dans tous les manuscrits (fig. 3).

Il s'agit d'un diagramme circulaire, qui porte en son centre un cercle entouré d'une représentation des phases de la lune. Le petit cercle du centre est l'œil de l'observateur. En haut, le soleil (qui correspond à l'absence de lune visible) et en face la pleine lune. Le tout comporte en plus les points cardinaux, le soleil en haut étant à l'est.

Dans une couronne extérieure sont ajoutés les noms de toutes les notes de musique, donc du grand système complet. Sont présents les quatre tétracordes du grand système parfait (soit 15 notes) ainsi que le tétracorde des conjointes (3 notes supplémentaires). Ce simple fait est déjà étrange, puisque le tétracorde des conjointes est à peine évoqué dans tout le traité de Bryenne. Le cycle des notes vient se superposer au calendrier lunaire, la note la plus grave venant coïncider avec le premier jour de la lunaison, la mèse (au milieu) correspondant à la pleine lune, et la nète, la plus aiguë au dernier jour du mois lunaire. 15 notes se superposent à un cycle de 30 jours, soit une note tous les deux jours pour faire coïncider une échelle harmonique complète avec un mois lunaire. L'analogie ne va pas plus loin.

Contrairement aux autres diagrammes, on ne peut établir aucun lien entre cette figure et le texte de Bryenne. Pour tous les autres diagrammes de l'édition, ce lien existe, souvent souligné par le texte. Au Livre II, les chapitres 8 à 15 sont scandés par la formule ὡς ἐναργῶς ἐν τῷ ὑποκειμένῳ τοῦ τοιούτου συστήματος ὑποδείγματι δείκνυται (comme cela est clairement montré ci-après dans le diagramme de ce système) avec un renvoi explicite à la figure, qui fait donc partie intégrante du texte. Les deux autres diagrammes astronomiques déjà évoqués en I, 1 et II, 5 viennent expliciter ou représenter le contenu du chapitre. Plus encore, le chapitre 7 du Livre II est l'explication pas à pas de la construction géométrique du diagramme qui suit (diagramme 15 chez Wallis-Jonker). Mais rien de tel pour le dernier diagramme: il n'est *jamais* question des phases de la Lune dans tout le traité.

En revanche, cette figure apparaît dans certains manuscrits des *Harmonica* de Ptolémée, sous cette forme ou sous une forme un peu plus élaborée. Le traité de Ptolémée faisant partie des sources majeures de Manuel Bryenne, c'est sans doute de ce côté qu'il faut chercher l'explication: s'agirait-il d'une citation (sous forme de figure), ou d'une contamination?

L'histoire du texte n'est pas encore totalement établie, mais un examen provisoirement partiel de la tradition manuscrite permet d'avancer quelques éléments.

Sur les 63 manuscrits recensés à ce jour, voici ce qui a été examiné précisément sur la question de ce diagramme 73:

Absence du diagramme astronomique	**Présence du diagramme astronomique**	**Cas particuliers**
Par. Coisl. 173	Par. gr. 2430	Par. gr. 2460: Livre III manque
Par. gr. 2452	Par. gr. 2455	Laurent. Plut. 28.11: Livre III manque.
Par. gr. 2456	Par. gr. 2461	Par. suppl. gr. 59: fin mutilée.
Par. gr. 2457	Par. gr. 2463	Par. gr. 2549: début seulement du texte, la fin est conservée à Munich, dans le Monac. gr. 487.
Marc. gr. 322	Par. gr. 2464	
Marc. gr. 318	Marc. gr. VI. 7	Leidensis BPG 16F: aucun diagramme copié
Laurent. Plut. 58.29	Berol. Philipp. gr. 78	Par. gr. 2462: aucun diagramme copié
Vat. Gr. 176	Guelf. gr. 4 Gud.	Par. gr. 2534: recueil d'extraits
Berol. Philipp. gr. 52	Leidensis BPG 16E	Monac. gr. 104: le diagramme a été ajouté par une main tardive (XVIIe siècle)
Vat. gr. 2365		
Vind. gr. 64		Marc. gr. 321
Vind. gr. 76		
Upps. gr. 52		

Dans l'examen des cas particuliers, nous pouvons éliminer pour cette analyse tous les manuscrits de la troisième colonne, à l'exception du dernier. Les trois premiers ne rentrent pas dans le cadre de cette analyse, car la fin du texte n'y est pas conservée, soit qu'il s'agisse d'une copie partielle, soit d'une perte de folios.

Il nous faut éliminer également tous les manuscrits qui sont des compilations d'extraits, ainsi que les copies qui omettent délibérément tous les diagrammes. Dans le cas du Par. gr. 2462, il s'agit d'une copie de la main de Nicolas de Nancel, qui décide systématiquement de ne pas copier les figures, tout en ménageant de la place, et en y inscrivant un renvoi s'il s'agit d'une figure connue par ailleurs (chez Euclide par exemple). Pour le Bibl. Publ. gr. 16F conservé à Leiden, le copiste, sans doute un assistant de Marcus Meibom, ne ménage pas même la place des diagrammes, puisque sa copie est une préparation pour une traduction latine en regard qui ne sera jamais faite.

Le cas du Monac. Gr. 104 est pour l'instant seul en son genre: la figure a été ajoutée, peut-être au XVIIe siècle si l'on en croit le dernier catalogue.[16] Comme la copie est d'environ 1550, ou bien l'antigraphe ne présentait pas de diagramme final, ou bien le copiste n'a pas jugé bon de le copier. Le diagramme du XVIIe siècle est plutôt la trace d'une lecture postérieure qui a comparé cet exemplaire avec un autre issu d'une autre branche de la tradition manuscrite.

La présence ou l'absence du diagramme final ne saurait en aucun cas servir d'argument principal pour établir l'histoire du texte, mais elle est à prendre en compte au même titre que toutes les formes d'ajout, d'omission ou de contamination dans le texte. On ne peut d'ailleurs pas exclure des cas de contaminations croisées, où un texte de la branche A aurait reçu des diagrammes ajoutés à partir d'une branche B à la suite d'une omission antérieure. En revanche, lorsque l'on compare les données fournies par ce diagramme avec les données textuelles, les lignes générales qui se dégagent sont plutôt cohérentes.

Le cas du *Marcianus Graecus 321* semble à première vue donner la solution du problème. Il s'agit sans doute du manuscrit le plus ancien que nous ayons des *Harmonica*. I. Perez-Martín a pu établir[17] que le copiste, anonyme, est le même que celui qui a copié le Paris. gr. 2390, c'est-à-dire l'*Almageste* annoté de la main même de Manuel Bryenne. Le Marc. gr. 321 est donc issu du cercle le plus proche de Manuel Bryenne. Dans ce manuscrit, les *Harmonica* de Bryenne (qui s'achèvent au f. 62*v*) sont suivis par ceux de Ptolémée (fols 65*r*-98*v*). Or, à la fin du f. 98*v*, une note du

16 Molin Pradel 2013, 294-303.

17 Acerbi, Pérez-Martín 2015, 109: «Manuele Briennio fu attivo nella Costantinopoli a cavallo tra i secoli XIII, XIV» .

copiste signale que le texte n'est pas complet et renvoie au f. 63*r* qui suit immédiatement le texte de Manuel Bryenne: il n'avait plus assez de place, donc il a copié le texte restant sur les deux folios restés blanc entre les deux traités. Ainsi, cette figure qui vient achever le texte de conservé de Ptolémée se retrouve au f. 64*v*, presque à la suite directe des *Harmonica* de Manuel Bryenne. On peut donc très facilement imaginer que l'erreur se serait produite dans les apographes du Marc. gr. 321.

Or, d'après ce que l'examen de la tradition textuelle a montré jusque là, il n'en est rien.

Il est possible d'identifier facilement au moins une branche directe dans la descendance du Marc. 321, notamment grâce à la disposition toute particulière des diagrammes 2 et 3 qui se chevauchent sur une page séparée, et à quelques leçons qui lui sont propres. Descendent du Marc. gr. 321, au moins et dans cet ordre, le Vind. gr. 64 puis le Berol. Philipp. gr. 52. Aucun de ces manuscrits ne contient le diagramme recherché.

Les manuscrits les plus anciens, et jusqu'à preuve du contraire les plus proches de l'archétype, sont le Marc. gr. 321, le Par. Coisl. 173, le Vat. gr. 176 et le Par. gr. 2461. Il semblerait bien que le Par. Coisl. 173 soit un frère du Marc. gr. 321, et qu'ils forment tous deux la tête de la première des deux grandes familles de manuscrits, alors que les deux autres, frères également, forment la tête de la seconde.

Les liens, qui ne sont qu'indicatifs pour le moment, sont déjà révélateurs. Parmi les manuscrits anciens, compris dans la première moitié du XIVe siècle, un seul contient le diagramme recherché: le Paris. gr. 2461.

Le Paris. gr. 2461 est un manuscrit particulièrement intéressant. Il est de la main du 'copiste F',[18] copiste que l'on rattache au cercle de Démétrios Triclinios et dont on retrouve la main dans d'autres manuscrits liés au cercle de Nicéphore Grégoras. Ce volume a fait partie de l'héritage de Joseph Bryenne,[19] qui en 1421 le lègue au patriarcat de Constantinople.[20] On ignore comment ce manuscrit a été acquis, au cours du XVIIe siècle, par la Bibliothèque royale. Toujours est-il qu'il ne figure pas dans *le Catalogue des manuscrits de la bibliothèque du roi* de 1645 par les frères Dupuy, mais bien dans celui de 1682 (de Nicolas Clément).[21]

18 La main du 'Copiste F' est décrite par Bianconi (2005), 157-58. Voir aussi Smith 1992, 188.

19 *PLP* 3257. Joseph Bryenne, moine, théologien et orateur, appartient peut-être à la même famille que Manuel Bryenne ; il est en tout cas le 'Bryenne' le plus connu après l'historien Nicéphore Bryenne (voir l'appendice donné par Jonker 451 sqq.). Il fut envoyé par le Patriarcat Œcuménique en Crête et à Chypre, où il s'opposa violemment à l'union des deux Églises. Pour des études préparatoires à une édition de ses œuvres, voir Tomadakis (1947) et (1961), ainsi que Astruc (1962).

20 Acerbi, Pérez-Martín 2015, 115. Joseph Bryenne fait la liste de sa donation dans la *lettre 4* (290-92 Tomadakis).

21 Les concordances entre les différents catalogues ont été établies par Omont, 1921.

De plus, le texte des *Harmonica* constitue la première partie seulement d'un grand volume dont la seconde partie est la *Syntaxis Persarum* de Chrysococcès[22] (copiée par une autre main). Parce que ce texte donne des exemples de phénomènes astronomiques pour des jours précis de l'année 1347, on sait qu'il ne peut avoir été composé plus tôt, et que sa date doit être postérieure de peu. À en juger d'après les filigranes,[23] cette copie est très proche de cette époque. L'association étroite de Bryenne et de Chrysococcès, ainsi que l'adjonction à la fin du codex d'un certain nombre de tables astronomiques, prouve bien que l'intérêt du commanditaire de la copie se portait sans aucun doute sur l'astronomie. Est-ce là une raison suffisante pour imaginer qu'il ait fait ajouter à la fin des *Harmonica* un diagramme astronomique trouvé à la fin d'un exemplaire de Ptolémée? Ce n'est pas impossible, mais rien ne permet pour l'instant de le dire. Il est également trop tôt pour dire si ce manuscrit est l'ancêtre unique de toutes les branches de la tradition comportant le diagramme des phases de la lune, ou bien un exemple parmi d'autres d'une même contamination.

Remarquons pour finir un détail qui ne plaide pas en faveur d'un phénomène de contamination lié au Marc. gr. 321. Dans le manuscrit vénitien, le premier quartier de lune est tracé dans le bon sens, avec le croissant de lune visible en haut, tourné vers le soleil qui l'éclaire. Dans toute la tradition de Bryenne qui le contient, le croissant de lune est tourné vers le bas, ce qui est astronomiquement 'à l'envers', mais obéit à une logique de symétrie graphique. Hasard, ou fruit d'une correction bien intentionnée d'un copiste ignorant tout d'astronomie?

4 La prise en compte des diagrammes dans l'histoire textuelle: perspectives

Seule l'évaluation fine du rôle de ce diagramme dans la tradition textuelle des *Harmonica* pourra déterminer si ce diagramme doit être mis au compte de Manuel Bryenne. En l'état, cela semble peu probable. Si ce diagramme ne faisait pas originellement partie du traité, rendre compte de sa présence permet d'enrichir l'histoire de cette transmission.

Comme le déplore David Creese dans sa thèse sur le monocorde,[24] I. Düring n'a pas prêté attention aux diagrammes qui accompagnent le texte

22 Nous ne possédons aucune édition critique de ce texte à ce jour.

23 Voir la notice du catalogue en ligne de la Bibliothèque Nationale de France: `http://archivesetmanuscrits.bnf.fr/ark:/12148/cc101702d`

24 Creese 2010, 62-63. Le constat est également posé et analysé dans son article Creese 2009, 67 sqq.

de Ptolémée dans son édition des *Harmonica*.[25] Par conséquent, il ne les prend pas en compte pour l'établissement du texte, et ne donne aucune indication quant à leur présence, leur absence, ou leur disposition dans la page des différents témoins.

Dans la dernière édition du texte de Ptolémée, objet de la thèse de Pedro Redondo Reyes,[26] les diagrammes sont à peine davantage pris en compte. Son édition repose sur celle d'I. Düring, qu'il corrige et améliore à partir des travaux de plusieurs érudits qui ont proposé des corrections sur la base du contenu, et non de la tradition textuelle. Suivant à la lettre l'édition de Düring,[27] il n'intègre pas ce diagramme, que certains manuscrits font figurer à la fin des *Harmonica*, et n'évoque en aucun lieu le fait qu'il le retire de la tradition ptoléméenne.

La prise en compte des diagrammes, et de celui-ci en particulier, s'avère donc tout à fait importante dans l'établissement de l'histoire d'un texte, a fortiori dans le cas d'une histoire croisée et contaminée. Cette figure au moins, mais peut-être d'autres également, doit être traitée comme une citation ou une interpolation due à l'auteur, à l'archétype, ou à un copiste. Dans ce cas précis, le croisement de la tradition des *Harmonica* de Ptolémée avec ceux de Manuel Bryenne pourra sans doute révéler à partir de quelle branche de la tradition ptoléméenne la contamination a eu lieu, et puisqu'elle semble remonter à une époque très haute, presque contemporaine de l'auteur, c'est au moins une tradition du texte de Ptolémée qui se trouvera indirectement attestée dans un cercle précis, proche de Nicéphore Grégoras, à qui l'on doit justement une tentative d'amélioration de la fin corrompue du traité de Ptolémée.[28] Cette contamination aurait alors eu lieu dans l'un des plus illustres cercles d'érudits byzantins. Par croisement des traditions manuscrites, l'histoire du texte et du diagramme chez Manuel Bryenne est susceptible d'éclairer l'histoire du texte de Ptolémée à Constantinople au XIVe siècle.

25 Düring 1930.

26 Redondo Reyes 2002.

27 Redondo Reyes 2002, cxli; sauf en II 15: «Todos los gráficos siguen, igualmente, la edición de Düring».

28 Redondo Reyes 2002.

5 Conclusions

La part occupée par l'astronomie dans les *Harmonica* de Bryenne n'est pas très importante, et se concentre sur un seul point en relation avec la question de l'harmonie des sphères. Elle révèle néanmoins les préoccupations de l'auteur, enclin à introduire des considérations astronomiques au cours d'une argumentation visant à justifier, en réalité, la numérotation byzantine des ἦχοι. Le diagramme comportant les phases de la Lune est selon toute vraisemblance le fruit d'une contamination, et ne doit donc pas être pris en compte pour apprécier la position et la qualité de Manuel Bryenne parmi les astronomes byzantins.

Le traitement de cette question astronomique est révélateur de la personnalité de Bryenne et de deux processus de réflexion. Le premier est son mode de pensée par analogie. Le glissement entre des arguments de différents ordres est un procédé récurrent dans le traité, de même que le glissement permanent entre l'héritage antique et la musique byzantine. A moins qu'il ne faille considérer que les données astronomiques du problème n'aient finalement été très floues dans l'esprit même de l'auteur – au point qu'il n'ait pas même vu la contradiction qui subsiste à la fin de sa démonstration –, un lecteur moderne ne doit pas oublier que la perspective byzantine nivelle et écrase les différences fondamentales qui existent entre les textes et les doctrines héritées de l'antiquité, les embrassant comme un tout unifié au sein duquel ne peut régner qu'une cohérence générale. La même indissociation qui lui fait citer les doctrines aristoxéniennes et pythagoriciennes côte à côte, prenant à chacune pour effectuer une sorte de synthèse, est aussi celle qui lui permet de superposer ses lectures des 'Anciens' et leurs différentes représentations du cosmos sur un pied d'égalité, sans aller au bout des implications du raisonnement.

Le second processus révèle l'importance des figurations graphiques: diagrammes et schémas sont autant des aides à la compréhension pour le lecteur qu'ils sont des outils de recherche pour l'auteur. Nous savons que Manuel Bryenne a lu Ptolémée et Euclide, ouvrages où les figures géométriques jouent un rôle important, à la fois de démonstration et d'illustration. Nourri de textes mathématiques 'illustrés' de ces figures, Manuel Bryenne en produit à son tour, moins abstraites que les simples lignes de rapport que l'on peut trouver chez Ptolémée. La moitié du Livre II est une mise en mots des calculs et des rapports explicités sur chaque diagramme. De la même manière, sa réflexion astronomique prouve combien sa propre représentation de l'univers est tributaire des schémas qui le représentent, et qu'il reproduit dans son ouvrage.

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Certissima signa
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Texts and Illustrations in Venice, Biblioteca Nazionale Marciana, ms. Lat. VIII 22 (2760)

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Abstract The article deals with the images of constellations depicted in the manuscript Lat. VIII 22 (2760) of the Biblioteca Nazionale Marciana in Venice, produced probably in an Anglo-Norman *milieu* in the last quarter of the 12th century. After a short introduction on the manuscript and the texts it contains, the paper focuses on the illustrations of the Carolingian star catalogue known as *De signis caeli*, examining their different iconographic traditions as attested in the surviving copies. While the images in the main recension of the star catalogue clearly derive from a late antique archetype (probably the same that was used also for the so-called *Aratus Latinus*), the Venetian copy belongs to a group of manuscripts with a very different set of illustrations. The author proposes that this second recension is a Carolingian creation, invented between the late 8th and the early 9th century through contamination with the iconographic tradition of Germanicus' *Aratea*. In this group of manuscripts, the original late antique set of illustrations was replaced by a new one, in order to give the star catalogue more consistency and to obtain a more effective tool for the study of the constellations.

Keywords Medieval astronomy. Aratus. Aratean tradition. Constellations.

The manuscript Lat. VIII 22 (2760) is among the most famous astronomical manuscripts preserved in the Biblioteca Nazionale Marciana in Venice (BNM).[1] Consisting of 42 folios and written probably in the last quarter of the 12th century, this book entered the Biblioteca Marciana in 1792, as part of the bequeathal of the Venetian nobleman, writer and collector Tommaso Giuseppe Farsetti.[2] The book was already in Farsetti's possession in 1771, when it was included in the catalogue of his collection.[3] We have

1 For a comprehensive treatment of this manuscript see at least McGurk 1966, 84-85; Blume, Haffner, Metzger 2012, 1, 530-35, cat. no. 62.

2 The provenance is stated in a note on the opening flyleaf: "Provenienza Farsetti, Tommaso Gius.". On Farsetti's life and works see Preto 1995.

3 Farsetti, Morelli 1771, 132: "LXXVIII. cod. memb. in 4. del sec. xv. Liber de Astronomia. Com. *Spera Coeli quater senis horis*, &c. In questo si riferisce un dialogo fra Nemroch Discepolo, e Gioantone Maestro, intorno a materie d'Astronomia; senza che vi si veda l'Autore, che forse fu qualche Arabo. Vi sono molte figure appartenenti alla materia trattata, dipinte con grande semplicità".

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no information on the history of the manuscript prior to 1771: against the traditional hypothesis of a northern Italian production, Isabelle Draelants has recently attributed it to an Anglo-Norman *milieu* (Draelants 2017 and forthcoming). However, the presence of some notes written by a 15th century Italian hand attests to a rather precocious arrival of the book in Northern Italy.

The manuscript is a short astronomical and computistical miscellany, originally consisting of three texts, written by the same hand, all of them provided with illustrations:

1. fol. 1*r*: Pacificus of Verona, *Versus de horologio nocturno* (*incipit*: *Spera celi quater senis*);
2. fols 1*r*-31*r*: *Liber Nemroth* (title: *Incipit liber de astronomia*);
3. fols 31*v*-36*r*: pseudo-Bede, *De signis caeli* (*incipit*: *Helix arctus maior*).

The last folios of the *codex* contain some later additions. Already in the 13th century a computistical text, with the title: *Incipit doctrina compoti*, was copied on fols 37*r*-38*r* and 39*r*/*v*,[4] followed by some musical diagrams (fols 40*r*-41*r*). Further additions, probably from the 14th and 15th centuries, took up the blank spaces: some sentences excerpted from classical poets, provided with moral interpretations, on fol. 36*v*; weather prognostics on fol. 38*v*; computistical calculations on fols 38*r*/*v* and 41*v*.

The manuscript opens with a *rhythmus*, whose first line reads: *Spera celi quater senis horis dum revolvitur*, describing the design and the working principle of a night clock. This was an instrument for the measuring of time, based on the observation of the movement of a circumpolar star, which is called *noctium horarum Computatrix* (the reckoner of the hours of the night).[5] The text is followed by an illustration showing the use of this instrument (fig. 1): a man, clearly identifiable as a monk thanks to the habit and the tonsure, is looking towards the polar star through a tube mounted on a vertical stand; a circular diagram is attached to the end of the tube, showing the solstices and equinoxes, in order to adjust the measurements to the duration of the night in the different months of the year. The *rhythmus* was written by Pacificus of Verona, who is also credited to be the inventor of this astronomical instrument. Serving as archdeacon in the Verona cathedral in the first half of the 9th century, Pacificus is a fascinating figure of the Carolingian cultural revival: the main source about his life and works is his funerary inscription, dated AD 846, still preserved (in a 12th century re-carving) in the Verona cathedral, which ascribes to

4 "Nachtrag des 13. Jhs." according to Blume, Haffner, Metzger 2012, 1, 531.

5 The standard edition of the poem, based on the version included in the manuscript Città del Vaticano, Biblioteca Apostolica Vaticana, ms. Vat. lat. 644, can be found in *PLAC*, 4, 692; on the functioning of Pacificus' night clock see Wiesenbach 1993; Wiesenbach 1994; Stella 2014.

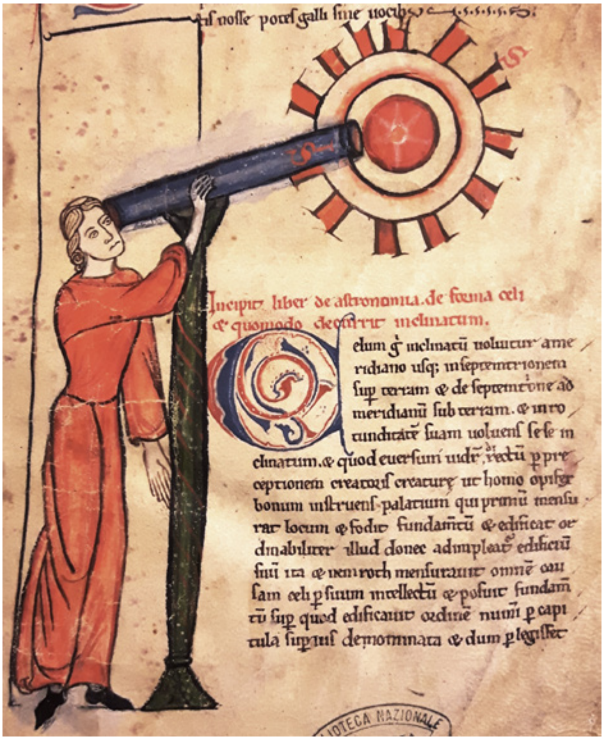

Figure 1. A monk measures the hours of the night using Pacificus' *horologium nocturnum*. Venezia, BNM, ms. Lat. VIII 22 (2760), fol. 1*r*. Northern France or England, last quarter of the 12th century (with permission of the MiBACT)

him an exceptional activity in the restoration of religious buildings, the organization and direction of the cathedral *scriptorium*, and the pursuing of various artistic and scientific enterprises. Pacificus' personality has been re-evaluated in recent years (Marchi 2002, Stella 2014), as a reaction to the thought-provoking book by La Rocca 1995 (whose conclusions are restated in La Rocca 1996 and 2000), which had cast doubt on the reliability of the information found in the funerary inscription. According to La Rocca, Pacificus as a patron and scientist was a 12th century fabrication of Veronese collective memory, which transformed a quite obscure Carolingian priest into a cultural leading figure, with the aim of highlighting the importance of the city's past and of legitimising the authority of the bishop in relation to the cathedral chapter and the lay civic institutions. But, as Francesco Stella recently pointed out, "la sua [i.e. La Rocca's] ricostruzione, basata quasi soltanto su documentazione archivistica, omette proprio le attestazioni poetiche dell'attività di Pacifico, che sono invece databili senza dubbio al IX e non al XII sec." (2014, 189), as witnessed by a number of astronomical and computistical manuscripts. "È possibile e, direi, quasi fisiologico che la sua figura sia stata mitizzata o almeno enfatizzata per rafforzare l'identità storica nel XII sec. e, soprattutto, in Età Moderna, ma questo non è sufficiente a dimostrare l'infondatezza dei dati storici pervenuti né a confutare attribuzioni di testi finora non soggette a contestazioni" (2014, 189). Despite the huge amount of studies devoted to his personality and works,[6] Pacificus still awaits a fuller understanding as a historical figure, poet and scientist: the new edition of his writings, currently in preparation by Stella for the *Edizione nazionale dei testi mediolatini*, will hopefully shed new light on the literary and astronomical achievements of this much debated Carolingian scholar.

While waiting for a more reliable edition of Pacificus' *rhythmus* on the night clock, I will concentrate here on its association with the main text included in the Venetian manuscript, the anonymous astronomical treatise known as *Liber Nemroth*. The Venice *codex* is one of the four manuscripts which preserve a more or less complete version of this text,[7] which is currently being studied by Isabelle Draelants.[8] According to the most widely accepted interpretation, the *Liber Nemroth* is a text of eastern, probably Syriac, origin, written sometime between the 6th and the 8th century, which was translated into Latin at the latest by the second half of the 8th century. At the end of the 8th or the beginning of the 9th century, the text underwent a substantial revision, which expunged the chapters dealing with astrological matters (now preserved only as excerpts in miscellaneous manuscripts) and integrated the remaining astronomical sections with materials taken from the Aratean tradition. The text as it now stands is made up of 110 chapters, interspersed with unnumbered excerpts (usually taken from other works, in most cases Bede's *De natura rerum*) and provided with ca. fifty illustrations, mainly circular diagrams. Among the Aratean materials which were associated to the *Liber Nemroth* in the Carolingian period, the most conspicuous addition is by far the star catalogue known as *De signis caeli*, previously also attributed to Bede. This is a short text, derived from the tradition of the *Aratus Latinus*, listing the ancient Graeco-Roman constellations and the main stars contained in each of them, and equipped with forty illustrations.

6 A recent survey of the numerous studies on Pacificus and his works can be found in Valtorta 2006, 177-81.

7 The other manuscripts are: Città del Vaticano, Biblioteca Apostolica Vaticana, ms. Pal. lat. 1417 (early 12th century); Paris, Bibliothèque Nationale de France, ms. Latin 14754, fols 203*r*-229*r* (mid-12th century); Torino, Biblioteca Civica Centrale, Fondo Antonio Bosio, ms. B.176 (end of the 13th century).

8 Haskins 1924, 336-45; van de Vyver 1936, 684-87; Livesey, Rouse 1981; Obrist 1994; Obrist 1997, 77-83; Juste 2004; Gebner 2008; Obrist 2011; Blume, Haffner, Metzger 2012, 1, 142-43; Draelants 2017; Draelants forthcoming. I thank Isabelle Draelants for her generous suggestions and for allowing me to read her still unpublished contributions. A whole branch of studies deals specifically with the relation between the *Liber* and the character of Nemroth in Dante's *Inferno*: see at least Lemay 1963; Lemay 1965; Nardi 1966, 367-76; Dronke 1986, 43-46 and 112-24; Ciccuto 2003.

The association of texts found in the Venice manuscript (Pacificus' *rhythmus* on the night clock – *Liber Nemroth* – *De signis caeli*) is not unique. As Charles Haskins had already recognised, the association of the *Liber Nemroth* with the *rhythmus* on the night clock is also attested in the 13th century by the *Speculum astronomiae* attributed to Albertus Magnus, who quotes the words *Sphaera coeli* as the *incipit* of Nemroth's astronomical treatise:[9] apparently a branch of tradition existed, in which Pacificus' poem, explaining how to build an instrument capable of improving the observation of the sky, was used as a sort of technical introduction to the main treatise. It is possible that the Paris manuscript of the *Liber Nemroth* (BNF, Latin 14754), written probably in Chartres, originally contained the same association of texts, but unfortunately here the beginning of the treatise is incomplete: the first ten chapters are lacking, and the text opens with chapter XI (entitled *De locis signorum*).[10] In the Palatine *codex* now in the Vatican, on the contrary, the beginning of the *Liber Nemroth* is preceded by a short excerpt taken from book 18 of the *De civitate Dei* (Aug. *ciu.* 18.39), where Augustine speaks of Atlas, *magnus astrologus*, identifying him as a contemporary of Moses and the brother of Prometheus, and tracing his offspring down to Hermes Trismegistos. The excerpt on Atlas serves the purpose of juxtaposing the biblical tradition, represented by Nemroth, to the pagan classical astronomy, as symbolised by the images of the two mythical astronomers drawn at the bottom of the first folio.[11] More clearly documented is the association of the *Liber Nemroth* with the star catalogue *De signis caeli*, which appears in three manuscripts. The star catalogue follows immediately the *Liber Nemroth* in both the Venice and Paris manuscripts (fols 31*v*-36*r* and 229*v*-232*v*, respectively), but it was once included also in the Pal. lat. 1417: as pointed out by van de Vyver (1936, 686-87 note 140), the summary of the latter manuscript, written by a 15th century hand on its fol. 1*r*, lists as its first entry a "libellus pulcer Besde de situ et dispositione stellarum et signorum coeli", followed

9 Borgnet 1890-99, 10, 631: "Ex libris ergo qui post libros geometricos et arithmeticos inveniuntur apud nos scripti super his, primus tempore compositionis est liber quem edidit Nembroth gigas ad Iohathonem discupulum suum, qui sic incipit: *Sphaera coeli*, etc., in quo est parum proficui, et falsitates nonnulle; sed nihil est ibi contra fidem quod sciam". Cf. Haskins 1924, 338.

10 For bibliographical references on the manuscript up to 2010 see the catalogue entry on the website of the Bibliothèque Nationale de France: `http://archivesetmanuscrits.bnf.fr/ark:/12148/cc75500d`, with a link to the digitised version available on the *Gallica* database.

11 The caption of the left figure says "Atlas magnus astrologus, rex Ispanensium, regens humeris suis celum inclinatum cum stellis", standing on the "Pireni montes"; the caption of the right figure says "Nemroth inspector celorum ac rex Caldeorum, regens manibus suis celum inclinatum sine stellis", standing on the "montes Amorreorum". The ms. Pal. lat. 1417 is fully digitised on the website *Bibliotheca Palatina–digital* of the Universitätsbibliothek Heidelberg: `http://digi.ub.uni-heidelberg.de/de/bpd/index.html`.

by other astronomical texts; thanks to this summary we know that the *codex* as it stands today, made of only 19 folios containing only the *Liber Nemroth*, was originally the first section of a more complex astronomical miscellany including also the *De signis caeli*. Thus, we can conclude that the star catalogue *De signis caeli* was originally used as a standard complement to the *Liber Nemroth*: this is hardly surprising, since the information available in the star catalogue provides a useful addition to the astronomy contained in the *Liber*, which does not include a thorough treatment of the constellations.[12]

Leaving a more detailed analysis of the texts contained in the Venice manuscript to the scholars who are preparing their editions, in the present paper I will focus on the images of the constellations included in the star catalogue *De signis caeli*. Since I am no medievalist, I do not have the capacity of addressing them from a stylistic point of view: I leave this task to historians of medieval book illustration, in the hope that they can say something more precise about the time and place of production of the manuscript. On the contrary, I will study these images from the point of view of their iconography, examining their relationship with both the text they accompany and the ancient models from which they ultimately derive. These materials, both textual and visual, are part of the so-called Aratean tradition, a complex stratification of texts and images aggregated over more than seven centuries (from the 3rd century BC to the 4th century AD) around the astronomical poem *Phaenomena*, written by the Greek poet Aratus of Soli in the 3rd century BC. This poem, containing a description of the stars and constellations visible in the sky, was a true best-seller throughout Greek and Roman antiquity: it was considered an essential part of the education of the upper classes in the Hellenistic and Imperial periods, while its quotation, attributed to Paul in his Athenian speech in the Acts of the Apostles, assured its success also among a Christian audience. Aratus' poem was translated into Latin several times between the 1st century BC and the 8th century AD; and, at least from the Roman imperial period, commented and illustrated editions were produced, both in the original Greek and in Latin translation. A handful of ancient astronomical manuscripts which survived into the early medieval West were in fact exemplars of these commented and illustrated editions of Aratus' *Phaenomena*. For the time being, I will narrow down my focus to the materials which were available in the Carolingian period: because it is in this period, between the late 8th and the early 9th century, that the text of the star catalogue *De signis caeli* and its illustrations were produced.

12 For this reason, on fol. 1*r* of the ms. Pal. Lat. 1417, Nemroth is depicted as "regens… celum inclinatum sine stellis", while the stars and constellations are regularly present in the 'pagan' sky carried on his shoulders by Atlas.

A comparative study of the texts and illustrations preserved in the extant medieval Aratean manuscripts allows us to identify four branches of the medieval tradition, each one derived from an ancient illustrated book (fig. 2). These books were presumably part of private aristocratic libraries in late Roman Gaul, and with the collapse of Roman administration during the 5th century they passed into ecclesiastical property, either by bequeathal or by simple continuity of ownership (for many late antique Gallic bishops were, in fact, local aristocrats). During the early period of the Frankish kingdom these books were preserved by ecclesiastical institutions as luxury items, until the 8th century, when they started to be studied and copied. Two of these books were specimens of what Jean Martin, in his reconstruction of the history of the Aratean tradition, called the 'Φ edition' of the *Phaenomena*:[13] in these books Aratus' poem was accompanied by an extensive astronomical and mythological commentary, equipped with ca. 50 illustrations. Judging from the iconography of the constellations as preserved in their extant medieval copies, these two manuscripts were exemplars of the late antique revision of the 'Φ edition', produced probably in the 4th or early 5th century AD: one of them was written in Greek, and it is the ancestor of the manifold tradition of the so-called *Aratus Latinus*; the other one was a Latin translation, which can be recognized as the archetype of the *O* family of Germanicus' *Aratea*. The other two manuscripts were probably contemporary with the two already mentioned, but they did not contain the 'Φ edition'. They can be recognized as the direct models of two of the most extraordinary luxury manuscripts written at the Carolingian court, namely the Leiden *Aratea* (a lavishly illustrated edition of the Latin translation of Germanicus without commentary, and the archetype of Germanicus' *Z* family); and the ms. Harley 647 of the British Library, containing a large fragment of Cicero's translation of the *Phaenomena*, with a commentary made of excerpts from Hyginus' treatise *De astronomia*.

Leaving aside the aesthetic fascination for these luxury court manuscripts, I would like to examine more closely the textual tradition of the two versions – the Greek and the Latin one – of the 'Φ edition', as reconstructed by the studies of Antonio Dell'Era and Hubert Le Bourdellès.[14] According to Le Bourdellès, the Greek version of the 'Φ edition' was translated into Latin probably in the monastery of Corbie, in northern France, already in the second quarter of the 8th century. This translation, known as the *Aratus Latinus*, was made by someone who had a very poor knowledge of

13 Martin 1956, 35-126.

14 See the critical editions of the Aratean commentaries by Dell'Era 1974, *De ordine ac positione stellarum in signis*; Dell'Era 1979a, *Scholia in Germanicum Basileensia*; Dell'Era 1979b, *De signis caeli*; Dell'Era 1979c, *Scholia in Germanicum Strozziana*. Le Bourdellès 1985 is the most recent comprehensive study of the tradition of the *Aratus Latinus*, seen from the point of view of a medievalist.

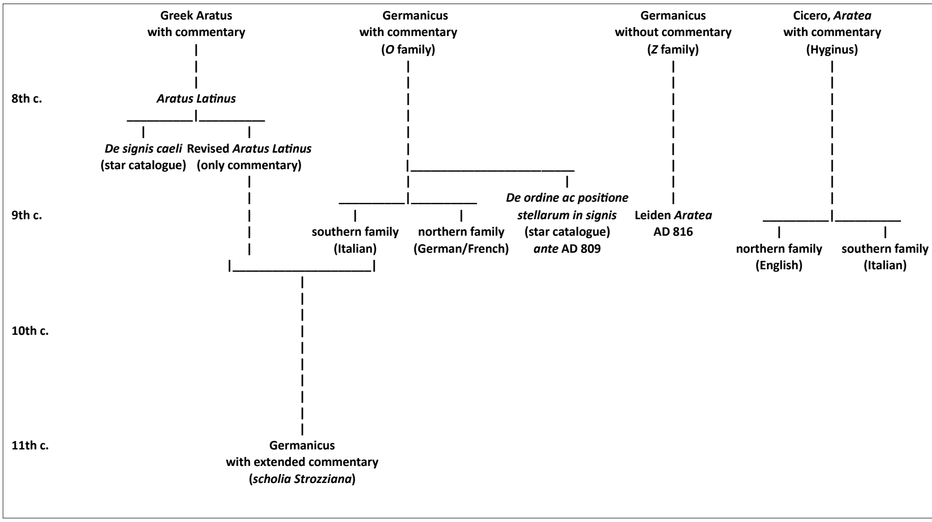

Figure 2. A scheme of the transmission of the Aratean tradition from Late Antiquity into the Latin Middle Ages

Greek, with the aid of some Greco-Latin *glossaria* which proved largely insufficient for the task: the text thus produced was almost unintelligible, especially the translation of Aratus' complex allusive poetry. For this reason, in the last decades of the 8th century this first attempt underwent an extensive revision, which ultimately produced two brand-new texts: on the one hand, a new version of the *Aratus Latinus*, now including only the commentary and not the main poetic text; on the other hand, a star catalogue, conventionally known today by the title *De signis caeli*, which extrapolated from the commentary only the sections dealing with the positions of the stars within each constellation, leaving aside all the mythological stories, as well as the astronomical introductory materials. A large number of manuscripts of both these texts are illustrated with an almost identical set of images, clearly derived from their common late Roman model.

16 illustrated manuscripts of the star catalogue *De signis caeli* are known today, all of them displaying the same sequence: every constellation is described, first, by a text listing its main stars, then by an image outlining its general shape. The illustrations of the star catalogue can be classified, on the basis of iconographic criteria,[15] into two main recensions: one has a set of illustrations which look very close to their late Roman

15 The main work on this subject has been done by Kristen Lippincott, and the following thoughts are based heavily on her classification, although with some changes. The results of Kristen Lippincott's studies can be found in the website of her *Saxl Project*: `http://www.`

models, while the second one varies the traditional iconographies in a quite creative way. The most characteristic manuscript of the first group is ms. Latin 5543 of the Bibliothèque Nationale de France, written in the mid-9th century in the monastery of Fleury, in the valley of the Loire, and probably completed in the first half of the 10th century:[16] this manuscript displays the typical layout of a late Roman illustrated *codex*, with the images taking the full width of the page and surrounded by a thick rectangular frame. The iconographies of the individual constellations, too, look very close to the ancient models: indeed, they offer a somewhat simplified version of those found in ms. Vat. gr. 1087, written in Constantinople in the first half of the 14th century, which, in turn, were copied from another specimen of the same, aforementioned late antique 'Φ edition'.[17] The superior artistic quality of these Byzantine drawings must be ascribed not only to the work of a first class artist, but also to the fact that the images of Vat. gr. 1087 were probably copied directly from an ancient model; on the contrary, before being included in ms. Par. Lat. 5543, the late Roman illustrations of the *De signis caeli* had already undergone a long process of copying, from the 8th to the 10th century, which had led to some iconographic *naïvetés* and misunderstandings. At any rate, this set of images appears to be the most common among the illustrated manuscripts of both the star catalogue *De signis caeli* and the revised version of the *Aratus Latinus*, and it must therefore be considered as deriving from their common ancestor, i.e. from the late antique Greek *codex* of Aratus' 'Φ edition' which was translated into Latin in Corbie during the 8th century, and which was the common archetype of this whole branch of the medieval western tradition.

The Venice manuscript, on the contrary, carries a completely different set of illustrations, which is found in a group of six manuscripts, ranging from the 9th to the 13th century and spread from northern Italy to England.[18] 6 manuscripts out of 16 is actually a rather high percentage for a

`kristenlippincott.com/the-saxl-project`. Lippincott's classification of the constellation cycles is more complete and more functional than the one proposed by Duits 2005.

16 The original, computistical section of the manuscript is dated AD 847, the folios containing the star catalogue *De signis caeli* are a later, 10th century addition: cf. at least Borst 2006, 1, 270-71; Blume, Haffner, Metzger 2012, 1, 87-89 and 422-29, cat. no. 44. Further bibliographical references are included in the catalogue entry in the website of the Bibliothèque Nationale de France: `http://archivesetmanuscrits.bnf.fr/ark:/12148/cc64506m`, with a link to the digitised version in the *Gallica* database.

17 On this manuscript see now Guidetti, Santoni 2013.

18 The group consists of the following manuscripts: Padova, Pontificia Biblioteca Antoniana, ms. 27, fols 130*v*-133*v* (Verona, late 9th-early 10th century); Dijon, Bibliothèque Municipale, ms. 448, fols 67*v*-71*r* (Burgundy, early 11th century); Durham, Chapter Library, ms. Hunter 100, fols 62*r*-64*v* (Durham, early 12th century); Paris, Bibliothèque Nationale de France, ms. Latin 14754, fols 229*v*-232*v* (Chartres, mid-12th century); Venezia, Biblioteca Nazionale Marciana, ms. Lat. VIII 22 (2760), fols 31*v*-36*r* (Northern France or England,

Figure 3. Opening folio of the star catalogue *De signis caeli.* Venezia, BNM, ms. Lat. VIII 22 (2760), fol. 31*v*. Northern France or England, last quarter of the 12th century (with permission of the MiBACT)

Figure 4. Opening folio of the star catalogue *De signis caeli*. Padova, Pontificia Biblioteca Antoniana, ms. 27, fol. 130*v*. Verona, early 10th century (with permission of the Pontificia Biblioteca Antoniana)

'secondary' tradition: this alternative set of illustrations, in other words, is not as rarely attested as we could expect in comparison with the main recension, namely that of the ancient model from which the text is also derived. If the success of the main recension finds its legitimation in the authority of its model, and in the conservatism of the copying process itself, we will have to find a reason for the creation and spreading of the second set of illustrations. An analysis of the distribution of text and images, as well as of the iconographies of the constellations in this group of manuscripts will lead us to some hypotheses.

In all six manuscripts of this group, the star catalogue *De signis caeli* shows the same layout, which is very different from the late Roman arrangement found in the Fleury *codex*: the text is now written in two columns, the illustrations are considerably smaller and they are not surrounded by any kind of frame. In four out of six manuscripts (including the one in Venice) the stars are marked on the image of each constellation, but their arrangement does not match the real positions of the stars in the sky: that is to say, the stars have been marked on the constellation images by meticulous scribes on the basis of the corresponding texts, without any reference to direct observation of the sky.

The impression that the marking of the individual stars should be interpreted as a scribal addition is also corroborated by the absence of this feature in the oldest manuscript of this group, namely the late Carolingian computistical miscellany written probably in Verona between the end of the 9th and the beginning of the 10th century, and acquired in the first half of the 15th century by the monastery of St. Anthony in Padua, where it is still preserved.[19] The important differences in the text of the *De signis caeli* between the Padua and the Venice manuscripts rule out the possibility of a derivation of the latter from the former:[20] nonetheless, the two

last quarter of the 12th century); Oxford, Bodleian Library, ms. Laud misc. 644, fols 8*r*-10*v* (Bayeux, second half of the 13th century).

19 Padova, Pontificia Biblioteca Antoniana, ms. 27. For a detailed description of the manuscript and its content see McGurk 1966, 64-72; Abate, Luisetto 1975, 28-33. A description and a bibliography up to 2010 can be found in the website *Nuova biblioteca manoscritta – Catalogo dei manoscritti delle biblioteche del Veneto*: `http://www.nuovabibliotecamanoscritta.it`; among the most recent publications, one should add at least Ó Cróinín 2010, 331-44. On the astronomical illustrations of the *De signis caeli*, copied in the last *folios* of the manuscript, see especially Toniolo 2004; Blume, Haffner, Metzger 2012, 1, 410-14, cat. no. 42. I hereby express my warmest thanks to the Director of the Pontificia Biblioteca Antoniana, father Alberto Fanton, for his invaluable assistance during the consultation of the manuscript.

20 Apart from the numerous textual variants, the most conclusive evidence is provided by a *lacuna* on fol. 133*r* of the Padua manuscript, where the chapter on the constellation of Hydra is lacking and a blank space is left on top of the corresponding illustration; the chapter is regularly present in the Venice manuscript, fol. 36*r*, which must thus derive from another source.

Figure 5. *Constellation of Draco.* Venezia, BNM, ms. Lat. VIII 22 (2760), fol. 31*v*. Northern France or England, last quarter of the 12th century (with permission of the MiBACT)

Figure 6. *Constellation of Draco.* Padova, Pontificia Biblioteca Antoniana, ms. 27, fol. 130*v*. Verona, early 10th century (with permission of the Pontificia Biblioteca Antoniana)

manuscripts share a characteristic detail in their layout, which does not appear in any other witness of the same group. In the Venice manuscript, the first entry of the *De signis caeli*, presenting the constellation of Ursa Maior, is initially written on one column, taking up only two lines of text; then, the scribe decided to shift to a two-column layout, in order to save space: thus, the image of Ursa Maior was drawn in the left half of the page, leaving space in the right column for the text of the second constellation entry, Ursa Minor. This decision, however, caused a problem, for as a consequence the scribe continued to use the right column for the entries about Ursa Minor and Draco, then placing the fourth and fifth constellations, Hercules and Corona Borealis, in the left column which he had previously left blank. As a result, the reader is now faced with the wrong sequence: Ursa Maior – Hercules – Corona Borealis – Ursa Minor – Draco (fig. 3). Significantly, this problem in the layout of the first page is also found in the Padua manuscript (fig. 4): here, too, the scribe started out by copying the text in one broad column, and only after the third constellation he realised that he could save space by shifting to a two-column layout. This change of mind regarding the layout, occurring in two manuscripts which

Figure 7. *The circumpolar constellations.* Basel, Universitätsbibliothek, ms. AN IV 18, fol. 14*r*. Fulda, ca. AD 820-830 (© Universitätsbibliothek Basel)

do not appear to be immediately derived from one another, points to the fact that, at the origin of this tradition, too, there may easily have been a one-column model: such a conclusion confirms that, despite the evocative similarity of the two-column format to the so-called '*rotulus*-style', the ancient model which gave origin to the whole textual and visual tradition of the *De signis caeli* was actually a one-column late Roman *codex* with lavish full-page illustrations, and the change in favour of a two-column layout was a Carolingian innovation, to be ascribed mainly to economic reasons.

In what follows, I will examine in greater detail some of the constellation images included in the Venice and Padua manuscripts, comparing them with the standard illustrations of the main recension of the *De signis caeli* (as best attested by the Fleury *codex* Par. Lat. 5543), with the aim of better understanding the models used for the creation of this 'alternative' set of illustrations, the criteria of its conception and the reasons for its success. From this point of view, the iconography of Draco is particularly interesting. Draco is usually depicted as a snake winding between the two Bears: accordingly, it appears in the form of a snake in all the extant branches of the Aratean tradition, including the manuscripts of the *De signis caeli*, in both the 'main' and the 'alternative' recension. The illustrator of the Venice manuscript, while drawing the image of Draco on fol. 31*v*, departed from this iconography and replaced the traditional snake with a veritable dragon, shaped like a bird with a snake's tail and flames flowing from its jaws (fig. 5). This image certainly testifies to the high degree of creativity and independence of this illustrator, who for some reason wanted to draw something closer to what the Latin word *draco* evoked to his own medieval imagination, rather than to accurately follow his model. As it can be noticed, however, in the first version of this illustration the tail of the Dragon was more winding, extending further below, in a way more similar to what was probably found in its model; then, the illustrator decided to shorten the tail and move it upwards, probably as a consequence of the layout problems which we have already mentioned, in order not to cross over into the adjacent left column: and this led him to produce an image that has almost nothing in common with the original iconography.

Perhaps even more interesting, from the point of view of the history of the text, is the fact that, in all extant manuscripts of this second recension of the *De signis caeli*, Draco is always represented alone: the earliest, and most elaborate, version is the one found on fol. 130*v* of the Padua *codex* (fig. 6). This choice is rather uncommon in the iconographic tradition of the *Aratea*: Aratus defines the position of this constellation in relation to the two Bears (Arat. 45-62); as a consequence, the ancient illustrations of the *Aratea* show the three circumpolar constellations together, thus clarifying the importance of their spatial connection. Accordingly, the combination of Draco with the two Bears is a common feature of all the extant branches of the Aratean tradition: it was found not only in the late antique Greek version of the 'Φ edition', as witnessed by the ms. Vat. gr. 1087 (fol. 305*v*) and the main recension of the *De signis caeli*, but also in the Latin version of the same 'Φ edition', as attested by the *O* family of Germanicus; finally, the same illustration also appears in Germanicus' *Z* family, represented by the Leiden *Aratea*.[21] In other words, we can state that in all the ancient astronomical books available to the Carolingian scholars, which were the archetypes of our extant families of manuscripts, Draco was always represented together with the Bears. So, the choice of excerpting it out of this combination, giving it an image for its own, must be regarded as a purposeful variation by the inventor of this alternative set of illustrations.

Significantly, the inception of the same tendency can already be seen in the main recension of the *De signis caeli*: here the images of the two Bears have been extrapolated from the comprehensive illustration of the circumpolar constellations, in order to accompany the corresponding entries of the star catalogue, which otherwise would not have been illustrated. As a result, for example, the Fleury manuscript of the *De signis caeli* shows, at its beginning, the two separate images of the two Bears (fol. 160*r*), fol-

21 Leiden, Universiteitsbibliotheek, VLQ 79, fol. 3*v*; on this famous manuscript cf. at least Blume, Haffner, Metzger 2012, 1, 53-67 and 292-98, cat. no. 23, with further bibliographical references. The illustrations of the circumpolar constellations are not preserved in the tradition of Cicero's *Aratea*, due to its incomplete state.

Figure 8. *Constellation of Hercules.* Basel, Universitätsbibliothek, ms. AN IV 18, fol. 14*v*. Fulda, ca. AD 820-830 (© Universitätsbibliothek Basel)

Figure 9. *Constellation of Hercules.* Venezia, BNM, ms. Lat. VIII 22 (= 2760), fol. 31*v*. Northern France or England, last quarter of the 12th century (with permission of the MiBACT)

Figure 10. *Constellation of Hercules.* Padova, Pontificia Biblioteca Antoniana, ms. 27, fol. 130*v*. Verona, early 10th century (with permission of the Pontificia Biblioteca Antoniana)

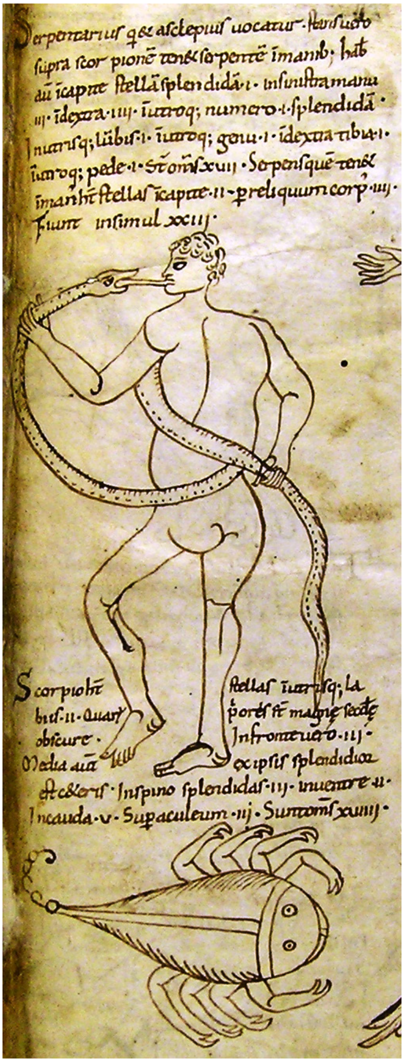

Figure 11. *Constellations of Ophiuchus* and *Scorpius.* Padova, Pontificia Biblioteca Antoniana, ms. 27, fol. 131*r*. Verona, early 10th century (with permission of the Pontificia Biblioteca Antoniana)

Figure 12. *Constellations of Ophiuchus* and *Scorpius.* Venezia, BNM, ms. Lat. VIII 22 (2760), fol. 32*r*. Northern France or England, last quarter of the 12th century (with permission of the MiBACT)

Figure 13. *Constellation of Gemini.* Padova, Pontificia Biblioteca Antoniana, ms. 27, fol. 131*v*. Verona, early 10th century (with permission of the Pontificia Biblioteca Antoniana)

Figure 14. *Constellation of Gemini.* Venezia, BNM, ms. Lat. VIII 22 (2760), fol. 32*v*. Northern France or England, last quarter of the 12th century (with permission of the MiBACT)

lowed on the next page by the traditional Aratean illustration featuring Draco and the Bears together, with the Bears drawn in two different colours in order to distinguish them from one another (fol. 160*v*). Compared with this situation, the second recension of the *De signis caeli* simply eliminates the repetition of the identical images, by removing the two Bears from the third illustration and thus leaving Draco alone. The same simplification is also found in a second Carolingian star catalogue, the slightly later *De ordine ac positione stellarum in signis*, derived from the Latin commentary (the so-called *Scholia Basileensia*) which accompanies Germanicus' translation in the manuscripts of the *O* family. This text was exceptionally widespread in the Carolingian period, thanks to its inclusion in the so-called *Libri computi*, the large computistical encyclopaedia prepared under the auspices of Charles the Great, probably under the direction of Adalhard of Corbie, and published in Aachen in AD 809.[22] Here, too, Draco has been separated from the Bears and appears as an isolated

22 The text of the *Libri computi* is now available in the critical edition by Borst 2006, 3, 1054-334, cat. no. 17 (The *De ordine ac positione stellarum in signis* is chapter 2 of book V, 1251-60).

Figure 15. *Constellation of Gemini.* Basel, Universitätsbibliothek, ms. AN IV 18, fol. 20*r*. Fulda, ca. AD 820-830 (© Universitätsbibliothek Basel)

Figure 16. *Constellation of Auriga.* Basel, Universitätsbibliothek, ms. AN IV 18, fol. 22*r*. Fulda, ca. AD 820-830 (© Universitätsbibliothek Basel)

constellation under the corresponding text, as can be seen in one of the earliest preserved manuscripts, now in Madrid.[23] However, a difference can be noticed between the two star catalogues in the position of Draco: in the manuscripts of the *De ordine ac positione* Draco is drawn vertically, thus keeping the position it has in all the descendants of the Greek 'Φ edition', including the main recension of the *De signis caeli*; on the contrary, in the alternative set of illustrations for the *De signis caeli*, Draco is drawn horizontally. This choice could perhaps be explained merely as a method for saving space, but in my opinion it can also be linked to a specific model: the horizontal Draco is found only in the *O* family of Germanicus, as attested for example in its earliest witness, the *codex Basileensis*, on fol. 14*r*[24] (fig. 7). We can thus formulate the hypothesis that this alternative set of illustrations was created through a contamination of the received set already available in the manuscripts of the *De signis caeli* (that is, the one derived from the Greek late antique 'Φ edition' of Aratus) with the set of the Latin 'Φ edition', as attested in the *O* family of Germanicus' *Aratea*. In the following pages we will back this hypothesis, providing more examples in which such a contamination can be recognised.

The tendency to separate groups of constellations which, in the Aratean tradition, are usually combined with one another is confirmed in the case of Hercules. The normal iconography in the manuscripts derived from the 'Φ edition' shows the hero while fighting against Draco, and thus combines the two constellations in a mythological depiction referring to one of Hercules' twelve labours, the stealing of the golden apples of the Hesperides. This image is found in both the Greek and the Latin versions of the 'Φ edition', as attested respectively by the Fleury manuscript now in Paris (fol. 161*r*) and the Basel *codex* of Germanicus (fig. 8).[25] The il-

23 Madrid, Biblioteca Nacional de España, ms. 3307, fol. 54*v*. The manuscript was probably written in the monastery of Murbach, in Alsace, around AD 820, as the faithful copy of a luxury exemplar produced at the imperial court in Aachen: see at least Borst 2006, 1, 248-49; Blume, Haffner, Metzger 2012, 1, 67-68 and 354-59, cat. no. 33, with further bibliographical references. The manuscript is fully digitised in the website of the *Biblioteca Digital Hispánica*: `http://www.bne.es/es/Catalogos/BibliotecaDigitalHispanica/Inicio/index.html` under the signature Mss/3307.

24 Basel, Universitätsbibliothek, ms. AN IV 18, written ca. AD 820-30, perhaps in the monastery of Fulda: it contains the introductory treatises of the *Aratus Latinus*, followed by Germanicus' *Aratea* with commentary and illustrations; see at least Blume, Haffner, Metzger 2012, 1, 73-74 e 202-07, cat. no. 6, with further bibliographical references. The manuscript is fully digitised in the website of the *Virtual Manuscript Library of Switzerland*: `http://www.e-codices.unifr.ch/en`.

25 The tradition of Germanicus' *Z* family offers no help on this point, because its Hercules (fol. 6*v* of the Leiden *Aratea*) is actually depicted with the attributes of Bootes: the long, curved stick and the short tunic, or *exomis*; perhaps this can be interpreted as the consequence of some errors occurred during the copy of the ancient model. In the manuscripts of Cicero's *Aratea*, as in the other cases mentioned earlier, this illustration is not preserved.

Figure 17. *Constellation of Auriga.* Venezia, BNM, ms. Lat. VIII 22 (2760), fol. 32*v*. Northern France or England, last quarter of the 12th century (with permission of the MiBACT)

Figure 18. *Constellation of Auriga.* Padova, Pontificia Biblioteca Antoniana, ms. 27, fol. 131*v*. Verona, early 10th century (with permission of the Pontificia Biblioteca Antoniana)

lustration found in the manuscripts now in Venice (fig. 9) and Padua (fig. 10) clearly derives from the same tradition: the hero is represented in an identical posture, seen from the back (that is, in globe view), kneeling on his right knee, with the club in his right hand and the lion skin on his left arm. But in these two manuscripts, as in all those of the second recension of the *De signis caeli*, the Dragon and the apple tree have been removed; the same simplification is found, again, in the earliest manuscripts of the other Carolingian star catalogue, the *De ordine ac positione stellarum in signis* (Madrid, Biblioteca Nacional de España, ms. 3307, fol. 55*r*).

In my opinion, this choice cannot be explained away as the consequence of a pious refusal to represent a pagan mythological hero: even without the Dragon and the tree, Hercules is clearly identifiable thanks to his attributes, the lion skin and club. Indeed, I am inclined to give to this choice a scientific rather than an ideological reason: as in the case of Draco, which we have seen earlier, the inventor(s) of this alternative set of illustrations wanted, for the sake of clarity, each constellation to be treated as a single unit. The double illustration of Draco found in the ancient model, first as winding between the Bears and then as fighting against Hercules, was considered redundant: thus, this constellation was removed from its two contexts and given an image of its own. As a result, the two original Aratean illustrations were replaced by four different images. In the first recension of the *De signis caeli* these illustrations represented, respectively: Ursa Maior; Ursa Minor; Ursa Maior, Ursa Minor, and Draco; Draco and Hercules. The second recension eliminates the redundancies and offers a much clearer distinction, with four separate depictions of Ursa Maior, Ursa Minor, Draco, and Hercules.

The same rule applies again in the case of Ophiuchus and Scorpius. In the entire Aratean tradition these two constellations are normally depicted together, with Ophiuchus standing on the back of Scorpius, as described in Arat. 83-86. This combination is also found in the main recension of the *De signis caeli* (Paris, Bibliothèque Nationale de France, ms. Latin 5543, fol. 161*v*): but, as it had already happened with the two Bears, the image of Scorpius is here repeated, as an independent constellation, to illustrate its separate catalogue entry (fol. 162*r*).[26] Exactly as in the case of Draco with the two Bears, in the second recension of the *De signis caeli* and in the *De ordine ac positione stellarum in signis* this duplication is eliminated: Ophiuchus and Scorpius have been given two different images, illustrating their respective catalogue entries as two separate constellations, as found in the Padua (fig. 11) and Venice (fig. 12) manuscripts.

On the other hand, the hypothesis of a contamination of this second recension of the *De signis caeli* with the *O* family of Germanicus (that is, with the Latin version of the 'Φ edition') is confirmed by the image of the constellation of Gemini. The main recension of the star catalogue, again well represented by the Fleury manuscript, identifies the Twins with the Dioscuri, Castor and Pollux (fol. 158*r*): they are depicted here as typical late Roman hunters, dressed with a short tunic, trousers (*bracae*), and a short mantle (*chlamys*), and with spears in their hands; the two figures, clearly separated from one another, are arranged in a symmetrical way. The alternative recension of the same text, on the contrary, as represented in the Padua and Venice manuscripts, clearly follows a different mythological identification: here the Twins are depicted as Amphion and Zethus, as is made clear by the lyre in the hand of one of them.

In the Padua version (fig. 13), the two figures are dressed only with a long *chlamys*, an outfit particularly suitable for late Roman heroes; on the contrary, the illustrator of the Venice manuscript (fig. 14) has provided both characters with a long tunic: this addition, along with the monumental arch framing the two figures, contributes to dignifying them, while the arch stresses at the same time their common identity as a single constel-

26 This phenomenon, however, is not found in all manuscripts of the main recension of the *De signis caeli*: some of them simply reproduce the original set of illustrations of the 'Φ edition', without modifying the combinations of constellations. These include the following manuscripts, closely related to one another: Città del Vaticano, Biblioteca Apostolica Vaticana, ms. Vat. lat. 643 (11th century); Zwettl, Stiftsbibliothek, ms. 296 (AD 1200 ca.); Klosterneuburg, Stiftsbibliothek, ms. 685 (Klosterneuburg, 12th century). The same situation occurs in the famous manuscript of Germanicus now in Aberystwyth, National Library of Wales, ms. 735C (Limoges, AD 1000 ca.), whose text pertains to Germanicus' *O* family, but which has the set of illustrations of the Greek 'Φ edition' (Guidetti 2013, 127-37): but in this case there would have been no point in modifying the extant set of illustrations, which had originally been invented for the same text, although in a different language.

lation.[27] This identification of Gemini as Amphion and Zethus is alien to the Greek version of the 'Φ edition', and consequently to the main recension of the *De signis caeli*. On the contrary, it points directly to the tradition of Germanicus: more exactly, the detail of the two figures embracing one another comes from the tradition of the *O* family (that is, from the Latin version of the 'Φ edition'), as attested again by the Basel *codex* (fig. 15); in the manuscripts of the *Z* family, on the contrary, the two figures are separated from one another. So, the illustration of Gemini in the second recension of the *De signis caeli* was taken from the tradition of Germanicus' *O* family; but, in a way consistent with the tendency we have already seen, the combination of Gemini and Cancer in the same illustration, which is found in both the Greek and Latin 'Φ edition', has been avoided by the illustrator of the star catalogue, and the two constellations have been clearly separated into two independent entries.

The influence of the Latin version of the 'Φ edition' is detectable in other images, too: as my last example, I will turn to the constellation of Auriga. The Greek version of the 'Φ edition' depicts Auriga as a floating figure dressed as a late Roman charioteer, wearing a long tunic held by a broad belt, with a helmet on his head and the whip in his right hand; the individual stars Capella and Haedi are represented by the goats on the right: Capella at Auriga's feet, the two Haedi on his stretched left arm[28] (Paris, Bibliothèque Nationale de France, ms. Latin 5543, fol. 159*r*). In the Latin version of Germanicus' *O* family, on the contrary, Auriga is not floating in the air, but standing on board his war chariot; the figure is definitely interpreted as a soldier, dressed with a mantle leaving his upper body naked, and provided with a shield and a helmet with crest. These warlike attributes are also found in the manuscripts of the second recension of the *De signis caeli*, which, for this constellation too, must have borrowed an image taken from the tradition of Germanicus. What makes the case of Auriga particularly interesting is the fact that, in this case, the illustrations found in the two branches of Germanicus' *O* family differ considerably from one another: probably as a consequence of some damage which affected their common model, making it hardly readable and thus forcing the scribes to integrate the source through their own creativity, the two

27 It is not by chance, I think, that the monumental arcade which frames the image of Gemini in the Venice manuscript features the same colours which are found throughout late Roman astronomical illustrations: the artist probably knew that, in the most lavishly illustrated astronomical books, the images of constellations were drawn on a blue background delimited by a thick red frame, and decided to introduce a variation on its model by imitating this special layout.

28 In the Byzantine manuscript Vat. gr. 1087, fol. 307*v* Auriga is clearly identified as the Sun, as can be recognised thanks to the radiate crown; in the western tradition of the Greek 'Φ edition', on the contrary, due to the lack of that attribute, Auriga is simply identifiable as a standard late antique charioteer.

branches have undergone different kinds of simplifications. In the northern (Frankish) branch, attested by the Basel manuscript, Auriga holds a patera in the right hand and turns his head backwards towards Capella and the Haedi; his chariot is unusually drawn by a single horse[29] (fig. 16). The illustration from the southern (Italian) branch, whose earliest witness is an early-12th century Cassinese *codex* now in Madrid,[30] seems at first sight more coherent, because it preserves the usual *quadriga* and places a spear in Auriga's right hand; but here the posture appears somewhat simplified: Auriga does not turn his head backwards, because Capella and the Haedi are placed, respectively, on his shoulder and his extended left arm (fol. 59*r*).

Let us now turn to the manuscripts of the second recension of the *De signis caeli*. The image of Auriga in the Venice manuscript (fig. 17) seems at first related to the southern branch of Germanicus' *O* family: Auriga has more than one horse (actually three), he holds a spear in his right hand, and looks straight ahead. But, if we look at the same illustration in the earliest manuscript of this group, namely the Padua one, we find that here, too, Auriga was originally turning his head backwards, as in the illustrations of the northern branch (fig. 18): this detail, which is a *lectio difficilior* if compared with the more banal posture of the Venice manuscript, also appears in all the other manuscripts of this group. Thus, the image of Auriga in the second recension of the *De signis caeli* seems to combine features pertaining to both branches of Germanicus' *O* family: the *quadriga* and the spear found in the illustrations of the southern branch, together with the peculiar posture of the northern branch. This leads to the conclusion that the contamination of iconographic motifs taken from the tradition of Germanicus into the alternative recension of the *De signis caeli* could have taken place at a moment when Germanicus' *O* family was not yet split into the two branches which are now extant. Indeed, the witness of this group of manuscripts of the *De signis caeli* can help us reconstruct the original illustration of the Latin 'Φ edition', which was later simplified in different ways in the two branches of its tradition: Auriga was probably depicted with a chariot drawn by four horses (still preserved in the manuscripts of the southern branch, reduced to three in the second recension of the *De signis caeli*, reduced to one in the Basel *codex*); he had a spear in his right hand (still preserved in all manuscripts except for the one in Basel); his head was turned backwards (a detail shared by the Basel *codex* and

29 This oddity was already noticed by some early reader, who wrote next to the single horse: "iiii aequi [*sic*] debent esse".

30 Madrid, Biblioteca Nacional de España, ms. 19. Cf. Borst 2006, 1, 247-48; Blume, Haffner, Metzger 2012, 1, 102-08 and 346-53, cat. no. 32 (with further bibliographical references). The manuscript is fully digitised in the website of the *Biblioteca Digital Hispánica*, under the signature Mss/19.

the second recension of the *De signis caeli*). The manuscripts of the star catalogue, on the contrary, are of no help when it comes to reconstructing the original position of Capella and Haedi (either behind Auriga, or on his shoulder and stretched arm), since these details have been excised by the illustrators of the *De signis caeli*: as the logical consequence of the tendency, which we have already noticed, to treat every constellation as a single entry, not only the combinations of more constellations, but also the depictions of specific stars within a constellation, such as Capella and Haedi, have been expunged.

While looking forward to expanding the analysis, in a future, more detailed study, to all the images of constellations attested in this group of manuscripts, I think that these examples can already point towards some preliminary results. The Venetian manuscript Lat. VIII 22 (2760) belongs to a figurative recension of the stellar catalogue *De signis caeli* which was developed as a more scientific alternative to the standard set of illustrations found in the late Roman archetype of this tradition. The inventor(s) of this recension consciously decided to eliminate all the combinations of constellations, well attested in the ancient Aratean tradition, in order to obtain a clearer picture of the sky, in which each constellation was easily recognisable in its individual character. In this recension, in other words, the interest of the illustrator lay not in the spatial relationships between two or more constellations, as was the rule in Aratus' *Phaenomena* and its Latin translations, but rather in the appearance of each specific constellation. This attitude is very consistent with the purpose for which the stellar catalogue had been excerpted from the tradition of the *Aratus Latinus*, and it appears to be the logical consequence of a process that had already begun in some copies of the main recension of the *De signis caeli*, where some constellations (the Bears, Scorpius, Cancer) are duplicated in order to give every entry of the catalogue an illustration on its own. Given the internal coherence between the textual excerpts of the *De signis caeli* and this set of illustrations, I would propose a date for the invention of the latter not much later than the redaction of the star catalogue: that is, at the end of the 8th or the beginning of the 9th century. This early date is supported, in my opinion, by two arguments. First, the same tendency is shown in the other Carolingian star catalogue, the *De ordine ac positione stellarum in signis*, which has as *terminus ante quem* the publication of the *Libri computi* (AD 809). Second, some iconographies of the new set of illustrations are borrowed from the Latin version of the 'Φ edition', that is, from the *O* family of Germanicus' *Aratea*: as shown by the case of Auriga, these images entered the tradition of the *De signis caeli* at a moment when they had not yet been simplified as a consequence of the division of Germanicus' *O* family into two sub-groups. This means that the inventor of our set of illustrations lived in a period quite close to the common archetype of the two branches of the *O* family, or at least he had access to an earlier copy of it, preceding the splitting of that tradition: in this sense, the earliest witness of this division, namely the Basel *codex* produced in the 820s, may constitute another *terminus ante quem*.

Despite their provenance from a different geographical and cultural background, the two manuscripts of the *De signis caeli* now preserved in Venice and Padua can shed light on a pivotal moment in the history of Western science: their set of illustrations testifies to the freedom and the creativity with which Carolingian scholars copied and contaminated their ancient models, trying to exploit them at best in order to fulfil their own scientific and computistical interests. These first generations of Carolingian scholars did not restrict themselves to merely copying and spreading ancient astronomical knowledge: they creatively manipulated all the materials available to them, with the aim of producing new scientific tools. The extent of their success can be appreciated precisely thanks to late manuscripts such as the one preserved in the Biblioteca Nazionale Marciana: some 400 years after its redaction, the star catalogue *De signis caeli* and its set of illustrations, carefully built out of the best ancient models available at the time, were still being copied and used for the study and the teaching of astronomy.

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Certissima signa
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De signis coeli and *De ordine ac positione stellarum in signis*
Two Star Catalogues from the Carolingian Age

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Abstract *De signis coeli* and *De ordine ac positione stellarum in signis* are two star catalogues produced during the Carolingian renaissance; they represent a contribution of the Aratean tradition to the basic astronomical knowledge in the early Middle Ages. Some characteristics of these texts are discussed, with a special focus on common aspects and differences.

Keywords Ancient astronomy. Medieval astronomy. Constellations. Celestial mythology.

1 Analogies and Differences

This paper focuses on two documents of the Carolingian age, two constellation lists with star catalogues and illustrations: *De signis coeli*, falsely attributed to Bede, and *De ordine ac positione stellarum in signis*, anonymous (figs. 1-2).[1] *De signis* and *De ordine* show the same structure and some common characteristics: it is easy to think that the first, more ancient one, was the model for the second.[2]

1 *De signis* is edited by Dell'Era 1979a, 269-30; for *De ordine* (and *Excerptum de astrologia*) editions see Dell'Era 1974b, *Una caeli descriptio* and Borst 2006, 1054 ff.; in part. 1251-60. Images from two of the oldest manuscripts, both dating to the first quarter of the 9th century: for *De signis* Laon, Bibliothèque Municipale ms. 422 (the ms. is reproduced in the digital database of the Bibliothèque Municipale de Laon, `http://bibliotheque-numerique.ville-laon.fr`), fig. 1a-b; for *De ordine* München, Bayerische Staatsbibliothek, cod. Clm 210 (the ms. is reproduced in the digital database of the Bayerische Staatsbibliothek, `http://daten.digitale-sammlungen.de`), fig. 2a-b. A description of the two manuscripts in Blume, Haffner, Metzger 2012, I, 274-79 (Laon 422), 372-78 (München clm 210).

2 It is not its principal source, as stated by Borst 2006, 1250, no. 143; *De ordine* reveals multiple influences among which Germanicus' *Aratea* with SB are the most relevant and

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Figures 1a-b. *De signis coeli* (1a: *Gemini, Cancer, Leo, Auriga, Taurus*; 1b: *Centaurus, Serpens, Urna et Corvus, Anticanis*). Laon, Bibliothèque Municipale ms. 422, fols 27*v* and 30*v*. First quarter of the eighth century (© Ville de Laon, Bibliothèque Municipale)

2 General Characteristics

Both the aforementioned writings are products of the Aratean tradition, the rich literary production originated from Aratus' *Phaenomena* together with related commentaries, including materials derived from Eratosthenes – a literature that was popular for centuries among the Roman élites.

Both writings stem from the *Aratea*, but from two different branches of this tradition.[3] *De signis* draws its materials from the *Aratus Latinus* (henceforth *AL*) a rudimentary Latin translation of a Greek commented edition of the *Phaenomena*, which included extracts from Eratosthenes'

characteristic, see Kauffmann 1888, 80 ff.; LXXI ff. Anyway it must be said that AL and Germanicus with SB occur together in some of the oldest preserved manuscripts of *Aratea* as Parisinus Lat. 7886 (ninth century Corbie) and Basileensis AN IV 18 (820-30 Fulda), which explains frequent contaminations.

3 A global schema of the Aratean tradition is in Le Bourdellès 1985, 15 (fig. 3).

Figure 2a-b. *De ordine ac positione stellarum in signis* (2a: *Auriga vel Agitator, Taurus*; 2b: *Cetus, Eridanus, Piscis magnus, Ara, Centaurus*). München, Bayerische Staatsbibliothek, cod. Clm 210, fols 117*v* and 120*v*. First quarter of the eighth century (© Bayerische Staatsbibliothek)

Catasterisms; the translation was made in the Abbey of Corbie and dates to the second quarter of the 8th century.[4] A partial re-elaboration, known as ‘Revised *AL*’ (hence *RAL*) was produced later, around the half of the same century.[5]

De ordine, on the other hand, draws from a Latin version of the same kind as Aratus’commented edition, the so-called *Germanici Aratea* with its *Scholia Basileensia* (*SB*),[6] a conglomerate which dates back at the latest to the 3rd century AD.

For the sake of completeness at this point we have to remember that during the same period, the Carolingian renaissance, another text was produced on the basis of the *RAL*: it was edited by Maass as *Anonymus Sangallensis*.[7] It reveals no astronomical interest, as opposed to the *De signis*; it

4 Le Bourdellès 1985, 259-63; he dates AL thanks to different arguments, including an analysis of the linguistic aspects of the Latin used in the translation.

5 *Terminus ante quem* is its oldest witness, cod. Köln, Dombibliothek 89, 798.

6 *Scholia Basileensia* are edited by Dell’Era 1979b, 301-77.

7 Cf. also Dell’Era 1974a.

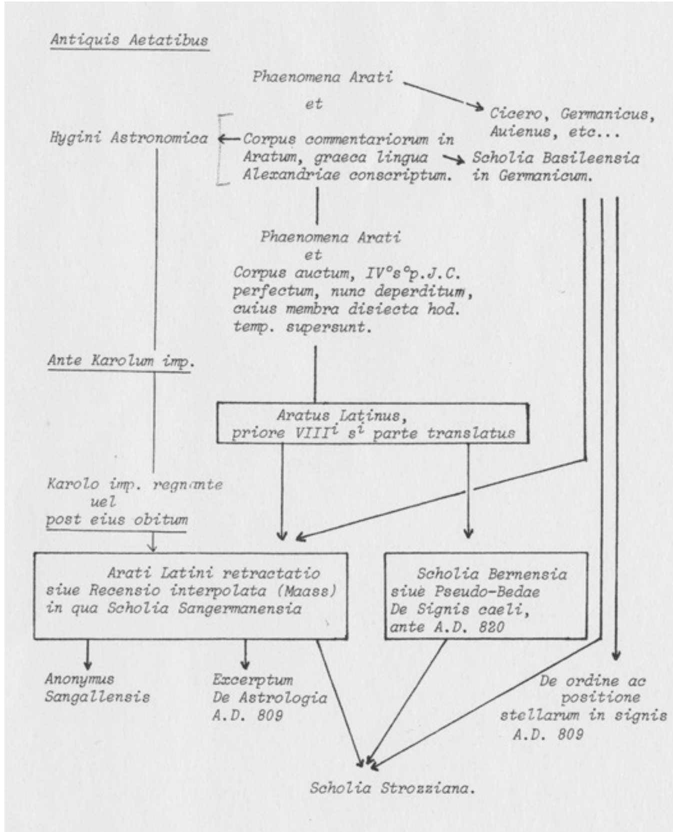

Figure 3. Scheme of the Aratean tradition (source: Le Bourdellès 1985, 15)

focuses totally on celestial mythology and collects myths on the origin of the constellations. Another text, which is strictly connected with *De ordine*, derives from the *AL*: it is commonly called *Excerptum de astrologia*.[8] It shows no interest in star catalogues or in celestial mythology, but draws from *AL* another kind of information: it is a description of the constellations according to their place in the sky, and it was certainly written with the help of a map. From this point of view, the *Excerptum de astrologia* follows the same structure of the first part of Aratus' *Phaenomena*, even if it introduces original remarks.[9]

8 Cf. Le Bourdellès 1985, 85-98 according to which the *Excerptum* was written following a celestial map of the AL and the author was a cultivated monk, acquainted with Virgil and Pliny. See also Borst 2006, 1054 ff., part. 1243-50; Dell'Era 1974b.

9 The author indicates the position of some non zodiacal constellations with respect to the Milky Way.

The two aforementioned catalogues, *De signis* and *De ordine*, find their historical value in the cultural frame of the recovery of astronomical data and information from the Aratean tradition in a well-defined geographical and chronological context. In fact, according to the provenance of the most ancient preserved manuscripts, the origin of the two catalogues must be placed in the same geographical area: Northern France, incidentally the same area involved in the production of most manuscripts of Carolingian astronomy between the end of the 8th and the beginning of the 9th century. This is also the date and the area of provenance of the oldest manuscripts contaning extracts from Macrobius, Pliny, Martianus Capella and Chalcidius, as shown by Eastwood in his excellent study (fig. 4): places like Corbie, Reims, Fleury, Auxerre are certainly also the places of origin of the oldest manuscripts of the Western medieval Aratean tradition, and of our catalogues.

De signis is older than *De ordine*; according to Dell'Era it shares a higher number of readings with the *AL* (42) and other readings with the *RAL* (28); it seems to represent an intermediate stage between the two, probably close to the oldest phase of the *RAL*. Its *terminus ante quem* is Hrabanus Maurus' *De computo* (820), which draws from *De signis* its description of the constellations.[10] Due to its closeness to *AL* and *RAL*, and to the provenance of its oldest manuscripts, its origin must be probably situated at the Abbey of Corbie.

The origin of *De ordine*, by contrast, is connected to the so-called *Liber computi*, the great encyclopedia about time produced during the scholarly gathering promoted by Charlemagne with the purpose of addressing many questions about time, computus, calendar.[11] The *Liber computi* dates to 809-812. *De ordine* seems conceived in order to complete the description of the celestial map in the aforementioned *Excerptum de astrologia*, which is the introductory treatise of section 5 of the *Liber computi*, a section devoted to astronomy.

The connection between the two treatises (*De ordine* immediately following the *Excerptum* in the *Liber computi*) allows to explain some peculiarities of this catalogue compared to *De signis*: the scarcity of topographical descriptions and the absence of a chapter devoted to the planets.[12] In fact a complete topographical description of the constellations can be

10 Hrab. Maur., *De computo* 51, *sunt ergo signa extra ea quae in zodiaco consistunt, ut Arati Phaenomena testantur, numero triginta, quorum alia horoscopus ad septentrionem sequestrat, alia ad austrum sequestrat.*

11 Coordinator was presumably Adhalard of Corbie, cousin and collaborator of Charlemagne, cf. Borst 2006, 1055-57. The authorship of Adhalard and of his entourage in the abbey of Corbie for both *Excerptum* and *De ordine* is suggested by Le Bourdellès 1985, 99-107.

12 A chapter on the planets is in a few manuscripts of *De signis*: Montecassino, Archivio della Badia 3, 9th century and a few others.

found in the *Excerptum*, where, on the other hand, no catalogue of stars is mentioned; furthermore, different treatises on the planets follow the *De ordine* in section 5 of the *Liber computi*.

To sum up, we can date both catalogues between the half of the 8th century and the first years of the 9th, and locate their origin and first diffusion in the monasteries of the Northern Frankish kingdom.

Their diffusion dates to more or less the same time: the two treatises occur in numerous manuscripts (about 20 for each of them) dating from the 9th through the 15th century, and they are especially popular between the 9th and the 12th century; they tend, however, to lose their value as a primary source of information in the 12th century due to the spreading of the Latin translation of Ptolemy's *Almagest*, a text which offered a much more detailed and scientifically advanced catalogue (for instance the position of the stars is measured in grades).

De signis and *De ordine* were very popular. *De signis* was not only the source of Hrabanus Maurus in his *De computo*, as we have seen, but it was also used to include information about the number of the stars in the constellation illustrations in manuscripts of two different translations of Aratus' *Phaenomena*: a *Germanici Aratea* manuscript[13] and a *Ciceronis Aratea* manuscript.[14] As for the *De ordine*, its materials have been used to fill in corrupted or lost sections of stellar catalogues in the *RAL*.

Another common characteristic of the two catalogues is that they are preserved in computistic astronomical collections used by scholars and students (sometimes together with materials concerning the other branches of the Quadrivium: geometry, arithmetic, and music)[15] and in computus encyclopedias. They consist of a few pages, a sober list of all the constellations from the North pole through the South Pole, from the Ursae to the Anticanis;[16] every constellation is described in a limited set of terms: its name (sometimes more names or mythological identifications), a list (not always complete nor precise) of the stars according to their astrothesia, the total number of stars, and finally a small, more or

13 Bern, Bürgerbibliothek, cod. 88 (ca. 1000; from St. Bertin?): Blume, Haffner, Metzger 2012, 1, 214-18.

14 London, British Library, ms. Harley 2506 (end of 10th century ca.; from Fleury): Blume, Haffner, Metzger 2012, 1, 327-32.

15 For the liberal arts in the Age of Charlemagne see Bischoff 1994, 93-114.

16 As stated before, a few mss of *De signis* also add a final chapter (41) on the five planets. It is following to the same need for completeness that Hervagius edition (I. Hervagius [ed.], *Opera Bedae Venerabilis*, Basileae 1563, 1, 422-56 = *PL* 90, col 948), adds one chapter on the Milky Way and one on Sagitta, both from Hyginus (*Haec Hyginius*); Sagitta is missing in *De signis*, probably because the author had identified it with the arrow of the Sagittarius, mentioned in the catalogue of this constellation (Sagitta followed immediately Sagittarius in the list of his source).

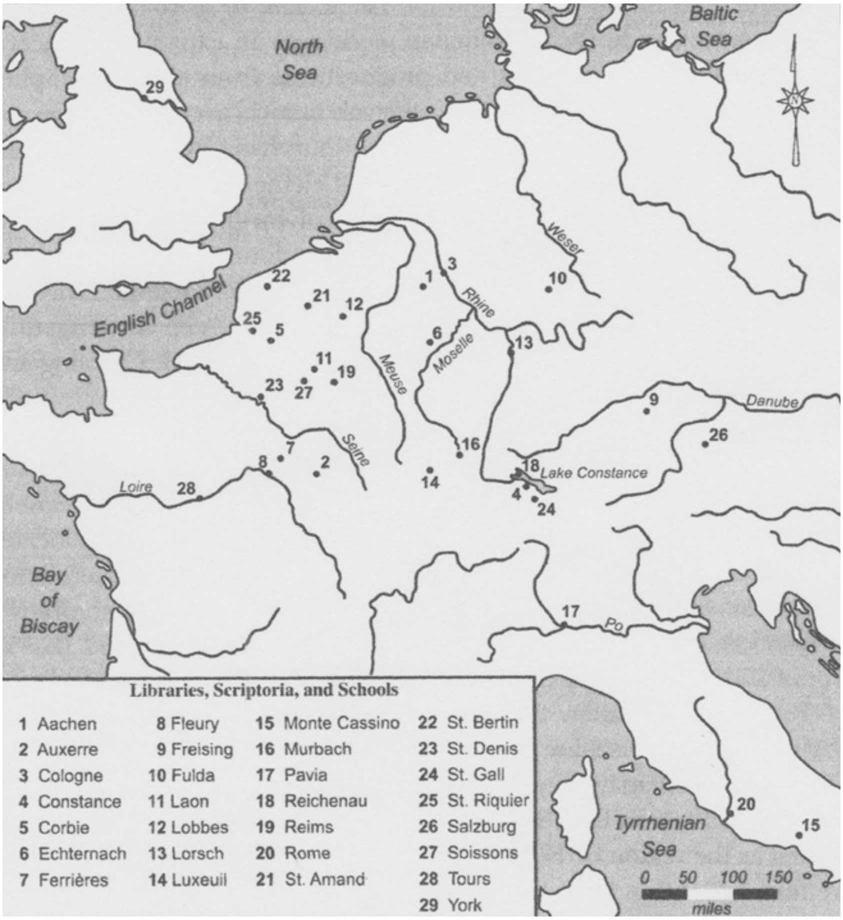

Figure 4. Map of Libraries and Scriptoria (source: Eastwood 2007, 18)

less carefully drawn or painted image. These books are not large documents, and they do not exhibit scientifically sophisticated information: in fact, they could easily be considered trivial and unworthy of any special attention from scholars.

On the other hand, it seems to me that both catalogues, and in general the Aratean tradition, deserve to be allotted a more prominent place in the process of the recovery and the spreading of the knowledge of ancient astronomy; this process flourished in the Carolingian age, and it must be considered part of a larger effort by Charlemagne and his scholars to promote civilisation and to reform education.

3 The Knowledge of All the Ancient Constellations

In modern studies about astronomy in the Western world during the Early Middle Ages, *De signis* and *De ordine* are ignored, and generally the same holds true for the Aratean tradition.[17] This general underestimation of all the Aratean tradition is well explained by Eastwood:

> Produced primarily for non-technical interest, the various versions of Aratea might best be called catalogues of constellations, names and stories; the description of star positions in each constellation could only be discerned by looking directly at the night sky with the assistance of an instructor who had already learned when and where to find constellations.[18]

Now, it seems to me that we could consider a different point of view. The Aratean tradition, including the commentaries to the *Phaenomena*,[19] provided a typology of astronomical knowledge that Carolingian scholars could not easily find in either Pliny, Macrobius, Martianus Capella or Chalcidius, nor for that matter in their favourite sources of astronomical information, namely Isidore of Seville and Bede.[20] Considering the scarcity of information about the constellations in the text of Capella and its commentaries (Remigius of Auxerre and Johannes Scotus), Eastwood writes:

> Not only Martianus' brevity of treatment (sc. of constellations), but also the paucity of Carolingian commentary and supplement make it obvious that a reader or student was expected to have previously read and been instructed in the texts, computistical and sidereal (Aratea, Hyginus), that gave a sound knowledge of the zodiac and the constellations.[21]

In other words, if we consider the complete and systematic description of the constellations of the entire sky, with their stars and figures, a star catalogue and (in some branches of the tradition) a complete synthetic

17 Both catalogues are not even mentioned in two recent studies on early medieval astronomy in western Europe: McCluskey 1998 and Eastwood 2007.

18 Eastwood 2007, 13.

19 It is the same material, of remote Eratosthenic origin, which constitutes the source of Hyginus' *De astronomia*, a text that was largely present in monastic libraries of the early Middle Ages; this text was not used to produce our catalogues, but only in the revised version of AL.

20 *De natura rerum* and *Etimologie*, book 3 for Isidorus and *De natura rerum* and *De ratione temporum* for Bede.

21 Eastwood 2007, 222-23.

map of all data, the Aratean tradition was by far the privileged source for this kind of information.

The author of *De ordine* confirms this suggestion; compared to the author of *De signis*, he is more careful about the style and literary form of his text, and he writes the following preface[22] to his catalogue:

> Est quidem hic ordo et positio siderum, quae fixa caelo plurium coacervatione stellarum in signum aliquod formata vel fabulose variarum genera formarum in caelum recepta creduntur; quorum nomina non naturae constitutio, sed humana persuasio, quae stellis numeros et nomina fecit,[23] adinvenit. Sed quia iuxta Aratum numerus stellarum unicuique signo adscriptus est, eo quo ab ipso est ordine digesta descriptio proferatur.

In this short preface the author informs his reader about a couple of essential issues: the content of the treatise; the origin of the constellations and of their names (two typical questions on this subject); the fact that, since Aratus had assigned a number of stars to each constellation, the present treatise would comply with the order of the constellations established by Aratus himself.[24] In short, our author states that Aratus is the author of a stellar catalogue.[25] Today if we think of an ancient stellar catalogue, we probably think of Ptolemy, Hipparchus, maybe of Eratosthenes; but the author of *De ordine*, instead, had only AL, which he called ‘Aratus’, at his disposal. Thus, the information offered by the two catalogues was not decorative nor of secondary importance; it contributed to integrate and define the subject-matter of the discipline, because astronomy did not only include the knowledge and the study of the sun, moon and zodiac, but also those of all the constellations and their stars: the constellations in these texts also have a didactic function, being helpful for memorization and in order to create a mental image of the sky

22 *De signis* has no preface: in ms. Vaticanus lat. 643 (9th century) (and in two of its apographs), an abstract from AL has been inserted as preface to the constellation list: see Kristen Lippincott (*Ps. Beda De signis*, 9-15, `http://www.kristenlippincott.com/the-saxl-project/`).

23 Verg., *Georg.* I 137, *navita tum stellis numeros et nomina fecit*.

24 The order was different from that followed in the *Excerptum*, the text that our *De ordine* had to complete.

25 Obviously, the stellar catalogue was not in Aratus’ poem, but in the commentaries to Aratus; but it was common practice to identify under the same name the poem and the commentaries included in the same edition of that poem: also Hrabanus (see note 10) mentioned ‘Aratus’ as the source of his information about constellations, which actually comes from the *De signis,* i.e. from the exegetical tradition to Aratus’ *Phaenomena*. By the same token, Lactantius (Lact. *Inst*. 1.11) quoted as “Germanicus” some data actually stemming from the commentary to Germanicus’ poem.

that can be useful for the actual observation of the night sky, and help to locate and recognize the stars.

Included in such contexts as computistic encyclopedias and other miscellaneous collections (these being required text-books throughout the Carolingian schooling system), both our texts contributed for generations to the spreading of the elementary astronomical knowledge; they contributed to perpetuate the description of the sky elaborated by the ancients: names and representations of these forty constellations and of their stars coincide with those that scholars will draw from Ptolemy from the 12th century onwards.

4 Pagan Mythology in the Sky

De signis and *De ordine* have also contributed to the survival of ancient pagan mythology of the sky in medieval Christian astronomy (and, in a certain sense, down to our own day). This survival was not to be taken for granted, because Christian scholars - as is well-known - did not generally appreciate pagan mythology, and the ancient sky was full of myths. In his work on Isidore and Visigothic Spain, J. Fontaine explains this very well:

> D'autre part, les catastérismes de l'époque alexandrine avaient achevé de peupler le ciel des dieux et des héros de la mythologie païenne. Sous ce rapport également, le ciel nocturne était resté l'un des catéchismes les plus vivants du paganisme classique. Ainsi, la science des étoiles pouvait être doublement suspecte à l'évêque de Seville.[26]

Celestial mythology is deeply immoral; to use the words of a great Christian scholar: pagan constellations represent creatures that have been glorified and put in the sky thanks to their crimes and misdemeanours on the earth.[27] Moreover, this sky, full as it was of pagan gods and heroes, was

26 Fontaine 1959, II, 503.

27 Greg. Naz., *Contra Iulianum* 2 (or. V) Λέγε μοι καὶ σὺ τοὺς σοὺς ἀστέρας, τὸν 'Αριάδνης στέφανον, καὶ τὸν Βερενίκης πλόκαμον, καὶ τὸν ἀσελγῆ Κύκνον, καὶ τὸν ὑβριστὴν Ταῦρον· εἰ δὲ βούλει, τὸν 'Οφιοῦχόν σου, καὶ τὸν Αἰγόκερω, καὶ τὸν Λέοντα, ἄλλους τε ὅσους ἐπὶ τῷ κακῷ γνωρίσας, ἢ θεοὺς ἢ ἀστέρας ἐποίησας. Christian aversion to pagan astronomy is extreme according to Claudius Mamertinus' praise of emperor Julian: "…tu Philosophiam paulo ante suspectam ac non solum spoliatam honoribus sed accusatam ac ream non modo iudicio liberasti, sed amictam purpura, auro gemmisque redimitam in regali solio conlocasti. Suspicere iam in caelum licet et securis contemplari astra luminibus, qui paulo ante pronorum atque quadrupedum animantium ritu in humum visus trepidos figebamus. Quis enim spectare auderet ortum sideris, quis occasum? Ne agricolae quidem, quorum opera ad motum signorum caelestium temperanda sunt, tempestatum praesagia rimabantur. Ipsi navitae, qui nocturnos cursus ad astra moderantur, stellarum nominibus abstinebant.

strictly connected to astrology, a form of knowledge and practice that Christians generally did not approve of. Half a century before Isidore, Gregory of Tours wrote a treatise in which he explained to his monks how to observe the night sky in order to recognise the right time for the nocturnal prayer, the *matutinus*. Gregory stated at the outset that he would not consider the names given to constellations by Virgil and the other poets, but would instead mention the star-names they were using in his own day, because – so he wrote – "he did not teach astrology and did not mean to investigate the future".[28] Thus, he cited just a few constellations, under names often so different from those of the ancient tradition that it is not always easy to identify the stars he is talking about.[29]

On the other hand, despite Gregory's claims about the danger of glorifying pagan culture and religion, and about the link with astrological practice, it proved very difficult to discard the ancient constellations and their names altogether, not only because they were used by ancient astronomical texts, but also because Christian scholars found them in the Bible, for example in the book of Job, where God crushes the poor wretched Job asking him if he can tie the bands of the Pleiades or loose the reins of Orion, if he can lead out the constellations in their seasons or guide the Bear with its cubs.[30] In his *De natura rerum*, Isidore of Seville, following other Christian scholars,[31] seems perfectly aware of the problem and warns

Prorsus terra marique non ratione caelesti sed casu ac temere vivebatur" (*Paneg. Lat.* XI.8.4-5).

28 *De cursu stellarum ratione*, fol. 78*v*, 15-16 Haase. "Set nomina, quae his vel Maro vel reliqui indiderunt poetae, postpono, tantum ea vocabula nuncupans, quae vel usitate rusticitas nostra vocat vel ipsorum signaculorum expremit ordo, ut est crux, falcis et reliqua signa: quia non ego in his mathesin doceo neque futura perscrutare premoneo, sed qualiter cursus in dei laudibus rationabiliter impleantur exhortor, vel quibus horis qui in hoc officio adtente versari cupit, debeat nocte consurgere vel dominum deprecare".

29 Some show Christian names as *Signum Christi*, or names related to agriculture as *Falx*; we also come across *Crux Maior* and *Crux Minor* (or *Alfa*), *Omega*, *Rubeola*, *Quinio*; *Plaustrum* vel *Septentrio* and a few others. About their identification see McCluskey 1991, 8-22.

30 *Job* 38.31-2; see also 9.8-9.

31 In his commentary to Amos, who mentioned Arcturus and Orion, st. Jerome wrote: "Quando autem audimus Arcturum et Oriona, non debemus sequi fabulas poetarum, et ridicula ac portentosa mendacia, quibus etiam coelum infamare conantur, et mercedem stupri inter sidera collocare… Sed scire Hebraea nomina, quae apud eos aliter appellantur, vocabulis fabularum gentilium in linguam nostram esse translata, qui non possumus intelligere quod dicitur, nisi per ea vocabula quae usu didicimus et errore combibimus". (Hieron., *Comm. in Amos* 2.5 = PL 25, 1042). And here is Gregory the Great about Job: "Nequaquam sermo veritatis vanas Hesiodi, Arati et Callimachi fabulas sequitur, ut Arcturum nominans, extremam stellarum septem caudam Ursae suspicetur, et quasi Orion gladium teneat amator insanus. Haec quippe astrorum nomina a cultoribus sapientiae carnalis inventa sunt; sed scriptura sacra idcirco eisdem vocabulis utitur, ut res quas insinuare appetit notitia usitatae appellationis exprimantur. Nam si astra quae vellet per ignota nobis his readers that the use of pagan constellation names must not imply acceptance of the immoral stories that these names represent; he also tries to explain why these names are nonetheless used in the Holy Scriptures.[32]

In actual practice, both Isidore[33] and Bede,[34] when speaking of constellations in their astronomical treatises, use the ancient names and indeed sometimes even explain the names by referring to the underlying myths. After all, etymological interest is an essential part of knowledge, for both Isidore and medieval culture in general. However, we do not find a systematic description of the constellations, nor a systematic list of their myths; a few myths are mentioned in a few cases only, and with explicit contempt for the *fabulae gentilium*.

Suspicion towards the pagan constellations of ancient astronomy was never totally abandoned, even in the Carolingian age: still, by that time we can witness a genuine interest for celestial mythology, e.g. in the aforementioned *Anonymus Sangallensis*. At the same time, we also find efforts to impose a Christian meaning to ancient images of constellations; for example, in some manuscripts we find that the *Anonymus Sangallensis* is paired with the *De astronomia more christiano,* a treatise in which zodiacal constellations are interpreted according to a Christian symbology.[35] After describing the ancient constellations (largely based on Aratus, i.e.

nomina diceret, homo pro quo haec eadem scriptura facta est, nesciret procul a dubio quid audiret. Sic igitur in sacro eloquio sapientes Dei sermonem trahunt a sapientibus saeculi". (Greg. Magn. *Mor.* 9.11.12, CCSL 143; 464).

32 Isid., *De Nat. Rerum*, 26: "*De nominibus astrorum***.** Legitur in Job, dicente Domino: *Nunquid conjungere vales micantes stellas Pleiades, et gyrum Arcturi poteris dissipare? Nunquid producis Luciferum in tempore suo, et vesperum super filios terrae consurgere facis?* Et iterum alibi: *Qui facit Arcturum, et Orionem, et Hyadas.* Haec nomina stellarum dum in Scripturis legimus vanis deliramentis assensum non praebeamus, qui falsis opinionibus vocabula ista in astris ex hominum nominibus, vel aliarum creaturarum vocabulis imposuerunt. Ita enim stellarum quarumdam gentilium sapientes nomina, sicut et dierum, indiderunt. Quod vero eisdem nominibus sacra utitur Scriptura, non eorum idcirco vanas approbat fabulas, sed faciens ex rebus visibilibus invisibilium rerum figuras, ea nomina pro cognitione ponuntur quae late sunt cognita, ut quidquid incognitum significat, facilius per id quod est cognitum humanis sensibus innotescat".

33 Isid., *Etym.* 3.71: the section concerning constellation names presents the explanation of some of them; the list is not systematic: 71.4-14 *Ursa, Bootes, Orion, Hyades, Pleiades, Canis*; 71.22-32 the zodiac, starting with *Aries*; 71.33-35 other non zodiacal constellations (*Perseus, Andromeda, Auriga, Ursa maior* and *Bootes, Lyra, Centaurus*); some myths are mentioned; the section is a miscellaneous compilation from different sources, as the double treatment of *Ursa* and *Bootes* suggests. It seems relevant that the closure of this section consists of a strong attack against astrology (71.37), in support of which Isidore recalls the authority of the greatest scholars of the pagan world Plato and Aristotle.

34 Beda*, De nat. Rerum* 17, lists the 12 zodiacal signs, the names of which he explains; he starts by saying that the names originate sometimes from seasons and sometimes from pagan stories (*gentilium fabulae*) and touch upon some myths for some constellations.

35 Le Bourdellès, 1991, 385-444.

on the *De signis*), Hrabanus Maurus warns his pupil: *et mira gentium stultitia, quod sidera, quae Deus ad honorem nominis sui creavit et in coelestibus constituit, ea ipsi sceleratis hominibus et brutis animalibus in terra adscripserunt* (*De computo* 51).

Nonetheless it is in this time, also thanks to our catalogues and to the cultural context of the Carolingian renaissance, that the ancient pagan constellations with their names and figures are entirely recovered and included in didactic and normative encyclopaedic texts. From the 8th through the 12th century, all students learned the pagan constellations, from the Bears to Procyon, they learned their names and the underlying myths, because – as Christian authors had seen – the names carry the myths with them. This led to the preservation of the pagan constellations in the frame of a Christian sky.

5 Other Analogies and Differences

To conclude, we come back to the analogies and differences between *De signis* and *De ordine*. A detailed analysis and comparison between the two texts would require a long discussion, far too long for this article. We shall see here just some common points and some differences, with special reference to the following aspects: data selection; accuracy in calculation; omission of the brightest stars; topographical data; influence of images on the text.

5.1 Data Selection

Neither author is indebted to his ancient sources just for the mere catalogues occurring in the commentaries to Aratus or Germanicus, neither wants to produce a rough inventory of names. On the other hand, both texts include the mythological names of the constellations and, especially the *De signis*, details about their position in the sky, so as to create a well informed, elaborated text, with an effort towards literary accuracy (*De ordine*), and sometimes embracing even some original translations (*De signis*).

The author of the *De signis* draws information both from the mythographic part of the commentary and from Aratus' poem itself.[36] In several instances, he adds for each constellation a second name and a short presentation; these data are often in the mythographic commentary[37] or in

36 For *AL*, see Maass 1898, 175-312.

37 *Serpentarius qui et Asclepius dicitur* (*De signis* 6); *Equus, qui et Bellerofons dicitur* (*De signis* 18).

Aratus'text.[38] That seems to suggest that the author knew and used the entire AL. In at least two cases we find some information that we do not find in the Aratean tradition.[39] Moreover, it is remarkable that the text preserves some original translations of the Greek original, different from AL: the stars close to the Ursa Minor, called *Circenses* in AL (and *Choreutae* in SB and Hyginus, according to the Greek name), are termed *Ludentes* in *De signis*; this name has no parallels;[40] Hercules is called *Qui stans genu flexu*, which apparently translates the Greek name *Engonasi* and is probably an interpretation of Aratus' text in AL *Ingeniculo…quod in genu laborat* (l. 66); in any case, it is an original name for the constellation.

More complex are the contributions to the *De ordine*. The variety of influences and sources in this text can be seen in the names of the constellations, often quite different from those of the *De signis*.[41] The author draws some information from the mythographycal part of the SB and probably from Germanicus'poem,[42] but the text also presents lexical consonances with the *Excerptum* (and, through the *Excerptum*, sometimes with AL).[43] He demostrates his high-brow literary education

38 *Delfinus non multum supercurrit Capricorno… Orione obliquus quidem Tauro* (*De signis* 29-30, cf. *AL* v. 316 and 322); *Cetus sub Ariete et Piscibus gradiens* (*De signis* 34, cf. *AL* vv. 357-58).

39 *Eurus* (sic!) and *Geon* for the River (*De signis* 35); Geon is mentioned in the book of *Genesis* (2.10-4), and generally identified with the Nile in Christian authors; see also *Farus* for the Ara (*De signis* 37).

40 *Ludentes* has been preserved in the *Scholia Strozziana*: see Dell'Era 1979c, 147-65.

41 This confirms the variety of sources and the varying degree of elaboration of the material, for istance: *Phoenix qui et Arcturus Minor* (*De signis* 2) is *Cynosura*; *Arcturus Minor* (*De ordine* 3); *Hercules qui Stans genu flexu* (*De signis* 5) is *Hercules, qui et Ingeniculus dicitur* (*De ordine* 6); *Serpentarius qui et Asclepius* (*De signis* 6) is *Serpentarius qui Graece Ophiucus vocatur* (*De ordine* 7); *Arcas qui et Bootes* (*De signis*) is *Bootes qui Graece Arctophylax vocatur* (*De ordine* 9); *Virgo qui et Iustitia* (*De signis* 9) is *Virgo* (*De ordine* 10); *Agitator* (*De signis* 13) is *Auriga vel Agitator quem Erichtonium* (*De ordine* 14); *Equus qui Bellerofons* (*De signis* 18) is *Equus, quem Pegasum* (*De ordine* 19); *Lyra* (*De signis* 23) is *Lyra quae Fidis De ordine* 24; *Canicula* (and *Sirium stellam, Canem*) in *De signis* 31 is *Canis* (and *Caniculam stellam*) in *De ordine* 32; *Eurus, qui et Eridanus et a quibusdam Nilus, qui et Geon* (*De signis* 35) is *Fluvius, quem Eridanum* (*De ordine* 36); *Sacrarium qui et Farus* (*De signis* 37) is *Ara sive Sacrarium* (*De ordine* 38).

42 See *Auriga, vel Agitator, quem Erichtonium dicunt* (*De ordine* 14), *Equus, quem Pegasum vocant* (*De ordine* 19) and *Quae (Argo Navis) non tota caelo, sed a gubernaculo usque ad malum figuratur* (*De ordine* 35): these passages for instance find their parallel in the mythographycal part of SB. As for *qui Graece Arctophylax vocatur* (*De ordine* 9), we find the Greek name of the constellation in the poem (Germ. v. 91); as for *Triangulus, quem Graeci Deltoton vocant* (*De ordine* 21), the Greek name is in Germ. 235 e 239, but also in Cic. 34.5. Consonances with Germanicus' poem suggest the use of a manuscript containing the poem and the SB as well: cf. Dell'Era 1974b, 30.

43 *De ordine* 2 and 3: *Helice, Arcturus maior* and *Cynosura, Arcturus minor*; cf. *Exc*erptum 5: *Helice, Arcturus maior, Cynosura minor appellatur*. *De ordine* 4: *Serpens*, as in the *Excerptum*, through a Virgilian reference in the preface as well as by some references to Cicero's *Aratea*.[44]

5.2 Accuracy in Calculation

Another common characteristic of the two catalogues is the accuracy in calculating numbers: the total number of the stars of each constellation is carefully reconstructed, and it is consistent with the description in the text, as can be verified in various instances. The total has been corrected when the author has modified his description as opposed to the original one, and when the total number was damaged or incorrect in the original. This common characteristic of the two corresponds to the centrality of calculation in early medieval astronomy.

5.3 Omission of the Brightest Stars

Even if the two catalogues show a high precision in counting the number of the stars for each constellation, on the other hand they show a certain inaccuracy in listing these stars. Sometimes they omit stars which are really relevant for their brightness, which one would never omit if only he had observed the sky according to the Aratean description. Both authors reveal total inexperience in the observation of the sky, at least according to the description they are transcribing.[45]

The *De signis* omits Arcturus in Bootes and Altair in Aquila, two stars mentioned in his source AL; moreover, he confuses Hyades with Pleiades and locates them on the face of the Taurus; finally, he omits an entire constellation (Sagitta), probably identifying it with the arrow of the Sagittarius' bow. The *De ordine* omits Deneb in Cycnus and the great star of Canis

not *Draco* as in *SB*. *De ordine* 5 *In geniculo dicitur* is not in SB, but it is in *Excerptum* 14 "Ille vero, qui *in geniculo* stat, quem Herculem dicunt". *De ordine* 7: *Serpentarius, qui Graece Ophiucus vocatur*, cf. *Excerptum* 43, l. 18 *Serpentarius vero qui a Graecis Ophiucus vocatus*. *De ordine* 34: *Navis, quae apud Graecos* Argo *nominatur*, cf. *Excerptum* 46, l. 81 *Navis quam Argo dicunt*. *De ordine* 36 *Eridano Fluvius, quem Eridanum dicunt*, cf. *Excerptum*, 46, l. 82 *Fluvius, quem Eridanum vocant*. *De ordine* 38 *Ara sive Sacrarium*, cf. *Excerptum* 45, l. 69 *Haec Ara, a quibusdam Sacrarium vocatur*.

44 *Lyra, qui et Fidis appellatur* (*De ordine* 24), cf. Cicero 34.42 and 34.381; 34.461 *clara Fides*. in *De ordine* a certain care of the style might be seen in the variation of a simple formula like this: *Hercules… dicitur; Serpentarius qui…vocatur; Auriga…quem vocant; Lyra qui et … appellatur; stellam …quam Caniculam appellant; Navis quae…nominatur; Fluvius quem…dicunt*.

45 As we have already seen in Gregory of Tours, other, simplified models of constellations existed, and an elementary observation of the sky in everyday life was certainly practised.

Minor.[46] Both catalogues do not reproduce the description of Perseus' head in the fog (*Via Lactea*) which they certainly found in their sources.

Being the only one to preserve the name of a certain number of stars, the *De ordine* can be said to carry a more complete description,[47] even if the *De signis* alone preserves at least a couple of other star names.[48]

5.4 Topographical Remarks

On the other hand, the *De signis* presents more often remarks on the position of constellations and stars;[49] this makes the catalogue more complete from this point of view:[50] there was no need for the author of *De ordine* to include this kind of information, as it was largely reported in the *Excerptum*.

5.5 Influence of the Images on the Texts

At last some textual choices in the *De signis* seem to indicate fidelity to illustrations rather than to the literary tradition. For instance the Auriga is described as follows:

> Agitator habet stellam in capite I, in utroque humero I (sed ea est clarior, quae in sinistro humero est), in utroque cubito I, in dextra manu I, in summitate manus sinistrae II et super ipso brachio Hedulos II: in utroque Hedulo stellam I. Sunt omnes X. (*De signis* 13)

46 The *De ordine* does not mention the bright star Vega in *Lyra*, but it must be said that this star cannot be found in SB.

47 It reminds the Claws and *Libra*, and argues that *Scorpio* is so large as to occupy *duo domicilia* in the zodiac (*De ordine* 8); it preserves in *Bootes inter genua utraque claram* I, which is *Arcturus* (*De ordine* 9); it mentions *Spica* in *Virgo* (*De ordine* 10); *Propus* in *Gemini* (*De ordine* 12); *Aselli* and *Praesepe* in *Cancer* (*De ordine* 11)*;* the *Pleiades* are located in their correct place: *dicunturque in cauda Tauri positae* (*De ordine* 15); the central star of *Aquila*, namely Altair, is mentioned as the brightest one (*De ordine* 29). Furthermore, in the *De ordine Sagitta* is listed and described as a constellation, together with *Aquila* (*De ordine* 29), whereas *De signis* omits it (see *supra* fn. 14).

48 *Ropalon* in *Hercules* (4) and the *Ludentes* in *Ursa minor* (3).

49 For instance: *Triangulus, qui iacet super caput Arietis* (20); *Delfinus non multum supercurrit Capricorno* (29); *Orion obliquus quidem Tauro* (30); *Cetus sub Ariete et Piscibus gradiens* (34); *Eurus… a meridianis partibus habens initium, ad Orionis pedem tendens* (35); *Piscis magnus… a Capricorno usque ad Pisces eius longitudo protenditur* (36); *Sacrarium… Hoc signum sequitur caudam magni Scorpii* (37); *Serpens… fertur enim ut caput submittitur Cancro et caudam ad Centaurum tendat* (39); *Anticanis dicitur sub Geminis bene parere*(40).

50 In this sense one might accept the note in Blume, Haffner, Metzger 2012, 1, 252, according to which *De ordine* has been replaced by the *De signis* in the ms. Freiburg am Breisgau, Archiv des erzbischöflichen Ordinariats, ms. 35, in a context of *Liber computi*, because it represented *eine etwas ausfürlichere Version*.

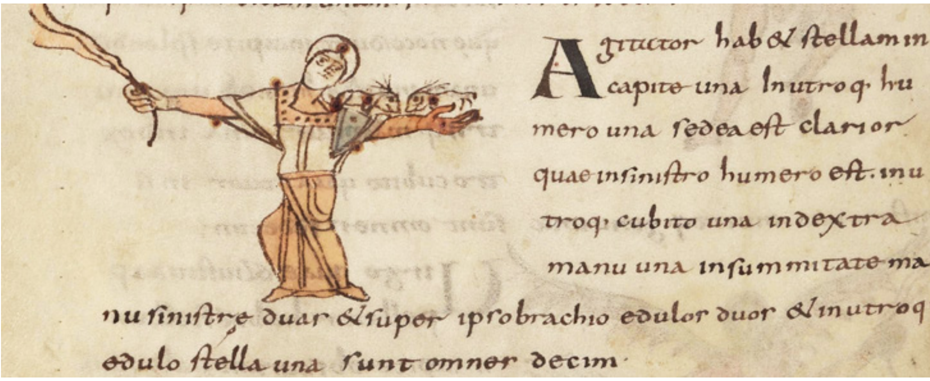

Figure 5. *De signis coeli*, *Auriga*. Laon, Bibliothèque Municipale ms. 422, fol. 27*v* (© Ville de Laon, Bibliothèque Municipale)

The author lists two unnamed stars on the left hand of the Auriga (in his source he found that they are named Kids (*Haedi*),[51] then he adds two other stars on the same left arm and calls them *Heduli*, Kids. And in accordance with his usual accuracy, he corrects the total by adding two units.

Thus, in ms. Laon 422, a manuscript that generally respects and reproduces the textual description in its illustrations, we find the figure of Auriga with two stars on his left hand and two kids on his left arm (fig. 5). But in fact, all the Aratean tradition, starting with Aratus' verses themselves, placed the Kids on Auriga's hand.[52] It seems possible that the author of *De signis* was inspired by an illustration of Auriga carrying the two kids on his arm; it is a type well represented in illustration series,[53] probably because the two kids were too large to be placed on one hand. An example occurs in ms. München clm 210 of the *De ordine* (fig. 2).

This instance suggests that a general analysis of the relationship between text and images in the two documents might prove useful to understand the process of their composition.

51 Maass 1898, 210, ll. 14-5 *Habet autem stellas in capite unam, in utroque humero unam, per singula cubita unam, super dextram manum unam, in sinistrae summitate duas, quae vocantur Heduli.*

52 Arat. *Phaen.*, 166 λεπτὰ φαείνονται Ἔριφοι καρπὸν κάτα χειρός; Germ., 169-70 *hanc Auriga umero totam gerit, at manus Haedos / ostendit, nautis inimicum sidus*; *Schol Bas. 14 : Qui Haedi dicuntur in sinistra manu eius sitae stellae sunt II*; *Catasterismi* ch. 13 ἐπ' ἀριστερᾶς χειρὸς β´, οἳ καλοῦνται Ἔριφοι.

53 It can be found in a variety of manuscripts, see the Iconographic Database of the Warburg Institute: `http://iconographic.warburg.sas.ac.uk/vpc/VPC_search/subcats.php?cat_1=9&cat_2=71&cat_3=32&cat_4=40&cat_5=33` and the Saxl project database of Kristen Lippincott: `http://www.kristenlippincott.com/the-saxl-project/illustrations/constellations/`.

These short notes are far from exhaustive about the different aspects and problems posed by the two texts, but I hope they can demonstrate the historical value of these texts, and the need for a more detailed study in the near future.

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Certissima signa
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Tubi astronomici

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Abstract Some illustrations in medieval manuscripts show people looking at the sky through astronomical tubes: this is a tentative census and discussion.

Keywords Astronomical illustration. Medieval manuscripts.

Per secoli, forse seguendo alcune affermazioni di Aristotele espresse nel *De generatione animalium* (5.780b18-23), si è tramandata la credenza che se si guardava il cielo dall'interno di una caverna o dal fondo di un pozzo o attraverso un tubo, si potessero scorgere, di giorno o di notte, stelle più deboli di quelle visibili in condizioni normali. Già da tempo si è stabilito, e anche modernamente confermato, che osservazioni del cielo nelle condizioni descritte da Aristotele non apportano nessun vantaggio. Fa dunque riflettere che nel Medio Evo ci siano raffigurazioni di osservatori che guardano attraverso tubi rivolti al cielo e ci si domanda a quale scopo potessero servire. C'è addirittura chi ha avanzato ipotesi, a dir poco fantasiose, secondo le quali già nell'antica Grecia si erano sviluppate conoscenze di ottica tali da permettere la costruzione di lenti.

Abbiamo esaminato una decina di immagini tratte da manoscritti miniati tra il X e il XIII secolo, che qui descriveremo brevemente, individuandole con la segnatura della pagina del manoscritto in cui sono presenti.

Vat. Lat. 644, f. 76*r* (fig. 1). Si tratta del documento più antico, datato al X secolo. Tre sono gli elementi che caratterizzano la figura: un tubo rivolto verso il cielo, sorretto da una colonna, un disco graduato con un foro centrale entro il quale è infilato il tubo e un osservatore. L'immagine illustra l'orologio stellare inventato dall'Arcidiacono Pacifico da Verona (776/8-845) per il conteggio delle ore notturne, indispensabile per stabilire i tempi delle preghiere. Il tubo serviva per trovare con esattezza la direzione del polo celeste attorno al quale ruota la stella chiamata *computatrix*, che a seconda della posizione assunta rispetto alla graduazione del disco indicava le ore trascorse dal tramonto del sole.

Antichistica 13
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Ms. Sangall. 18, 43 (fig. 2). Immagine datata al X secolo, con gli stessi elementi della precedente: tubo sorretto da una colonna, disco graduato e osservatore. La figura di quest'ultimo rappresenta probabilmente un monaco (si veda la tonsura), ma c'è anche chi l'ha interpretata come quella di Tolomeo che era erroneamente creduto re d'Egitto, data la presenza della tunica e dei calzari scarlatti tipici dell'abbigliamento regale. Questa interpretazione ha suggerito che questo codice carolingio sia una copia di un codice bizantino, e pertanto anticipi di molto l'invenzione dell'orologio stellare. Su come si debba orientare il tubo esattamente verso il polo si è espresso Gerberto d'Aurillac, papa Silvestro II (950-1003), in un lettera a Constantino di Fleury. Si deve a Gerberto la costruzione di un orologio notturno a Magdeburgo.

Marc. Lat. VIII, 22, f. 1*r* (fig. 3). Questa immagine è una diretta derivazione della precedente, ma molto più tarda in quanto è datata tra la fine del XII secolo e l'inizio del XIII.

Ms. Chartres 173 (fig. 4). Disegno dall'originale del XII secolo, andato distrutto. Oltre al tubo, al disco e all'osservatore rappresentati sul piano del foglio, senza prospettiva, viene mostrata anche la configurazione delle stelle che servono a determinare l'ora notturna.

Ms. Avranches 235, f. 32*r* (fig. 5). L'immagine, del XII secolo, è costituita dagli stessi elementi della precedente, ed è compresa anche la configurazione delle stelle. Non solo è prospettivamente distorta, ma l'osservatore si trova in una strana posizione, a testa in giù, e appoggiato sul cerchio. Molto probabilmente l'illustratore ha trovato difficoltà nel rappresentare quanto descritto nel testo.

Le cinque miniature fin qui descritte illustrano bene l'uso che viene fatto di un tubo diretto verso il polo, che è quello di determinarne l'esatta posizione. Ciò viene fatto guardando attraverso di esso il movimento delle stelle dovuto alla rotazione della volta celeste. Quando questo movimento si è ridotto al minimo o addirittura si annulla, il tubo viene fissato e quella posizione indica la direzione del polo celeste. Non si pone dunque nessun problema su quella che era l'utilizzazione del tubo, in quanto il tubo stesso è parte integrante di quello strumento, l'orologio stellare, impiegato per scandire le ore notturne.

Più difficile appare invece interpretare l'uso del tubo in quelle immagini in cui quest'ultimo non è parte di uno strumentazione, ma è posto nelle mani dell'osservatore, rivolto verso il cielo. In questo caso le miniature sono più recenti che nel caso precedente, in quanto risalgono all'epoca tra il XIII e il XV secolo.

Bruxell. 11040, f. 5*v* (fig. 6). XIII secolo. La parte superiore di questa suggestiva immagine, tratta da un manoscritto sulla vita di Alessandro Magno, mostra il re Nectanebo che osserva dal tetto del suo palazzo la Via Lattea attraverso un tubo. Cosa si potesse vedere meglio che senza l'uso del tubo non è per nulla chiaro. È da notare che la Via Lattea non è una configurazione celeste presa in considerazione dall'astrologia, per cui si è tentati di concludere che il re non fosse interessato a trarre auspici da fenomeni celesti.

München, Clm 17405, f. 3*r* (fig. 7). XIII secolo. In questo foglio vengono rappresentate le allegorie della musica e dell'astronomia, ciascuna costituita da tre distinte immagini. A noi interessa quella di sinistra relativa all'astronomia che raffigura Tolomeo in abbigliamento regale (tunica scarlatta) come esplicitamente indicato anche dallo scritto sottostante. Tolomeo regge con la mano sinistra un tubo con all'estremità una stella, significando che la funzione del tubo è quella di guardare gli astri. Il tubo è costituito da quattro parti di diametro via via decrescente a partire dalla più esterna indicando forse la possibilità di ridurne le dimensioni. Certamente questo tubo non ha molto a che vedere con quelli utilizzati negli orologi solari che erano fissati ad una colonna ed erano diretti ad un ben determinato punto della volta celeste, il polo. La mano, quella sinistra in tutti i casi qui considerati, non poteva garantire un puntamento preciso, senza oscillazioni, del tubo.

Bodl. Ashm. 304, f. 2*v* (fig. 8). XIII secolo. Figura ricca di contenuti. Sono rappresentati due personaggi, a destra Hermannus Dalmata e a sinistra Euclide. Il primo regge con la mano destra una sfera armillare,cioè un modello della sfera celeste, e con la sinistra un tubo della lunghezza di 50-60 centimetri, mentre Euclide sostiene un astrolabio, strumento per la localizzazione dei corpi celesti. Sorprende che in questa raffigurazione vengano messi nella stessa evidenza tre strumenti astronomici, di cui due, la sfera armillare e l'astrolabio, erano strumenti di precisione d'uso ben noto, mentre il tubo rimane senza una spiegazione convincente.

Bodl. Digby 46, f. 8*v* (fig. 9). Fine del XIV secolo. Questa immagine è una copia quasi esatta della precedente, ma più tarda. È più raffinata ed elegante.

Oxon. Balliol Coll. 238, f. 27*r* (fig. 10). Le due figure, rappresentanti Socrate e Pitagora, sono disegnate sul bordo interno di una pagina di un manoscritto risalente al XV secolo. Mentre Socrate maneggia un compasso, quindi uno strumento di precisione impiegato nelle costruzioni, Pitagora regge un tubo diretto verso una stella, dalla cui imboccatura emergono dei filamenti, ad indicare probabilmente l'entrata nel tubo dei raggi stellari. Di nuovo, come nelle immagini precedenti, assistiamo all'accoppiamento di uno strumento ben noto di precisione, il compasso, con il tubo, che in questo caso sembra ottenuto da una canna di bambù.

Figura 1. Personaggio osserva attraverso un tubo per determinare le ore notturne. Città del Vaticano, Biblioteca Apostolica Vaticana, Vat. Lat. 644, fol. 76*r*, X secolo (per gentile concessione)

Figura 2. Un monaco (oppure Tolomeo) osserva attraverso un tubo per determinare le ore notturne. Biblioteca abbaziale di San Gallo, Ms. Sangall. 18, 43, X secolo (per gentile concessione)

Figura 3. Immagine derivata dalla precedente. Venezia, Biblioteca Nazionale Marciana, Marc. Lat. VIII, 22, f. 1*r*, fine XII-inizio XIII secolo (per gentile concessione)

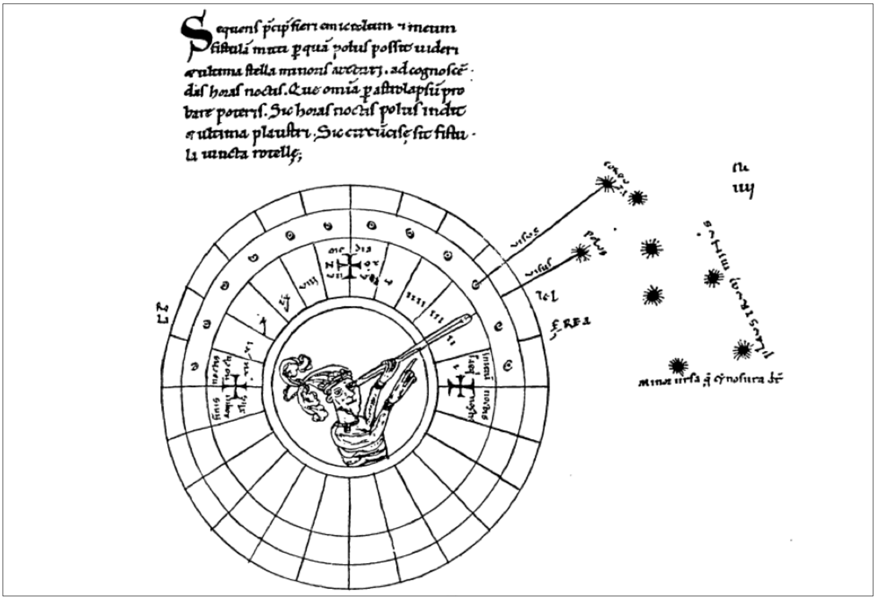

Figura 4. Disegno dall'originale (ms. Chartres 173) andato distrutto del XII secolo. Oltre agli strumenti necessari per ottenere l'ora notturna sono indicate le stelle da usare (fonte: Michel 1954)

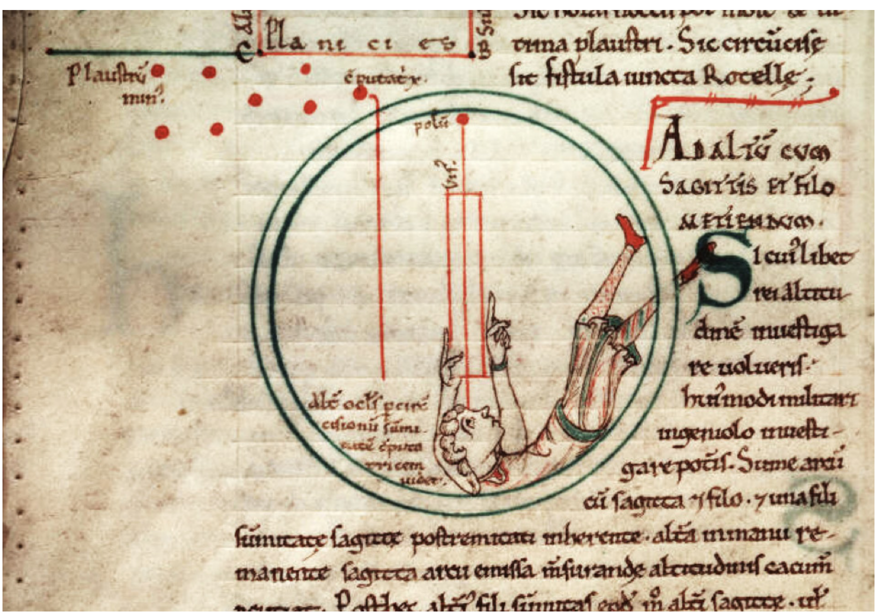

Figura 5. L'osservatore punta il tubo verso la stella polare da una posizione che sembra scomoda forse per un effetto di prospettiva. Avranches, Bibliothèque municipale, Ms. 235, f 32*r*, XII secolo (per gentile concessione)

Figura 6. Il re Nectanebo osserva la Via Lattea con un tubo. Bruxelles, Bibliothèque Royal de Belgique, ms. 11040, f. 5*v*, XIII secolo (per gentile concessione)

Figura 7. Tolomeo guarda con il tubo una stella. München, Bayerische Staatsbibliothek, Clm 17405, f. 3*r,* XIII secolo (per gentile concessione)

Figura 8. Due personaggi reggono una sfera armillare, un astrolabio e un tubo. Oxford, Bodleian Library, Ashm. 304, f. 2*v*, XIII secolo (per gentile concessione)

Figura 9. Copia dell'immagine precedente, ma più tarda. Oxford, Bodleian Library, Digby 46, f. 8*v*, fine XIV secolo (per gentile concessione)

Figura 10. Pitagora regge un tubo diretto verso una stella e Socrate maneggia un compasso. Oxford, Balliol College Library, ms. 238, f. 27*r* (per gentile concessione)

A questo punto appare evidente che il significato e l'uso del tubo che veniva rivolto al cielo non è per nulla ancora chiarito. È stata avanzata l'ipotesi che si tratti semplicemente di un oggetto senza alcun uso specifico, che caratterizzava la figura dell'astronomo-astrologo; ma il suo accostamento con strumenti ben noti e di precisione, come abbiamo visto nelle ultime immagini, non ci porta in questa direzione. È auspicabile che l'esame di ulteriori testi ci porti a comprendere esattamente l'impiego di questi tubi, come già accaduto per quelli utilizzati negli orologi stellari.

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Exploring the Relevance of the Star-positions in the Medieval Illuminated Manuscripts of Hyginus’ *De Astronomia*

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Abstract This paper analyzes the agreement between pictures and text in the 20 extant manuscripts of Hyginus’ *Astronomy* which are illuminated and marked with stars, the majority of which date from the second half of the 15th century. It focuses on the number and position of the stars on the constellation figures, and systematically inventories in each manuscript all discrepancies between picture and text. The existence of independent constellation albums and the disconnection between the activities of *pictor* and *scriptor* could suggest a great mismatch of the two main features of illuminated manuscripts. The results of the investigation on these manuscripts are in fact more ambiguous. It actually appears that in some cases the positions of the stars precisely match the wording of a manuscript and lead to the conclusion that star-positioning might have sometimes been a secondary process adjusted to the very text of the illustrated manuscript.

Keywords Hyginus. Illuminated Manuscripts. Ancient Constellations. Star Iconography. Astrothesy. Ancient Astronomy. Medieval Astronomy.

1 Introduction[1]

Marion Dolan’s 2007 lament over how little scholarly attention has been paid to the illustrated manuscripts of Hyginus’ *De Astronomia* is less valid today,[2] as the recent contributions of Kristen Lippincott[3] and the catalogue

1 This paper has been considerably improved by the help and revision of Kristen Lippincott. I remain fully responsible for all its shortcomings.

2 See Dolan 2007, 4 and also 107: “The numerous illustrated manuscripts of Hyginus are mostly neglected in art historical literature, they have not been studied either individually nor as a manuscript tradition”.

3 See Lippincott 2014; Lippincott (The Saxl Project).

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volumes by Dieter Blume, Mechthild Haffner and Wolfgang Metzger[4] have brought astronomical illustration back under the spotlight by continuing the early work on astronomical manuscripts pioneered by Fritz Saxl, Hans Meier and Patrick McGurk.[5] In general, though, all these studies have tended to focus more on art historical concerns, with Lippincott primarily addressing the iconographic features of the manuscripts and Blume, Haffner and Metzger being mostly concerned with codicological issues.[6] With the recent exception of Elly Dekker's study of the Leiden *Aratea*,[7] few scholars have studied the placement of the stars in the illustrations of these manuscripts. We believe that such an endeavour might be useful to historians of astronomy, and serve to improve our philological understanding (including pictorial stemmatology) of these works.

This paper addresses only the illuminated manuscripts of Hyginus that are marked with stars and, with regard to this restricted corpus, it tackles a question previously raised by Dolan: "Are the illuminators reading the poem and creating images in accordance with their readings or simply following ancient models?".[8] The aim, therefore, is to consider systematically the relationship between the positions of stars as prescribed by the individual texts found in these manuscripts and where the stars actually appear in the accompanying illustrations.[9]

Before providing a systematic analysis of the codices and considering the positioning of the stars in connection with the textual readings in detail, it is worth considering the characteristics of the corpus and attempt to reconstruct the process of asterization.[10] Beyond the main issue of pictorial adherence to the text, we will briefly address the question of the correspondence between the manuscript illustrations and actual pat-

4 See Blume, Haffner, Metzger 2012a-b, 2016a-b.

5 Saxl 1915, 1927; Saxl, Meier, Bober 1953; MacGurk 1966.

6 None of the recent editions of the text of *De Astronomia* (Serra 1976, Vitobello 1988, Le Boeuffle 1983, Viré 1992a) have discussed the illustrations that appear in the manuscripts, though Viré does mention which ones are illustrated in her 1981 handlist.

7 Cf. Dekker 2010.

8 Dekker 2010, 7: "Are the illustrators reading the poem and creating images in accordance with their reading, or mainly copying earlier exemplars?".

9 Several websites have been used with profit for this study. I would like to mention especially: The Saxl Project (`http://www.kristenlippincott.com`), especially Hyginus/Commentary and the entries on the individual manuscripts (*ad vocem*); The Warburg Institute Iconographic Base (`http://warburg.sas.ac.uk`), under: Magic and Science/Astronomy and astrology/Hyginus; Certissima signa (`http://certissimasigna.sns.it`); Mirabile (`http://www.mirabileweb.it`); as well as the digital resources of the various libraries mentioned.

10 This investigation would not have been possible without the remarkable work of Kristen Lippincott. I greatly thank her for her support and advice. For a general study on the Hyginus manuscripts and the pictorial tradition, see The Saxl Project.

terns of the stars in the night sky. The case of astronomical illustrations is indeed peculiar, in that they are supposed to correspond ultimately to observable phenomena. Given that the figures of the constellations are arbitrary cultural frameworks intended to codify the representation of real sectors of the sky, with each figure thus subject to a set of accepted posture and attributes, the stars that punctuate each figure should maintain specific relations with each other, and should reproduce a pattered structure analogous to what is visible in the night sky. The question that remains to be answered is whether any differences between pictorial astrothesy found in our manuscripts and the accepted astronomical schemata of the constellations in the night sky are the result of a positive aesthetic choice or indifference.

2 The Corpus

Viré's 1983 survey of manuscripts of Hyginus' *De Astronomia* listed 88 examples, spanning from the ninth to the 15th century, but only half of which (44) are complete.[11] Recent research has added a number of new manuscripts to this list, suggesting that there are possibly as many as one hundred or more surviving manuscripts of the text, assuming that there are still a few extant texts remaining to be discovered.[12] Viré gives a general account of the corpus,[13] but she appears not to be concerned with the pictorial tradition of the manuscripts.[14] In their recent catalogue of medieval and Renaissance astronomical manuscripts, Blume, Haffner and Metzger list 38 illuminated Hyginus manuscripts, 13 of which were

11 Viré 1992, 10: *amplius octoginta.* At least five illuminated manuscripts with stars have not been taken into account by Viré.

12 Viré 1983, 163-77. Among the manuscripts of Hyginus' text or excerpts that should be added, one should mention: Leiden, Bibliotheek der Universiteit, Voss. Lat. o. 8; Klosterneuburg, Stiftsbibliothek, 685; München, Bayerische Staatsbibliothek, Lat. 10662; Vatican, Biblioteca Apostolica Vaticana, Barb. Lat. 76; Zürich, Zentralbibliothek, Car. C 176.

13 Note that there are mistakes: the Florence, Biblioteca Nazionale Centrale (BNC), Magliab. XI.114,2 is not illuminated (as previously noted by Lippincott); and the Leiden, Univ-bibl., Gronov 21 is only partly illuminated (fol. 55*r*). Also, the Holkham Hall manuscript is not illuminated (Lippincott – private communication).

14 The only angle from which she deals with this element is that of the inherited educational purpose: "Peut-être ces illustrations sont-elles simplement le prolongement des globes peints dont se servaient les anciens pour rendre la description de la voûte céleste plus accessible au public profane" (1983, 162). See, however, her comment on the Leiden, Voss. Lat. 8° 15 and on the Vatican, Biblioteca Apostolica Vaticana (BAV), Reg. Lat. 123 (1983, 206): "il n'est guère surprenant de constater que, dans l'un comme dans l'autre, les dessins imitent des modèles antiques tant pour le tracé des figures que pour le détail des personnages et l'ornementation des objets: personnages à demi nus, vêtements drapés à l'antique, bonnet phrygien, simplicité des éléments décoratifs".

produced before 1200, and nearly twice as many between 1200 and 1500. From their findings, then, the known corpus of identified illustrated manuscripts marked with stars consists of the following 20 manuscripts (listed chronologically):[15]

1. Vatican, Biblioteca Apostolica Vaticana, Reg. Lat. 123 (Spain, 1056)
2. Oxford, Bodleian Library, Digby 83 (England, ca. 1150)
3. Baltimore, Walters Art Museum, W 734 (Northern Italy or France, 1150-1200)
4. Leiden, Bibliotheek der Rijksuniversiteit, Gronovius 21 (France, 1180-1220)
5. Vatican, Biblioteca Apostolica Vaticana, Vat. Lat. 3110 (Florence, 1370-1380)
6. Florence, Biblioteca Nazionale Centrale, Magliabechi XI.114 (Italy, 1380-1420)
7. Vatican, Biblioteca Apostolica Vaticana, Vat. Lat. 3109 (Italy, 1400-1450)
8. Milan, Biblioteca Ambrosiana, T 47 sup. (Italy, 1425-1450)
9. Milan, Biblioteca Trivulziana, N 690 (E. 83) (Padua, 1460)
10. Cambrai, Bibliothèque Municipale, 993 (Padua, 1460)
11. Oxford, Bodleian Library, Canon. Class. Lat. 179 (Ferrara, 1460-1470)
12. Vatican, Biblioteca Apostolica Vaticana, Urb. Lat. 1358 (Florence, 1470-1480)
13. Pavia, Biblioteca Universitaria, Aldini 490 (Italy, 1470-1480)
14. Siena, Biblioteca comunale degli Intronati, L.VI.25 (Italy, 1474)
15. New York, Public Library, Spencer ms. 28 (Padua, 1475-1480)
16. Freiberg, Andreas-Möller Bibliothek, XI.4.9 (Padua, 1475-1500)
17. Florence, Biblioteca Medicea Laurenziana, Ashb. 1148 (Florence, 1475-1500)
18. Cambridge, Fitzwilliam Museum, 260 (Mantua, 1480)
19. Florence, Biblioteca Medicea Laurenziana, Plut. 89 sup. 43 (Florence, 1482-1483)
20. Vienna, Österreichische Nationalbibliothek, Vindob. Lat. 3111 (Austria, 1491)

Three quarters of these manuscripts were produced in the 15th century, with twelve of these fifteen having been produced in the second half of the 15th century.[16] It is noteworthy that the majority of 15th-century illustrated Hyginus manuscripts are marked with stars (15 manuscripts).[17] The increased ratio in the 15th century suggests that it was easier to find a model with stars indicated to copy during this period, but this does not rule out the possibility that an illuminated, star-marked manuscript could also have been created by adding stars to images derived from a manuscript that did not contain stars.

15 Blume, Haffner, Metzger 2012a, 193-98, 280-83, 396-402, 488-95 and Blume, Haffner, Metzger 2016a, 551-657 for descriptions of the manuscripts.

16 Of the 67 astronomical manuscripts that pre-date 1200, Blume, Haffner, Metzger 2012a list 13 Hyginus manuscripts, only four of which are marked with stars.

17 Blume, Haffner, Metzger 2016a, 552-655.

In this survey, the following manuscripts have not been included: those that provide only excerpts of the *De Astronomia*; the epitomized version known as *Excerptum de astrologia*;[18] manuscripts that show serious contamination from other texts;[19] examples that have fewer than four constellations marked[20] and those that contain only a set of pictures apparently connected with the *De Astronomia* but without the actual text of Hyginus.[21]

Admittedly, a study whose focus is restricted to the text of the *De Astronomia* could be regarded as problematic in many ways. One obvious criticism is that the very identification of these manuscripts as an independent corpus is questionable, especially since so many of the selected manuscripts betray evidence of explicit or implicit contaminations from the texts and images that appear as part of other iconographic traditions. More fundamentally, the *De Astronomia* tradition is an integral part of the broader tradition of astronomical literature: as far as iconography is concerned, there is a profound and mutual influence between all the texts involved in this tradition, and more particularly: Eratosthenes' *Catasterismoi*, Cicero's *Aratea*, Germanicus' *Aratea*, *Scholia in Germanicum Basileensia*, *De ordine ac positione stellarum in signis* (deriving from the aforesaid scholia), Pseudo-Bede's *De signis caeli* (or *Scholia in Germanicum Bernensia*), *Aratus Latinus*, and *Aratus auctus*, *Aratus Latinus Recensio interpolata*, *Excerptum de Astrologia*, *Anonymus Sangallensis*, *Scholia in Germanicum Strozziana*. As an integral part of the broader tradition of astronomical literature, there is a profound interdependence amongst all the texts involved, especially given the tradition of bringing together these texts or excerpts from them to form astronomical compendia and miscellanea.[22] For example, the astronomical com-

18 Munich, Bayerische Staatsbibliothek (BSB), Clm 59 (15th century). This manuscript is regarded as a "deutsches Hyginus-Derivat" (Blume, Haffner, Metzger 2016a, 79) with "*Delineationes rudes signorum*" (Halm et al. 1892).

19 Berlin, Staatsbibliothek, Lat. Oct. 44 (13-14th century) offers a brief excerptum, conflated with excerpts of Pliny, without any textual information on stars' positions. It is illuminated with coloured drawings of 38 constellation groupings. Oxford, Bodley 614 (fols 18*r*-22*r* and 22*v*-33*v*) provides Hyginian excerpts conflated with readings from Isidorus, *De natura rerum* and the *scholia Sangermanensia*.

20 For example: Leiden, Univ-Bibl.,Voss. Lat. 8º15 (11th century) and St Paul im Lavanttal, Benediktskabinett 16/1 (*olim* XXV. 4. 20) (11th century).

21 Vatican, BAV, Vat. Lat. 3109, fols 51*r*-68*r* (15th century).

22 For example: Baltimore, Walters Art Museum, W 734, which contains texts from Germanicus, Cicero, *Aratus Latinus, Recensio interpolata* and the *Excerptum de astrologia*; Vatican, BAV, Vat. Lat. 3110, with excerpts from Germanicus, Martianus Capella and Fulgentius; Milan, Biblioteca Ambriosiana, cod. T 47 sup. with Johannes Sacroboscus' *Libellus de sphaera* and Ps-Aristotle's *De mundo*; Florence, Biblioteca Laurenziana, Plut. 89 sup. 43, which also contains Germanicus' *Aratea*.

pendium known as *Aachen Compilation of 809-812* (which incorporates the *Excerptum de astrologia* and the *De ordine ac positione stellarum in signis*, and survives in numerous ancient manuscripts) had a momentous impact on the pictorial and textual tradition.[23] Also, the text of Pseudo-Bede's *De signis caeli*, which diverges from the *De Astronomia* astrothesy in at least 22 instances,[24] frequently interfered with Hyginian tradition in a more or less explicit way, and thus generated confusions.[25]

The text of the *De Astronomia* is divided into four books: the second one deals with the mythological background of the constellations and the third one with the position of the stars in the constellation. It is striking that in many illuminated manuscripts, and especially in the oldest ones,[26] the pictures appear in the second book and not the third one, thus suggesting that the illustrations in these early manuscripts have been included as mythological portraits, rather than astronomical diagrams[27] – especially given the fact that none of the manuscripts that carry illustrations to Book 2 has stars marked, and the pictures marked with stars always appear when the constellations are placed in Book 3.[28]

Following the structure of the *De Astronomia,* the following detailed descriptions of the manuscripts list the constellations according to 41 constellation groupings: the Pleiades have been included as part of Taurus, Corona Borealis appears as part of Centaurus, Libra is half of Scorpio, Serpens is part of Ophiuchus and Triangulum is distinct from Aries. Most of the manuscripts carry 39 pictures (with Draco, Ursa maior and

23 Ramírez-Weaver 2008. On the "fusion of astronomical tradition", see McCluskey 1998, 130 and Blume, Haffner, Metzger 2016a.

24 See e.g. the major differences between the constellations of Ursa Maior, Hercules, Leo, Gemini and Hydra in the two traditions.

25 This contamination between the differing versions of texts and images has been a focal point of the research carried out by Kristen Lippincott in both The Saxl Project and her publications. See for example, Lippincott 2014 and her comments on Montpellier ms H 452 (The Saxl Project, *ad vocem*).

26 See, for example, for the 11th century: St Paul im Lavanttal, Benediktskabinett, ms. 16/1 (*olim* XXV. 4. 20); for the 12th century: Wolfenbüttel, Herzog August Bibliothek, Aug. 4° 18.16 (Guelf. 3147) and Vienna, Österreichische Nationalbibliothek (ÖNB), Vindob. Lat. 51; Florence, Biblioteca Laurenziana, Plut. 29.30. The manuscript in Leiden, Universiteitsbibliotheek, Voss. Lat. 4° 92 (12th century) is an exception as there are pictures without stars accompanying book 3. One might also mention Paris, ex-Phillipps 26.235 (12th century), which has belonged to a private collection since 22 June 1973 (cf. Viré 1983: 172): it is inaccessible today, but the illustrations do not have the stars marked (see the photographs in Blume, Haffner, Metzger 2012b, 305).

27 Viré 1983, 206; McGurk 1966: XXII sq.

28 Two 12th-century manuscripts (Vatican, BAV, Reg. Lat. 123 and Oxford, Bodleian Library, Digby 83) conflate the corresponding chapters from book 2 and 3 of *De Astronomia* for each constellation.

Ursa Minor combined as a single figure: *Draco inter arctos*), though some have 38 (with the head of Aries shown '*intra Triangulum*').[29]

3 Marking the Stars

In terms of basic iconographic structure, the illustrations of the constellations with and without stars are the same. When added, the stars are represented by open circlets or dots (coloured in black, red or gold), crosses with two or more bars or star-like symbols (fig. 1).

Unlike the more scientific images of the constellations one finds attached to the Ptolemaic tradition (mostly on globes),[30] the star-marking process in the Hyginus manuscripts usually follows the drawing of figures, though the addition of the stars is not necessarily by the same hand. Most often, the illustrations are added to the manuscript after the text has been written. The three exceptions to this case are Vatican, BAV, Vat. Lat. 3109; Oxford, Bodleian Library, Canon. Class. Lat. 179 and Digby 83, where the pictures were obviously drawn first (witness the incompleteness of the text, the outlines of the textual blocks and the areas in which the ink of the text overlaps the pictures).[31] For at least 16 of the 20 Hyginus manuscripts under consideration, the operational sequence seems to involve three or four stages: text > picture > star punctuation (+ star decoration). Moreo-

29 The following manuscripts have incomplete sets of constellations: Leiden, Univ-bibl., Gronov 21 has only five constellations: Bootes, Corona Borealis, Hercules, Lyra and Cygnus; Florence, BNC, Magliabechi XI.114 has only 12 constellations: Ursa Maior, Ursa Minor, Draco, Bootes, Corona Borealis, Hercules, Lyra, Auriga, Ophiuchus, Sagitta, Aquila, Taurus; with blank spaces being left for the remaining ones; Oxford, Bodleian Library, Canon. class. Lat. 179 is missing eight folios and the corresponding pictures for Taurus, Gemini, Virgo, Scorpio, Aquarius, Pisces, Lepus and Orion; Siena, Bib. Com., cod. L.VI.25 is missing three folios and images for Cygnus, Cepheus, Aquila, Delphinus, Pegasus, Canis Maior and Canis Minor; Cambrai, Bibl. Mun. 993 is missing two folios and the illustrations of Cygnus and Cepheus; Cambridge, Fitzwilliam Museum, ms. 260 is missing eight pictures: Draco, Ursa Maior, Ursa Minor, Cassiopeia, Virgo, Libra, Pisces and Eridanus; Freiberg, Andreas-Möller Bibliothek, XI.4.9 is missing one picture: Orio; the first series of pictures of the Vatican, BAV, Vat. Lat. 3109 (32*r*-50*r*), consists of an album of 38 constellations and contains the Hyginian text only for four of them (Bootes, Corona Borealis, Hercules and Lyra on fols 32*r*-34*v*).

30 Ptolemy, in his recommendations on the construction of a globe exhorts to mark the stars and then draw outlines around them: "As for the configurations of the shapes of the individual constellations, we make them as simple as possible, surrounding the stars within the same figure only by lines, which moreover should not be very different in colour from the general background of the globe" (Ptolemy, *Almagest* 8.3, ed. Toomer 1984, 406); see Dekker 2010, 351.

31 Among the other manuscripts of Hyginus, this is also the case for the Paris, ex-Phillipps 26.235 ("Die Illustrationen zum dritten, astrothetischen Buch wurden vor dem Text ausgeführt". Cf. Blume, Haffner, Metzger 2012a, 461).

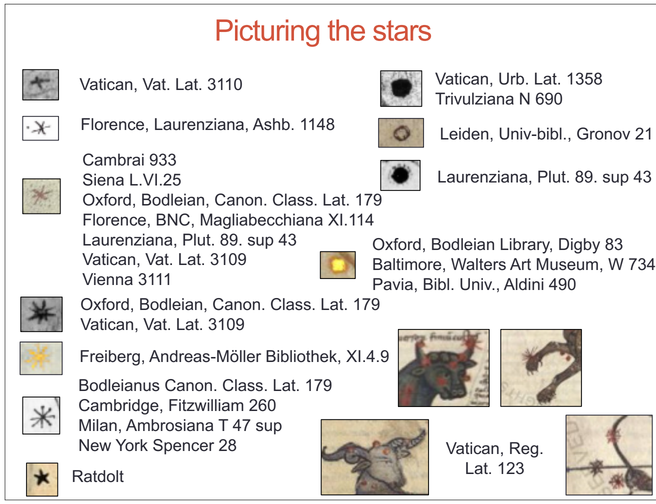

Figure 1. Picturing the stars. Samples of stars from all illustrated mss. of Hyginus' *De Astronomia*

ver, the process appears to reflect the participation of several different hands.[32] For example, in the Florentine manuscript in the Biblioteca Laurenziana (Plut. 89, sup. 43), the stars are clearly not by the same hand as the pictures and in the manuscript in Freiberg (Andreas-Möller Bibliothek, XI.4.9), Cancer, Lepus and Orion are only sketches.

In addition to evidence of more than one artist contributing to the illustration cycle,[33] two different kinds of star-marks appear in some of the manuscripts. For example, the combination of dots and open circlets in Vatican, BAV, Urb. Lat. 1358, fol. 124*rv*, clearly suggests that a first hand had marked a series of 'place-holders' for the stars, some of which were then left unfinished (fig. 2).[34]

In Cambrai 993, it seems that a single scribe was responsible for both text and pictures as they both are executed in the same ink, but the stars have been added in red ink – raising the possibility that there might have been an additional rubricator, who added the stars at a later stage. In the Leiden manuscript, Voss Lat. 8°15, the text was obviously added after the pictures. Four constellations have been additionally marked with stars probably as an afterthought, and the positions of the stars on the top of the Lyra (fol.

32 Not to mention the multiplicity of illuminators in some of the manuscripts, such as in New York Public Library, Spencer 28 (with at least 3 hands, probably five according to G. Mariani Canova, cited in Blume, Haffner, Metzger 2016a, 601).

33 Blume, Haffner, Metzger 2016a, 605.

34 See also Milan, Biblioteca Trivulziana, N 690, fol. 124*v*; and Oxford, Bodleian Library, Digby 83, fol. 51*v*. See also Spencer 28, fol. 42*v* and our comment *infra*.

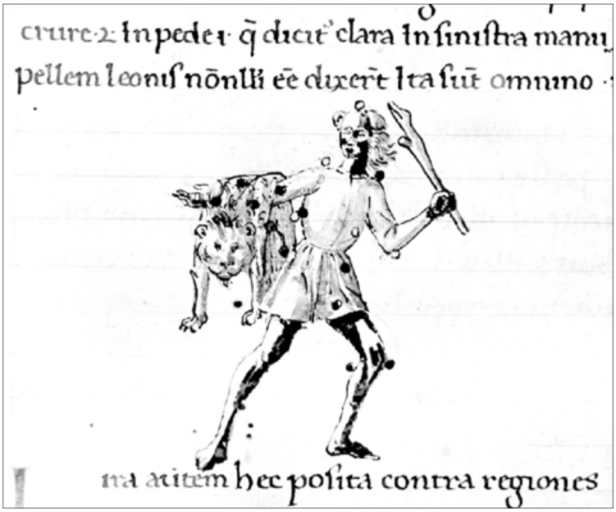

Figure 2. *Constellation of Hercules.* Città del Vaticano, Biblioteca Apostolica Vaticana, Urb. Lat. 1358, 124*v*. Florence, 1470-1480 (with permission of BAV; from: http://iconographic.warburg.sas.ac.uk/)

173*v*) suggest that the dots were added after the text was written (fig. 3).[35]

In fact, even when the drawing is made before the text, such as in Vatican, BAV, Vat. Lat. 3110, the 'star-positioner' may in some cases have set to work at the end of the process.[36] Vatican, BAV, Vat. Lat. 3109 offers a splendid example of the complexity of the process: the first set of pictures reveals three different stages: raw pencil sketches of constellations already equipped with stars, with guidelines for the later insertion of text (fig. 4); drawings with dots on sheets marked by lines of writing (most of the pictures; fig. 5); drawings with text (only fols 33*v*-34*v*; fig. 6). The probable sequence was here: page ruling, sketch with dots, drawing, insertion of the text.

The positioning of stars is a demanding process. The person in charge of it is faced with pictures that correspond to conventional pictorial formulae and do not always correspond with the textual descriptions.[37] Virgo, for example, is supposed to receive four stars on her wings (*pennae*), but in some

35 See Lippincott 2014 for a discussion of the construction of this manuscript. In Vatican, BAV, Vat. Lat. 3109, the constellations of Sagitta and Triangulum are missing their stars, probably because the 'star-positioner' has overlooked it. This suggests that asterization of this manuscript was an operation distinct from the illumination.

36 See Blume, Haffner, Metzger 2016a, 555: "Im Unterschied zu den älteren Hyginus-Illustrationen sind hier die Sternpositionen offenbar nach den Angaben des Textes in roter Farbe eingetragen".

37 Many postures are imported from different contexts, transferred from one text to another (deriving from the Aratean corpus or the *De signis* tradition), or from one character to another. The illuminator of Oxford, Bodleian, Canon. Class. Lat. 179 uses the same postural stereotype for the entire family of Andromeda, and in Vatican, BAV, Reg. Lat. 123, Perseus (fol. 189*v*) and Orion (fol. 199*v*) have exactly the same posture.

Figure 3. *Constellation of Lyra*. Leiden, VLO 15: XIII, fol. 173*v*. France, 1000-1050? (with permission of Universitaire Bibliotheken Leiden)

Figure 4. *Constellation of Gemini.* Città del Vaticano, Biblioteca Apostolica Vaticana, Vat. Lat. 3109, fol. 40*v*. Italy, 1400-1450 (with permission of BAV)

manuscripts the figure has no wings,[38] and the stars have to be placed on the shoulders or arms. When Argo only has one *gubernaculum*, the stars on each oar often appear on the hull;[39] or when Sagittarius is bipedal the stars in the tail (*in cauda*) are often placed on the thigh or omitted.[40] In addition to two large claws (*chela*), Cancer must have four pairs of small legs (cf. *in quarto pede*), but the number of the legs (sometimes deprived of claws) varies in the manuscripts between three (Oxford, Digby 83 or Baltimore, Walters Art Museum, W 734) and five (Vatican, BAV, Urb. Lat. 1358), and is sometimes even seven (Vatican, BAV, Vat. Lat. 3109). As a result, these depictions of Cancer cannot have the exact number of stars that should appear on its right feet (*in dextris pedibus singulas*).

In many cases, it is simply the orientation of the view adopted for the figure (back or front view) that limits the possibilities of the relevant positioning of stars – such as in the Cambridge, Fitzwilliam 260, where the star *in ventre* of Perseus is marked in the middle of the back.[41] Accuracy in star-positioning is restricted not only by pictorial characteristics, but

38 I.e.: Cambrai 993; Oxford, Bodleian Library, Canon. Class. Lat. 179 and Digby 83.

39 Cambrai 993 and Cambridge, Fitzwilliam 260.

40 Baltimore, Walters Art Museum, W 734.

41 In the globes, the constellations are seen from the rear, but in the texts all constellations are theoretically figured according to our observation and facing us (see Hipparchus,

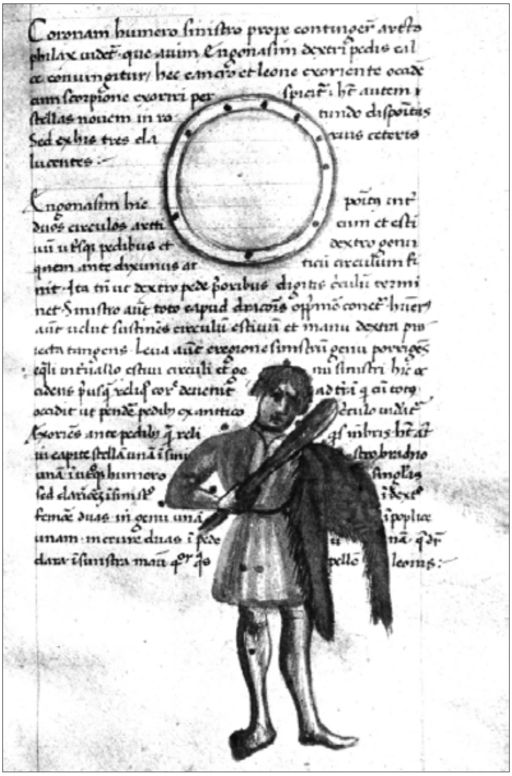

Figure 5. *Constellation of Pegasus*. Città del Vaticano, Biblioteca Apostolica Vaticana, Vat. Lat. 3109, fol. 39*r*. Italy, 1400-1450 (with permission of BAV)

Figure 6. *Constellation of Hercules*. Città del Vaticano, Biblioteca Apostolica Vaticana, Vat. Lat. 3109, fol. 34*r*. Italy, 1400-1450 (with permission of BAV)

also by aesthetic choices, such as the need to preserve or even to embellish the pictures: the stars are thus sometimes placed outside of the image (fig. 7),[42] or groups of stars are placed as a block (fig. 8)[43] or a line (fig. 9).[44]

4 Individual Description and Evaluation

In order to test the hypothesis that the 'star-positioner' normally relied on the text of the manuscript when placing the stars, it is necessary to review each manuscript individually to check both position and number of the stars in connection with the precise readings that appear in each

1.4.6); on the problems of lateralization also induced by the double referencing system, see Zucker 2008, 46-49; for a detailed comment on the Hipparchan rule see Dekker 2010, 34-38.

42 As in Cambridge, Fitzwilliam 260.

43 As in the Cambrai 993.

44 As in Pavia, Bibl. Univ., Aldini 490.

Figure 7. *Constellation of Perseus.* Cambridge, Fitzwilliam, ms. 260, fol. 9*r* (with permission of the Syndics of The Fitzwilliam Museum, Cambridge)

Figure 8. *Constellation of Capricornis.* Cambrai, MAC, ms. A 933, fol. 33*r* (with permission of Médiathèque d'Agglomération de Cambrai. Service des collections patrimoniales; cliché CNRS/IRHT)

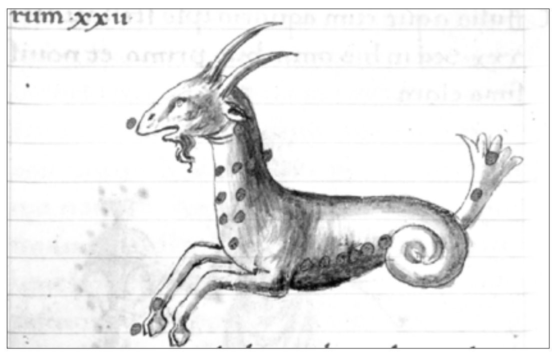

Figure 9. *Constellation of Capricornis.* Pavia, Bibl. Univ., Aldini 490, fol. 91*r* (with permission of Biblioteca Universitaria di Pavia, MiBACT)

version of the text. In *De Astronomia* Book 3, the total sum of the stars is not systematically given for each constellation.[45] Beyond this, there is often an inconsistency between the number of stars listed in each part of the constellation and the 'total sum' provided at the end of the list.[46] The

45 By contrast, the total number is generally given in the *Aratus Latinus* and always present in the *De ordine et positione* (*summa X,* vel *fiunt X*), in the *De signis* and in the *Revised Aratus latinus*.

46 For Delphinus: *omnino est stellarum VIIII* (for 10 stars listed); Pegasus: *omnino stellarum XVII* (for 18 stars listed); Cancer: *omnino septemdecim* (for 18 stars listed); etc. Besides, note that this amount is often different from one text to the other: Ursa Maior has 21 (Hyginus), 22 (*De ordine et positione*) or 18 (*De signis*) stars; Auriga has 7 (Hyginus), 9 (*De ordine et positione*) or 10 (*De signis*) stars; etc.

task of comparing the descriptions of the stars and their placement in the manuscripts themselves is also fraught with challenges: ink stains, faint or faded dots (either accidental or supposed to be filled in or replaced by stars), damaged parts, darker zones[47] or 'parasitic' decorations[48] all add to a certain level of doubt and compromise in one's readings.[49]

5 Misreadings and Misrepresentations

Apart from the inversion of right and left, which is a constant feature in these pictures due to ignorance or disregard of the so-called 'Hipparchan rule' (see note 40), it is worth noting the casual way in which the stars in the arms and legs of a constellation are marked when the text fails to specify a particular side. This haphazard tendency is slightly odd, since the catalogue of stars given by Hyginus is methodical, progressing from top to bottom, and it is always possible to get a clear idea of the figure – even in the absence of lateral descriptors – and know precisely which leg or arm is concerned (fig. 10).

None of the manuscripts is devoid of mistakes, however. Interestingly, the most reliable placement of stars vis-à-vis the text is found in Ratdolt's edition of the *De Astronomia*, despite the non-Hyginian pictorial origin of the figures of the constellations themselves. A systematic cross-comparison between all manuscripts of both text and picture could (in another study) help establish the possible relations of interdependency between the manuscripts. We have already seen how corrupted readings can impact the positioning of the stars in such a way that we can assume the 'star-positioner' either took account of the text he was illustrating, or used a model already integrating the special reading into the picture. One of the most striking cases in point is Aquarius, which is supposed to have 14 stars in the figure of Aquarius himself and 30 for the Water. The manuscripts that have only 16 stars marked in the Water (*Fluvius Aquarii*) in addition to the 14 stars of Aquarius[50] actually agree with

47 E.g.: Pavia, Aldini 490, fol. 78*v* (Bootes), where the shield is dark and almost entirely black (but supposed to be marked with stars).

48 See especially Vatican, BAV, Urb. Lat. 1358 and Milan, Trivulziana N 690.

49 It is striking that no manuscript version of the text has 21 stars for Virgo, because none has the modern edited reading *in veste decem*, but has either *in veste septem* or *in veste quinque*. Pavia, Aldini 490, for example, shows 24 differences from modern editions of Hyginus, but the discrepancies between the manuscript readings and the pictures are less evident. On the fact that the numbers provided in moderns editions do not correspond to what is found in the Hyginus manuscripts, because none of the modern editors consulted any of the 15th-century manuscripts when preparing their editions, see Lippincott (this volume).

50 Florence, Laurenziana, Ashb. 1148 and Plut. 89 sup. 43; Pavia, Aldini 490; Milan, Trivulziana N 690; Milan, Ambrosiana T 47 sup.; New York, Spencer 28; Freiberg, Andreas-Möller Bibliothek, XI.4.9; Vatican, Vat. Lat. 3110; Vienna, Vindob. Lat. 3111; Cambridge, Fitzwilliam 260 and Vatican, Urb. Lat. 1358.

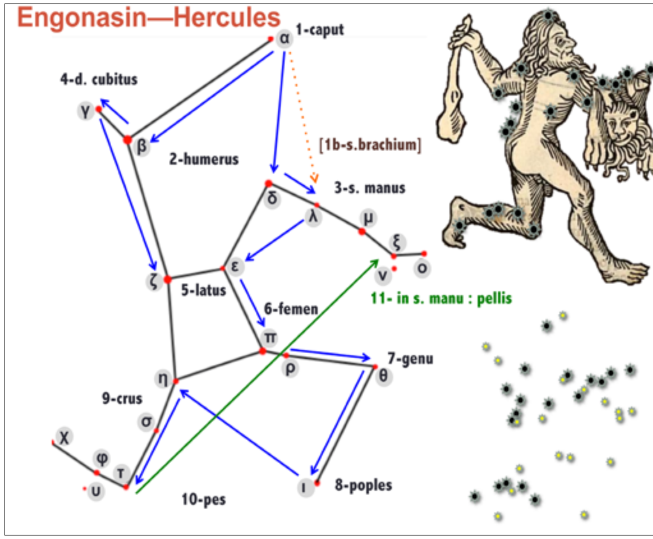

Figure 10. Hercules Trajectory of Hyginian description (from 1 to 11); Ratdolt's picture of *Hercules* with stars; star disposition in Ratdolt (black stars) and observable pattern in the sky (yellow stars)

the reading: *Effusio aquae cum aquario ipso stellarum est XXX* (instead of *Effusio aquae cum aquali* (urn) *ipsa stellarum est XXX*).[51] Many errors can be ascribed to a misunderstanding of Latin words or expressions, as in New York, Spencer 28 and in the 'twin' manuscript, Freiberg, Andreas-Möller Bibliothek, XI.4.9, where *in utrisque pennis quinas* (Cygnus, fol. 43*r*) was interpreted as meaning "five for both wings" (and not five on each), and *in ipsa testa* (Cancer, fol. 50*v*) as meaning "on the head itself", instead of the shell. The words *lumbae*, *femen* and *interscapilium* are particularly affected by the limited linguistic proficiency of the illuminators and the stars placed on these body parts tend to be rather nomadic.

However, the discrepancies in most of the manuscripts go far beyond a misunderstanding of the Latin – thus seriously challenging our hypothesis that the star-positions provide evidence of a careful reading of the texts.[52]

51 A similar case occurred with Triangulum: the pattern of *Aries intra Triangulum* derives from a misreading of Hyginian text *caput infra Triangulum* in Milan, Ambrosiana T 47 sup. (fol. 54*r*); Cambridge, Fitzwilliam 260 (fol. 16*r*); Vatican, Vat. Lat. 3110 (fol. 71*v*); New York, Spencer 28 (fol. 49*r* [*intra*, supra lineam); Freiberg, Andreas-Möller Bibliothek, XI.4.9; Oxford, Canon. Class. Lat. 179 (fol. 40*v*); Pavia, Aldini 490 (fol. 87*r*); Siena L.VI.25 (fol. 41*r*); Vatican, Urb. Lat. 1358 (fol. 30*v*); Milan, Trivulziana (fol. 17*v*) and Vatican, Vat. Lat. 3109 (fol. 57*v*). See Lippincott 1993 and Lippincott 2006. See also the regular reading (in Ari) *sub ventre unam, in lumbis tres*, correctly reported on the picture, instead of *sub ventre tres, in lumbis unam* of the edited texts of Hyginus.

52 The main exceptions being New York, Spencer 28; Freiberg, Andreas-Möller Bibliothek, XI.4.9; Siena L.VI.25 and Laurenziana Plut. 89 sup. 43, in which positioning of the stars appears to follow the texts fairly closely.

For simple constellations such as Cetus, with 13 stars dispatched in three clusters (*in extrema cauda II obscuras, ab eo loco usque ad reliqui corporis curvaturam V, sub ventre VI*), how could any 'star-positioner' keeping a watchful eye on the text make a mistake? Nevertheless, in Vatican, Urb. Lat. 1358, there are 13 stars listed in the text (organised 2-5-6) and 14 in the picture (2-6-6); in Vatican, Reg. Lat. 123, there are 14 in the text (2-6-6) and 13 in the picture (2-6-5) and in Pavia, Aldini 490 there are 13 stars in the text (2-5-6) and 14 in the picture (2-5-7).

In spite of the comments of some scribes on the importance attached to the astrothesy,[53] star-positioning often appears to have been a disconnected and inaccurate process. Indeed, the discord between text and stars seems to prove that the text was rarely checked carefully (or checked at all!) by the man in charge of positioning, especially when there are more stars in the picture than listed in the text.

Before discarding our original assumption altogether, though, we should remember that all copyists generate errors, and that the projection of a set of stars onto a picture is a kind of 'apograph', probably even more demanding than a textual copy as it involves the transposition from one medium to another. Perhaps not surprisingly, the constellations with fewer than ten stars (such as Auriga, Sagitta, Aquila, Delphinus, Lepus, etc.) are almost always correct, whereas constellations with a greater number of stars generate a greater number of divergences. Finally, there is also the issue of the attentiveness of the 'star-positioner'. To take one example, in Vienna 3111, which is obviously a direct copy of one of Ratdolt's edition of Hyginus,[54] there are errors in ten constellations and changes in the location of stars in five of them, which is almost twice as many as one sees in the manuscripts such as Siena L.VI.25 or Ashburnham 1148, and more than in New York, Spencer 28, Laurenziana, Plut. 89. sup. 43, or Vatican, Vat Lat. 3110.

53 Oxford, Bodley 614, fol. 18*r*: *ut hic dispositus*; fol. 34*r*: *Caveat itaque omnis cui forte huius opusculi de syderum ratione figurati modum transformare placuerit ne quicquam horum signorum aliter quam hic continetur depingat, nec punctos stellarum extra praenotata loca disponat quia in singulis notis figurarumque distinctionibus et formis subtilis continetur intellectus. Sola vero breuitatis causa eorumdem signorum formaturae stellarumque determinata loca hic scriptis nominatim non distinguuntur.* (Those who might be inclined to change the art and nature of this small illustrated treatise on the order (*ratio*) of the stars should be aware not to present these constellations differently from how they are shown here, and also not to place the points of the stars outside the accurately marked places, because each mark with regard to order and shape of the figures has been obtained by careful consideration. For the sake of shortness only have these constellations and the precise places of the stars not been described explicitly in the text). See Saxl 1957, 199 and Lippincott, *ad loc.*

54 They share the major error of placing Ursa Maior (instead of Ursa Minor) in the loop near the head of Draco (!). Note that this error may come from the iconographic tradition of the *De ordine ac positione* (i.e.: Paris, Bibliothèque nationale de France [BNF], ms. nouv. acq. 1614), where the stars of Ursa Maior and Ursa Minor have been transposed (five for Ursa Maior and 20 for Ursa Minor).

6 Asterization and Celestial Pattern

The 'asterization' of pictures probably meets a demand to increase the attractiveness and value (i.e.: price) of the manuscripts, but it might also indicate the intent or desire to provide a relevant and potentially more scientific display of the constellations, which consist, after all, of stars that are visible in the sky. Having said that, it must be stressed that the accuracy of star-positioning with respect to the celestial patterns that appear in the night sky is emphatically not an issue taken into account by the different 'star-positioners' of these manuscripts. The text of Hyginus is never revised to take account of cartographic accuracy, nor do any divergences in the positions of the stars reflect the influence of observed data. This is particularly striking for familiar clusters such as the square of Ursa Minor, Orion's belt, the 'W' shape of Cassiopeia or the characteristic structure of Bootes. For this latter constellation, Hyginus explicitly mentions the fact twice that the four stars on *sinistra manus* never set (III, 3: *Huius manum sinistram circulus arcticus includit ita ut neque occidere neque exoriri videatur…quae numquam occidere dicuntur*). The astronomical meaning of this indication is clear: the left hand of Bootes, who is represented standing and with his head more-or-less facing the North Pole, is *above* the head of the figure. In the manuscripts, however, the stars are generally marked both in text and picture on the *sinistra manus*, which is held *down* by his side.[55] The notable exception to this rule appears in Baltimore, Walters Art Museum, W 734, which provides an ingenious solution to the problem.[56] The general lack of interest in astronomical relevance is also demonstrated by the absurd position of the Pleiades in front of the muzzle of Taurus in seven manuscripts, proving that the illuminators were completely unaware of the relative position of Aries and Taurus.[57]

Scribes and illuminators are not responsible for this inaccuracy, because the anatomical description of Hyginus bound them to a rigid figurative representation… often impossible to correlate with the physical experience. Whether owing to a corruption of Hyginus' original text or, more probably, to the imperfection of the anatomical references, it is an impos-

55 Except in Pavia, Aldini 490 and Vatican, Urb. Lat. 1358, where the stars are placed on the right hand in both the picture and the text; and in Vatican, Vat. Lat.123, where the stars are placed on right hand in the text and left hand in the picture.

56 Lippincott 2006.

57 Hyginus, *Astr.* III.20: *Inter huius finitionem corporis et Arietis caudam.* Aries is naturally 'behind' (i.e.: west of) Taurus. The Pleiades appear before the nose of Taurus in following manuscripts: Milan, Trivulziana N 690; Pavia, Aldini 490; Florence, BNC, Magliabechi XI.114; Cambridge, Fitzwilliam 260, Vatican, BAV, Vat. Lat. 3110; Siena L.VI.25; Florence, Laurenziana Plut. 89 sup. 43.

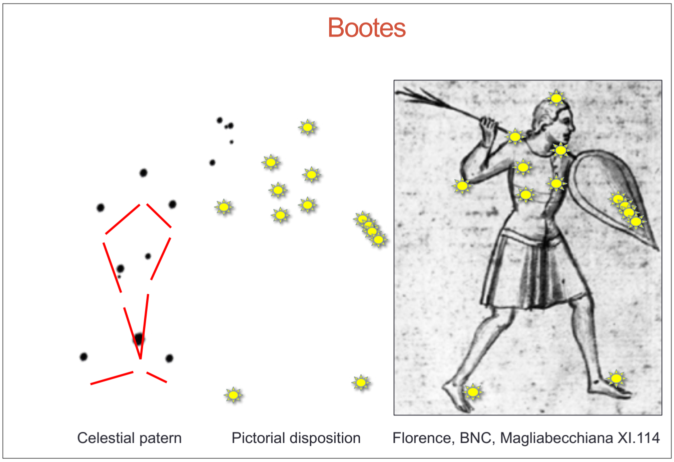

Figure 11. *Constellation of Bootes.* Difference between a pictorial disposition and the celestial pattern

sible challenge in the case of most constellations to draw a realistic figure that respects both the anatomical instructions and the celestial scheme in the positioning of the stars (fig. 11).

The Erathostenian anatomical depiction of the constellations (in *Catasterismoi*), on which the Hyginian text is based (Zucker 2015), had already been revised by Hipparchos and Ptolemaios, in order to match a more realistic structure (see Zucker 2016, 1065 sq.). In short, the only way to eschew the contradiction between literary depiction and visual experience was to abandon Hyginus and his like, and to restart afresh the description with a new structure and a new positioning.[58]

7 Conclusion

The position of the stars in the manuscripts of Hyginus under consideration reflect differing levels of accuracy, but it seems safe to conclude that there are three major factors at play: 1) the descriptions provided in the text, 2) the pictorial conventions of the drawn figures and 3) the relative degree of attentiveness and skill of the person responsible for positioning the stars. The scribe of the text responds to a simple demand – which

58 Relying on the tradition of Ptolemy's *Almagest* tradition and above all on Tycho Brahe's accurate observation, the asterization of constellations provided by modern atlases, from Bayer's *Uranometria* (1603) onwards does not follow any more the Hyginus' tradition, which more or less directly determined in the Latin West the major part of astronomical illustration until at least the 12th century and the first translation of the Sufi's version of Ptolemy's catalogue.

is to reproduce a text, from one or more manuscripts, which sometimes include pictures. The scribe is rarely called upon to improve the text, nor is the illuminator often called upon to revise the pictures. Neither was he likely to be an expert in astronomy. As a result, and as might be expected, the pictorial star-structures in our corpus have little in common with the observable patterns in the night sky.[59] The irrelevance of the arrangement of stars for the constellations compared to the celestial patterns clearly proves that the illustration was not meant to represent the disposition of real stars in the sky but to visually project astrothesic data provided in the ms. A double fidelity to text and sky was impossible anyway. We may nonetheless observe that some medieval texts, such as the *De cursu stellarum* of Gregorius, favored a more acute display of celestial patterns, avoiding the 'pagan' iconography (and nomenclature) for the constellations, and that the manuscripts transmit more relevant sketches with respect to the star clusters, even if the lack of orientation and of celestial context make their identification sometimes unsure.[60]

As for the main issue of our investigation, the conclusion appears to be that of the 20 manuscripts in question, only six (see Appendix 2) show a sufficiently high degree of agreement between text and star-placement. Instead, one sees a series of odd mistakes and divergences, most of which should probably be regarded, up to a certain point, as the kind of accidents characteristic of every process of copying, especially with repetitive and numeric data. Besides, a number of examples show evidence that stars have been often placed in the figures according to extant pictorial models, in fact not always with great accuracy. In response to Dolan's original question as to whether the illuminators of Hyginus manuscripts are reading the poem and creating images in accordance with their readings or simply following existing pictorial models, one must conclude that the evidence appears to vary on almost a case-by-case basis.

59 It stands "zwischen Wissenschaft und Phantasie" as observed in the title of Blume, Haffner, Metzger's catalogue.

60 Bamberg, Staatsbibliothek, ms. Patr. 61, fol. 75*v* sq. McCluskey writes (2000, 107 and note 29): "the orientation of the stars and the brightness of distinctive ones are clearly indicated – These figures differ from the more artistic but astronomically unintelligible drawings of the classical constellations in manuscripts of Aratus and Hyginus. This striking difference reflects the concern with actual astronomical practice by readers of *De cursu stellarum*". Note that the structures of the twenty or so asterisms appearing in the manuscript is more simple (generally with fewer than 12 stars).

Apparatus

1 Vatican, Biblioteca Apostolica Vaticana, Reg. Lat. 123

The Vatican manuscript, Reg. Lat. 123, is the oldest Hyginus manuscript where the majority of the stars have been marked. The constellations are presented in two series, one with the zodiac, the other with the remaining constellations, following the order of Pseudo-Bede's *De signis caeli* (Ophiuchus after Corona Borealis, Perseus after Triangulum, etc.).[61] In spite of this structure, the text regularly given is Hyginus' and not that of the *De signis caeli*. However, for the last five chapters (Eridanus, Piscis Austrinus, Ara, Centaurus and Hydra) and for Bootes (fol. 189*v*), Ps.-Bede's description of each constellation is given in addition to Hyginus', and is introduced by the formula *secundum Aratum*.[62] Other excerpts are scattered in the text, mainly from Isidorus (fol. 176*v*, fol. 188*v*, etc.) or Fulgentius (fol. 193*v*), with no apparent impact on the iconography.

This manuscript is a *unicum* in the tradition. The asterization is chaotic, and it includes many divergences from both texts (Hyginus and Ps.-Bede) as well as with the general Hyginian tradition, but in the final analysis it seems to fit the Hyginian description more than any other known source:[63] The asterization is related to Ps.-Bede's description for eight constellations (Ursa Maior, Ursa Minor, Draco, Cepheus, Perseus, Auriga, Delphinus, Hydra) and in two cases the illustration appears as a conflation of both texts (Hercules, Argo). Having said that, the illuminator is not sufficiently competent to deal with astronomical data, and he makes a number of different kinds of mistakes.[64] For example:

- On fol.185*r*, dealing with Arctophylax (Bootes) and following the Hyginian description, he misunderstands a blank space left by the scribe with a characteristic shape for a picture of Bootes, and fills it with a picture of Ursa Minor (!).

61 The only deviation from the Pseudo Bede's order concerns the inversion of consecutive constellations (Cassiopeia/Cepheus and Canis Maior/Lepus).

62 This indication is missing before the astrothesic description of Bootes.

63 See Lippincott's 2014, 17 assessment: "With the Vatican illustrations, it is difficult to uncover any dominant rationale behind the placement of the stars. In 11 constellations, they can be connected to the *De signis caeli* text; in 7, to the text of Hyginus. The positioning of the remaining 24 are sufficiently problematic to be unattributable to any single or known pictorial source".

64 Lippincott 2014, 14: "Despite his painterly bravado, it is clear that the artist of the Vatican manuscript is often unsure about many of the details of what he is copying. For example, he misunderstands the structure of the *harpe* held by Perseus and misses the identity of the severed head of Medusa".

Figure 12. *Constellation of Cepheus*. Città del Vaticano, Biblioteca Apostolica Vaticana, Reg. Lat.123, fol. 191*r*. Spain, 1056 (with permission of BAV)

- The picture of Bootes on fol. 189*v* (alongside the text of the *De signis caeli*), seems to follow the text of Ps.-Bede (omitting the main star Arcturus, which is missing in the text),[65] but it offers a characteristic disorder: 16 stars are listed in the text, with an alleged total of 15 (*sunt omnes XV*), while 17 stars are marked on the picture. The four stars on the *right* elbow (*in dextro cubito iiii*) are actually on the left one, with the four stars of the *right* hand (*in dextra manu IIII*), one star is missing on the breast, and two additional ones are marked on the right hand. Hyginus' text for Bootes is given on fol. 185*v*.
- Ursa Maior (without tail) and Ursa Minor (with long tail) are reproduced twice (fols 184*v*-185*r*, fol. 186*r*: *Draco inter arctos*), with inconsistent asterization.
- The cases in which the illuminator *might* have respected the text (Gemini, Cancer, Capricorn) are very rare.[66] Given the importance and antiquity of this earliest of all asterized manuscripts, it is important to list all the remaining errors or oddities of the ms.:[67]

65 This star appears in Hyginus' text, correctly quoted on fol. 185*r*: *in zona unam clarius*.

66 For Gemini, the text duplicates *in sinistro humero unam*, omits *in dextro humero alteram* and the picture has accordingly only one star on the left shoulder. For Cancer, the animal has no claws but five pairs of legs, thus receiving one additional star (*in dextris pedibus singulas obscuras).*

67 Comments in brackets stress the discrepancies with regard to Ps.-Bede's text.

Constellation	ms. text	ms. illustration	Comments
Ursa Maior	Hyginus 19	(a) Hyginus 19 (b) Ps.-Bede 14	– omits one star on each ear [but four instead of nine on the head]
Ursa Maior	Hyginus 17	(ab) Ps.-Bede 7 & 7	[= four stars *in humero* (instead of the feet)]
Draco	Hyginus 15	Hyginus 15	
Bootes	Hyginus 14 Ps.-Bede 15	Ps.-Bede 14	[four stars *in dextro cubito* are on the left elbow; omits one star on the breast]
Corona Borealis	Hyginus 9	Hyginus 9	
Hercules	Hyginus 19	Conflation Hyginus/ Ps.-Bede 13	– omits one star on the right shoulder (*in utroque humero*) – one on the right hand instead of the left (*in manu sinistra i*) – omits four stars on the left hand (*in sinistra manu IIII*) – adds a star on the left knee – NB: two partly faded on the leg (*in crure ii*) [omits one star on the right shoulder (*in utroque humero* and one *in dextra tibia*); adds one star on the right foot and one on each flank]
Lyra	Hyginus 9	Hyginus? 8	– omits a star at the bottom (*in imo Lyrae, quae ut basis totius videtur, unam*)
Cygnus	Hyginus 13	Hyginus 13	
Cepheus	Hyginus 19	Ps.-Bede 20	[omits 3 stars (*in manu dextra I, item in cubito obscuram I, in sinistra manu*); three stars on the belt (*in zona*) are on the chest (fig. 12)[1]
Cassiopeia	Hyginus 14	Hyginus 13	– omits the star on the right foot (*in pede primori dextro unam*) [as in Ps.-Bede] – omits two stars on the throne (*in angulis utrisque*) – adds two stars on the hands [as in Ps.-Bede]
Andromeda	Hyginus 21	Hyginus 23	– adds two stars on the trees drawn on both sides of the figure [as in Ps.-Bede]
Perseus		Ps.-Bede 17	[inverts right and left hand; adds an unconventional star on the left hand; omits three stars, with regard to the text: *in sinistro femine unam in tibia duas*]
Auriga[2]	Hyginus 7	Ps.-Bede 10	
Ophiuchus + Serpens	Hyginus 17 + 21	Hyginus? 12 + 6	– trampling on Scorpio [as in Ps.-Bede: *stans uero supra Scorpionem*] – omits three stars on the hands – omits one star on the right knee – omits one star on the right thigh – omits fifteen stars on Serpens

Certissima signa, 153-212

Constellation	ms. text	ms. illustration	Comments
Sagitta	Hyginus 4	Hyginus 4	– marks on the tail the two stars *in eo loco quo ferrum solet affigi* (usually marked on the arrowhead)
Aquila	Hyginus 4	Hyginus? 5	– the text is interrupted (fol. 198*r*) and does not continue on the following page (*in utraque penna unam, in cau* <*da unam*>) – shows *five* stars (instead of four) with three stars on the chest instead of one on each wing (*in utraque penna i*)
Delphinus	Hyginus 10	Ps.-Bede 9	
Pegasus	Hyginus 18	Hyginus 18	– probably omits a star on the right leg, supposed to be on the hough (*in utrisque poplitibus singulas*), but the picture is damaged – adds one star on the wings
Triangulus	Hyginus 3	Hyginus 3	
Aries	Hyginus 18	Hyginus 18	
Taurus	Hyginus 14	Hyginus 18	– adds one star on the belly (cf. *in ventre unam* in Ps.-Bede) – has *three* stars on the neck instead of two (cf. *in collo ii*, also in Ps.-Bede) – adds three stars on the shoulder, accompanying an abnormal text (*vacuum et cervicem* before *et interscapilio tres*).
Gemini	Hyginus 8 + 8	Hyginus 8 + 8	
Cancer	Hyginus 18	Hyginus 19	– adds a star on a fifth foot – the two stars *in testa* are erased – the stars *in chelu* (sic) are on the shell[3]
Leo	Hyginus 19	Hyginus 20	– adds one star on the left forefoot
Virgo	Hyginus 17	Hyginus 21	– adds one star on each breast – adds one star on each elbow (cf. in Ps.-Bede: *in unoquoque cubito unam*) – has six stars at the bottom of her dress (*stellas ex* [sic]) instead of five, seven or ten (cf. Ps.-Bede *in penula uestimenti sex*)
Scorpio + Libra	Hyginus 12 + 4	Hyginus 15 + 4	– adds three stars on the body, corresponding to Hyginus' text (<*in interscapilio III*>; cf. *in spina tres* in Ps.-Bede), but omitted in the manuscript[4]
Sagittarius (+ Corona Australis)	Hyginus 15 + 7	Hyginus 15	– omits the star *in poplite* – adds a star on the hand, that could be *in pollice* – the star *in dextro cubito* is on the left elbow – stars *interscapilio* are in the front, on shoulder and hand

Constellation	**ms. text**	**ms. illustration**	**Comments**
Capricornus	Hyginus 20	Hyginus 26	– adds six stars on the horns, in accordance with the aberrant segment given in the text (*in cornibus VI*) at the end of the description (after *in cauda duas*): this does not exist in either Hyginus or Ps.-Bede.[5]
Aquarius	Hyginus 16 + 30	Hyginus? 16 + 8[6]	– along with the 16 stars of the human figure (*omnino XXII* [sic]), has only 8 stars on the Water, while it is supposed to have 30 to respect the text: *Effusio aque cum aquali ipso stellarum XXX*[7]
Pisces	Hyginus 41	Hyginus? 40	– stars marked (*notius*: 15; *coniunctio*: 12; *boreus*: 13) do not match either Hyginus' (17-12-12) or Ps.-Bede's text (15-12-12)
Eridanus	Hyginus 13 Ps.-Bede 16	Hyginus 12	– omits one star
Cetus	Hyginus 14	Hyginus 13	– omits one star *in uentre*
Lepus	Hyginus 6	Hyginus 6	
Orion	Hyginus 17	Hyginus 17	– a correction process has been undertaken to align with the Hyginian text, three stars on the cape (corresponding to the Ps.-Bede text: *in mantili 3 obscuras*) having been partly erased, and seven stars are crossed on the left side (on leg: 2; arm: 2; sword: 3). – stars *in dextro cubito* and *in manu* (scil. *dextra*) are on the left arm (holding the sword)
Canis Maior	Hyginus 19	Hyginus 19[8]	
Canis Minor	Hyginus 3	Hyginus 3	
Argo	Hyginus 22	Conflation Hyginus/Ps.-Bede 27	– adds five stars on the stern (cf. Ps-Bede: *in puppi* 4) – adds one star on the oar (cf. Ps-Bede: *in utroque humero 5*), – omits one on the ship (4 instead of 5 *sub reiectu*; cf. Ps.-Bede: *in anteriori parte navis 4* ?)[9]
Centaurus + Lupus	Hyginus 24 + 10 Ps.-Bede 24 + 9	Hyginus? 18 + 8	– omits four stars listed by both Hyginus and Ps.-Bede (*in medio pectore equino unam, in ventre ii, in lumbo equino i*) – omits four stars of Hyginus' catalogue (*interscapilio iiii*; or *in spina ii* in Ps.-Bede) – adds two stars on the front paws – omits one star on the head of Lupus (common text of Hyginus and Ps.-Bede: *in capite iii*)
Ara	Hyginus 4	Hyginus 4	

Constellation	ms. text	ms. illustration	Comments
Hydra + Crater + Corvus	Hyginus 26 + 9 + 8 Ps.-Bede 3 + 3 + 3	Ps.-Bede 3 + 3 + 4	– [adds a star on the beak of Corvus or the body of Hydra].
Piscis Australis	Hyginus 12	Hyginus 12	

1 The text in the manuscript is: *Hic autem habet in capite stellas duas, in manu dextra i, item in cubito obscuram i, in sinistra manu & humero singulas, in dextro humero i, in zona, quae medium eius dividit corpus tres stelle clare videntur, in latere dextro obscura i, in sinistro genu due, utrisque pedibus singule, supra pedem stelle iiii*.

2 The positions of the stars in Auriga are: head, both shoulders, both elbows, two on the hand [*scil*. left = *Heduli*]. In the *De ordine et positione*, the stars are not on the elbows but on the knees, and the stars called *Heduli* are counted twice (four stars on the hand), for a total of 9 stars. The text is misread and *Capra* is considered as a star, different from the star on the right shoulder (*sed in sinistro clariorem quae Capra vocatur*).

3 The animal has no claws, but five pairs of legs; probably the scribe did not understand the word *chela* (*in ea que chelu [sic] dexterior dicitur*). The stars of the claw are often misplaced before the head of Cancer (in BAV Lat. 3110, BAV Lat. 3109, BAV Urb. Lat. 1358, Siena L.VI.25, Bodley Canon. Class. Lat. 179, Trivulziana N 690, Ambrosiana T 47 sup., Cambridge Fitzwilliam 260); they are correctly marked in: Digby 83; New York, Spencer 28; Laurenziana, Plut. 89 sup 43; Florence, Laurenziana, Ashb. 1148; Cambrai 933; Baltimore, Walters Art Museum W 734; Vienna 3111 (see also: Pavia, Aldini 490 [two on the left claw, three before the right one]).

4 The description and picture of Scorpio are on fol. 180*r*; in the chapter of Ophiuchus there is another picture of Scorpio on fol. 188*v*, under the feet of Ophiuchus, with identical asterization.

5 On the left forefoot there *might* be an additional star.

6 Note that the two stars pictured on the breast cannot follow the corrupted text (*in utrisque membris*, instead of Hyginus' text *infra mammas singulas obscuras*); similarly a correction *supra lineam* had *que genu* above *in utribus* (omission of *genibus*).

7 On the more common text *cum aquario ipso* see below.

8 Note that Ps.-Bede's description is very different (with 17 stars).

9 Note that in Ps.-Bede Argo (*Navis, quae apud Argivos Argo vocatur*) has only 21 stars.

2 Oxford, Bodleian Library, Digby 83

For each constellation, Digby 83 conflates the chapters from books 2 and 3 of Hyginus.[68] It seems to follow the iconography of Oxford, Bodley 614, containing the *Recensio interpolata* of Hyginus' *Astronomia* (excerpts conflated with readings from Isidorus' *De natura rerum* and the *scholia Sangermanensia*),[69] which is also marked with stars,[70] but it does not provide the textual description of the astrothesy or the exact position of stars, mentioning only the number of stars for each constellation.[71] Digby 83 is generally more complete than Bodley 614 in the asterization, though it also differs from it from time to time.[72] The positioning of the stars in this manuscript is often faulty. The text contains numerous linguistics errors,[73] and the 'star-positioner' regularly places the stars described as *in lumbis* on the genitals (Cassiopeia, Perseus, Orion and Aquarius).[74] This linguistic inadequacy also could be responsible for the asterization of Cygnus, which theoretically carries five stars on each wing (*in utrisque pennis*

68 A similar case appears in the manuscript London, British Library, Arundel 339, which is without stars.

69 On fols 17*v*-33*v*. Blume, Haffner, Metzger 2012a, 390-93; McGurk 1966 (IV): xxiii; Lippincott (The Saxl Project, *ad vocem*). On the family of Oxford, Bodleian, Digby 83, see Saxl 1957, I.99: "Harley 647 is a manuscript of purely classical character which was brought over from France" and was copied into London, BL, Cotton Tib BV; Cotton Tib C I; Harley 2506; Oxford, Bodleian, Bodley 614 and Digby 83. See also Lippincott (The Saxl Project, Hyginus/Commentary: 149-59).

70 Only the zodiacal constellations are in colour, and they are used in a symbolic way referring to the elementary meaning of each trigon, in red (= fire: Aries, Leo, Sagittarius), yellow (= earth), green (= air) and blue (= water).

71 There are many discrepancies between the number of stars given in the text and their pictorial asterization (e.g. for Gemini [fol. 18*v*-19*r*]: *Hi habere stellas xii*, while 16 stars are marked on the picture).

72 In Lippincott (The Saxl Project, Hyginus/commentary: 151-59), Elly Dekker has provided a systematic comparison of the two manuscripts and it appears that they are in agreement for 23 constellations and in disagreement in 18 cases. Digby 83 is richer in 13 cases and poorer in 6 cases. For Bootes, Digby 83 has 12 stars (while Bodley 614 has 11), adding two stars on the left hand and omitting one star on the right elbow. Pegasus, however, offers a reverse case (16 stars are marked in Bodley 614, and 12 in Digby 83). In spite of its numerous errors, the scribe of Bodley 614 addresses a *caveat* to the reader (fol. 34*r*), warning that "these images are not to be drawn indiscriminately as they indicate certain positions of the stars in the sky and should therefore be carefully copied" (Saxl 1957, 199; Lippincott, *ad loc.*).

73 Among many others, see fol. 47*r*: *intem in cubituto*, and fol. 51*r*: *habens in capite stellam utramque pennam unam.*

74 As in other manuscripts, the total number of the stars given in the text (*omnino sunt…*) is often incorrect (Cancer: XVI instead of 18; Argo: XX instead of 21; etc.). Note that the positioning of stars is not always accurate (cf. Serpens in Ophiuchus: the stars *in secunda [scil. curuatura] caput versus habet stellas VI* are placed at the end of the tail).

Figure 13. *Constellation of the Scorpion.*
Oxford, Bodleian Library, University of Oxford [2016], Digby 83, fol. 56*r*. England, ca. 1150 (© 2016 Bodleian Libraries. All Rights Reserved)

quinas), but it only has five in all (3 + 2) in the manuscript.[75] Remarkably, Digby 83 presents Bootes and *Draco inter Arctos* (fol. 44*r*) together in a single picture (see a similar formula in Baltimore, Walters Art Museum, W 734), and it gives an individual representation of the Pleiades and Hyades (fol. 48*v*) – unique within Hyginian iconography. Corona Borealis has ten stars, instead of nine in all other manuscripts, and Lepus has seven stars (instead of six), on account of an interpolation from the *Scholia to Germanicus* present in the text (*in extremitate caude unam*).[76] Pictures and text are in agreement for all but 18 chapters (the differences occurring in Ursa Maior, Bootes, Hercules, Cassiopeia, Perseus, Pegasus, Aries, Gemini, Cancer, Leo, Sagittarius, Capricorn, Aquarius, Pisces, Orion, Eridanus, Centaurus and Hydra), even when the text is corrupt or when

75 See also New York, Spencer 28, fol. 43*r* and Freiberg, Andreas-Möller Bibliothek, XI.4.9, fol. 33*r*. Note that there is no similar mistake in the manuscripts for Virgo, that has two stars on each wing (*in utrisque pennis bine*).

76 Cf. Milan, Ambrosianus T 47 sup. (also with 7 stars, but without the text of the scholia). The text for Canis Minor (*habet stellas tantum tres in ventre*) and the corresponding stars' position in the picture has, to the best of my knowledge, neither a parallel nor an explanation.

the number of stars differs from what we would expect.[77] However, the position of stars is definitely independent of readings in the manuscripts, as is clearly shown in the chapters on Gemini.[78] For Pegasus, the textual description is truncated, only mentioning the stars of the head (*in rostro stellas duas, in capite unam, in maxilla unam, in utrisque auribus singulas. Ita sunt omnino stellarum xvi*), but the asterization matches the standard positions, with the remarkable exception of the first four listed stars (*in rostro, in capite, in maxilla*) that are missing. The picture of Scorpio also demonstrates this (fig. 13). It is supposed to represent a crustacean with *in unaquaque earum* [scil. *chele*] *duas […], in fronte stellas tres, in ventre duas, in cauda ii, in acumine […] duas.*[79] For the constellation of Capricorn, adorned with 17 stars, the list of those stars is omitted.

Many stars listed in the text are missing in the pictures:

- Bootes – *sub ea* [scil. *mamma*] *alteram, in cubito dextro*
- Hercules – one of *in crure duas*
- Cassiopeia – *in quadrato, quo stella deformatur, una*
- Perseus – *in genu* [scil. left] *alteram*
- Aries – *in cervice*, *in cauda*
- Leo – *in posteriore* [scil. *pede*]
- Aquarius – stars missing on the left elbow, right foot; the *effusio stellarum* has not 30 stars but a golden line
- Pisces – the southern fish has 14 stars, instead of 17
- Centaurus – one of *inter scapulas iiii*
- Lupus – *in posteriore pede primo una*, *in priore anterioris parte pedis unam.*[80]

A mistake on the asterization of Cancer is due to the picture: the animal has three pairs of legs (instead of four) and the mixing of the claw and

77 Virgo, for example, has only 16 stars, in agreement with the text (with only *in veste quinque,* instead of seven or ten).

78 Castor in Gemini (fol. 54*r*) correctly stands on the right side and has 10 stars, but only five are listed in the text, one of which (*infra pedem*) is not marked: *in capite unam <in sinistro humero I, in dextro humero alteram, in utrisque mammis singulas, in dextro genu I,> in sinistro genu I, in pedibus utrisque singulas, et infra sinistrum pedem unam.*

79 Other cases of stars marked although not listed in the text: Ursa Maior, with 10 stars on the head, instead of 9 (*septem in capite omnes obscuras, in utrisque auribus unam* [sic: usually *binas*]); 4 marking the rectangle on the body, but only 3 are mentioned (*in humero, inter scapulas, in crure*); Aries with 2 stars in excess, on head and shoulder (in other manuscripts one finds: *in capite*, *inter scapilio*); Orion with 3 stars, instead of 2 (*in zona duas*); Eridanus with 14 stars, instead of 13; Sagittarius with 3 unlisted stars on right hand, right elbow and the belly.

80 Note that in Delphinus (*in ventre tres*) two golden dots are marked but there is a third pale dot close to them.

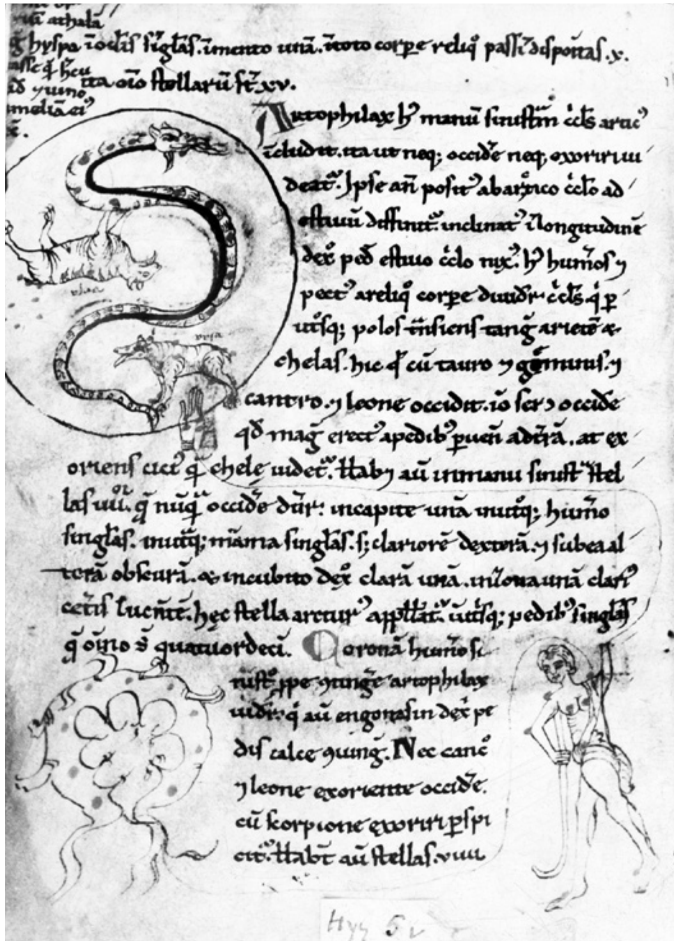

Figure 14. *Constellation of Bootees and Draco inter Arctos.* Baltimore, Walters Art Gallery W734, fol. 5*v*. Northern Italy or France, 1150-1200. (© 2017 Walters Art Museum)

Figure 15.*Constellations of Bootes* and *Corona Borealis.* Leiden, GRO 21, fol. 55*r*. France, 1180-1220 (with permission of Universitaire Bibliotheken Leiden)

the first leg leads to the omission of some stars.[81] But, in Auriga, the error in the positioning of Heduli (two stars on the right shoulder instead of *in utroque humero unam*) has no rational explanation. The stars of Hydra are, as usual, differently clustered in the text (3-6-3-3-2-9 = 26) and in the picture (3-3-8-2-9 = 25).

3 Baltimore, Walters Art Museum, W 734

The Walters W 734 manuscript is in poor condition, and the text is often difficult to read (especially for Pegasus and Hydra) and some pictures are hard to analyze properly (Andromeda, Delphinus, Pisces, Eridanus).[82] The positioning of the stars in this manuscript reflects in general the text. It is noteworthy that the Serpent of Ophiuchus is deprived of stars, despite the list given in the text. Also, the pictorial model for Sagittarius (as a biped satyr) is very rare, and unique in our corpus.[83] The manuscript presents other peculiarities in the details of various constellations (Gemini, Leo, Scorpio, Cetus, Argo, Centaurus, as well as the lack of a list of stars for Lupus, with no stars marked on the picture either).[84] The most striking anomaly concerns Orion, which is deprived of stars on the head in both text and pictures: *Hic habet iii claras in utrisque humeris singulas* (instead of *Hic habet in capite stellas iii claras, in utrisque humeris singulas*). This feature appears elsewhere only in Cambrai 993. Also, Corvus is marked by 9 stars instead of 7, in accordance with the text (*Corvus autem habet in gutture stellam i, in pennis ii, infra pennam ii, ad caudam versus ii* [instead of: *infra pennam ii ad caudam versus*], *in utrisque pedibus singulas. Omnino VII* [sic]), which also appears in Cambridge, Fitzwilliam 260.

But there are also other discrepancies: stars are listed in the text and missing in the picture (Andromeda, Gemini, Cancer, Virgo); stars are wrongly positioned on the pictures (Ophiuchus, Cancer, Sagittarius); and additional stars have been added (Perseus: on the right knee as in the conventional depiction (*ad genu unam*), but not listed in the text; Scorpio: on the body). These particular discrepancies are rather rare, and it can-

81 Note that the picture of Virgo is deprived of wings, but the corresponding stars are placed on the forearm.

82 We assume that a stain is responsible for the fact that Canis Minor seems to have four stars, instead of three (*omnino est stellarum iii*).

83 The corrupt text mentions a *Cornua* (instead of *Corona*), but the satyr has no horns and the seven listed stars of Corona Australis are not marked anywhere.

84 See, for instance, the corrupt but consistent text for Leo carrying 2 stars on the paw (instead of one) and none on the belly (instead of 2): *in pede priore unam claram* [in ventre claram unam] *et infra alteram magnam*; or the text for Scorpio, whose picture is deprived of the two stars on the sting: *in cauda V, in acumine ipso quo percutere existimatur* <II>.

not be ruled out that the ‘star-positioner’, who probably had an illustrated model at his disposal, did check and follow the text. Nevertheless, the original and fascinating picture of Bootes (fig. 14) provides evidence of a particular attention being paid to Hyginus’ description of the figure: the left hand of Arctophylax is disconnected from the body and placed inside the circle, where Draco inter Arctos lies, following the opening sentence of the chapter (*Huius manum sinistram circulus arcticus includit ita ut neque occidere neque exoriri videatur*); but there is another line that connects his left shoulder with the picture of Corona Borealis, standing for the opening sentence of the following chapter on that constellation (*Coronam humero sinistro prope contingere Arctophylax videtur*), both text and pictures appearing on the same page.[85]

4 Leiden, Bibliotheek der Rijksuniversiteit, Gronovius 21

The Leiden manuscript, Gronov. 21, illustrates only five constellations (Bootes, Corona Borealis, Hercules, Lyra and Cygnus). Cygnus is incomplete (two parallel lines with two stars), and the other four are rough sketches. Bootes and Corona Borealis are duplicated, appearing both as drawings of a figure marked with stars (open circlets) and as a similar pattern of stars but without the line of the body (fig. 15). The positioning of the stars is correct (Corona Borealis seemingly having nine stars on one of the drawings), and one can only regret that such a promising setting was not continued for the other constellations.

5 Vatican, Biblioteca Apostolica Vaticana, Vat. Lat. 3110

As far as pictures are concerned, Vat. Lat. 3110 is very close to Florence, BNC, Magliabechi XI.114.[86] In both cases, the pictures generally agree with the text,[87] especially if we take into account some probably simulta-

85 Lippincott 2006.

86 Rather than with New York, Spencer 28 as suggested by Alexander 1994, 120: “The positions and movements of the figures in the copy of the Hyginus illustrations at New York Public Library almost invariably correspond to similar ones in this manuscript”.

87 Note that for Perseus the picture showing only one star close to the knee agrees with the text (*in dextro femore [unam] ad genu unam*). This also appears in Milan, Trivulziana N 690; New York, Spencer 28; Freiberg, Andreas-Möller Bibliothek, XI.4.9; Oxford, Bodley Canon. Class. Lat. 179 and Pavia, Aldini 490. Similarly, Sagittarius has a star on the thumb (*pollex*) and not on the thigh (*poples*), in agreement with the text (*in pollice unam*).

neous marginal corrections.[88] The placements are not random, but some stars are incorrectly placed:[89]

- Ursa Maior – the star *in summo interscapilio I* does not figure on the back but rather on the scapula
- Cancer – the five stars of the *Chelae - in ea quae chela dexterior dicitur, tres similes, non grandes; in sinistra similes II* - are in front of the head and not on the claws
- Pegasus – the star *in umbilico* is missing or misplaced above the neck, far from the figure itself.

The star-positions on Serpens (in Ophiuchus) and Hydra are wrong as well, and imply errors in the star numbers. While the standard Hyginian sequence of stars is given in the text (Serpens = 2-4-2-5-4-5 [= 22]; Hydra = 3-6-3-4-2-8 [= 26]), the stars are marked with different groupings (Serpens = 2-3-8-6-4 [= 23]; Hydra = 0-9-6-3-5 [= 23]). Except for Ophiuchus (an additional star on Serpens) and Gemini, all discrepancies in the number of stars result from missing stars in the pictures (in Ursa Maior, Cassiopeia, Andromeda, Serpens in Ophiuchus, Aries, Gemini, Virgo, Argo and Hydra):[90]

- one star on Cassiopeia's leg (only two for *in sinistro femore duae, in genu I*)
- one on Andromeda's arm (*in bracchio unam*)
- one on Serpens' head (*sub capite IIII*)
- one on Virgo's left foot (*in utrisque pedibus*)
- three on Hydra's body

A more blatant mistake marks the Aries picture, where three stars are missing on the neck (*in cervice 3*), and Gemini, where there is one additional star in Pollux' left hand (right Twin) and three missing stars in Castor, including the famous Propous (*in dextro* [scil. *humero*] *alteram, in sinistro genu alteram, infra sinistrum pedem i quae tropus* [sic] *appellatur*). Even though mistakes are not numerous, it is difficult to assume that the 'star-positioner' read the manuscript. This is especially clear in the chapter on Argo, where the illuminated ship is marked with 19 stars, while the list mentions *twice* three stars on the mast, which are absent from the picture (*Haec habet in puppi< IIII,> ad singula gubernacula ad primum stellas 5, ad malum 3, ad alterum 4… sub reiectu 5, ad malum 3*).

88 See the marginal additions for Leo (fol. 73*r*: *interscapilio tres, in media cauda unam*) and Cassiopeia (fol. 68*r*: *in pede ipsius dextro unam*). See also Centaurus (fol. 77*r*: *equino*).

89 Contrary to what is claimed in Dolan 2006, 330.

90 The stars on Ursa Maior's head are erased but probably less than eleven.

6 Firenze, Biblioteca Nazionale Centrale, Magliabechi XI.114

The unfinished Magliabechi XI.114 has only ten pictures, which match the text almost perfectly.[91] If one allows for a corrected lateral re-orientation in Ophiuchus and Serpens, the only error is the addition of a sixth star on the middle of Serpens (*ad ipsam corporis coniunctionem* 5).[92] The description of the stars of Taurus matches the depiction as long as we take into account a marginal gloss that completes the text (*Praeterea in sinistro genu priore habet stellam unam*).

7 Vatican, Biblioteca Apostolica Vaticana, Vat. Lat. 3109

Vat. Lat. 3109 offers two complete albums of constellations (fols 33*r*-50*r* and fols 53*r*-68*r*),[93] but only the first set is partially accompanied by a text (fols 32*r*-34*v*), corresponding to the Hyginian description of five constellations (Draco, Bootes, Corona Borealis, Hercules and Lyra). Only one picture (Bootes) appears wrongly marked, with two misplaced stars on the top of the arms (*in utraque mamma singulas*) and a missing star supposed to be under the star in the right chest (*sub ea* [scil. *in mamma*] *alteram obscuram*). The asterization of the pictures, which was completed before the text was written, could not have been based on the text, and the total number of stars suggests several mistakes (Ursa Maior, Bootes, Hercules, Andromeda, Auriga, Ophiuchus, Sagitta, Pegasus, Triangulum, Aries, Taurus, Gemini, Cancer (with seven pairs of legs), Scorpio, Sagittarius, Capricorn, Aquarius, Eridanus, Canis Maior, Centaurus, Hydra and Piscis Austrinus). Sagitta, Triangulum, Corvus and Crater are deprived of stars.

8 Milan, Biblioteca Ambrosiana, T 47 sup.

As far as star-positions are concerned, Ambrosiana T 47 sup. is close to Oxford, Bodleian, Canon. Class. Lat. 179. It usually gives a bigger size to stars qualified as *magna* (except for Aquarius on fol. 57*r*), but not to stars described as *clara* (see Hercules, fol. 49*r* and Gemini, fol. 54*v*). It

91 The textual description is missing for Auriga, but this picture of 7 stars is never mistaken in the corpus (except in Vatican, BAV, Vat. Lat. 3109 and Reg. Lat. 123). Note that the drop capitals are missing from the text.

92 The same addition occurs in Siena L.VI.25; Milan, Ambrosiana T 47 sup.; Oxford, Bodleian, Canon. Class. Lat. 179.

93 Note that style and postures are very different in both sets (cf. fols 40-41*r* vs fols 58*v*-59*r*), and the asterization is independent: Cepheus has no stars on the knees in the first series (fol. 35*r*) and two in the second one (fol. 53*r*).

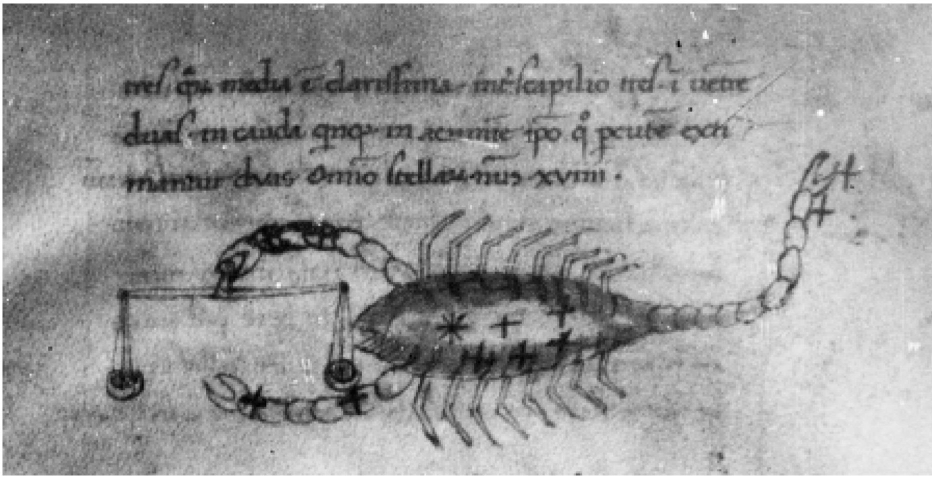

Figure 16. *Constellation of Scorpion*. Milano, Biblioteca Ambrosiana T 47 sup., fol. 56*r*. Italy, 1425-1450 (with permission of the Biblioteca Ambrosiana)

appears that the asterization of the pictures and possibly the execution of the pictures themselves (as is more clearly the case with Vat. Lat. 3109; Oxford, Bodleian, Canon. Class. Lat. 179 and Digby 83) was certainly performed after the text was written, since some stars partially cover letters of the text (see for example fol. 49*r* and fol. 50*v*). The illuminator has not followed the text, however – as is demonstrated by the picture of Bootes showing 2 stars on the belly, which is omitted in the text (corresponding in the tradition to *in utraque mamma singulas*), and missing a star on the chest, which is duly listed in the text (*et sub ea* [scil. *in humero*] *alteram obscuram*). The impact of the pictorial tradition is evident in many details, such as in Cassiopeia, where the star *in lumbis* is placed on the genitals,[94] and the 4 stars of the throne are placed correctly in spite of the flawed text (*in <angulis> utrisque <singulae> clarius ceteris lucentes*). This is also the case for two other constellations where the number of stars is missing in the text but is correct in the picture.[95]

In general, the positioning is very inaccurate (fig. 16),[96] even on the simpler constellations, such as Sagitta, with one star in the middle and

94 Oxford, Bodleian Digby 83 (for Cassiopeia, Perseus and Ophiuchus) or Vatican, Urb. Lat. 1358. Same placement of the stars *in lumbis* for Aquarius in this ms.

95 Orion with 3 stars on belt and 3 on sword (*in zona <tres> in eo quo gladius… tres*); Hydra: *in quinta usque ad caudam <novem> omnes obscuras*.

96 See Sagittarius, where the star marked on the shoulder might be the star *in pollice* (that is ‘on the thumb’ of the right hand); or Perseus, having a star on the thigh (*femur*) instead of the calf (*tibia*); or the disposition of the stars of Scorpio (fig. 13).

Figure 17. *Constellation of Cepheus*. Milano, Biblioteca Trivulziana, N 690, fol. 7*r*. Padua, 1460 (with permission of the Biblioteca Trivulziana © [2016] Saporetti Immagini d'Arte)

one on the tip (as in Oxford, Bodleian, Canon. Class. Lat. 179), instead of *duae reliquae in eo loco quo ferrum solet affigi*. Overall, there are 33 missing stars and 6 additional stars in the pictures of Bootes, Lyra, Cassiopeia, Andromeda, Perseus, Ophiuchus, Pegasus, Taurus, Gemini, Cancer, Scorpio, Sagittarius, Capricorn, Pisces, Lepus, Canis Maior, Canis Minor, Argo, Centaurus and Hydra.[97]

Some omissions are common:

- a star in the chest of Bootes
- *in mediis* in Lyra
- *in dextro genu* in Castor, etc.

The other missing stars are:

- Cassiopeia – one *in sinistro femore*
- Andromeda – *in brachio*

97 In Aries, the three stars *in cervice* might be marked, but the ram's neck is abundantly curled and the area very darkened.

- Perseus – one *in tibia* [*scil. dextro*]
- Taurus – left eye of *utrisque oculis singulas*
- Gemini for Castor – *in dextro genu, in sinistro humero*
- Cancer – one on each foot: *in sinistro pede duas primo, in secundo duas obscuras*
- Scorpio – *in cauda quinque*
- Sagittarius – *in pollice unam*
- Capricorn – one of *in ventre septem*
- Pisces – two on the cord
- Canis Maior – one of *in cauda quatuor*
- Argo – one of *ad malum quatuor*
- Centaurus – one *in lumbo equino*
- Lupus – 3 stars corresponding with *in interscapilio unam claram et in priore parte pedum unam, infra alteram*
- Hydra – *in capite stellas tres*.

There are also some additions:

- a sixth star *in dorso Anguis ad ipsam corporis coniunctionem quinque*[98]
- a star on the left hand of Pollux[99]
- a third star to the left claw of Cancer.[100]

The illuminator is surprisingly careless and makes very unusual mistakes. He misses as many as 4 noteworthy stars in Pegasus (*in capite unam, in humero claram unam*, in *umbilico novissimam unam, in pectore unam*) and enriches small constellations – such as Lepus (3 stars) with an additional star above its shoulders, and Canis Minor with 5 stars (one on each of its hind feet), instead of 3 (*omnino stellarum trium*).

9 Milan, Biblioteca Trivulziana, N 690 (E. 83)

The Trivulziana N 690 manuscript displays fine pictures,[101] where ink dots were first marked and then painted in gold. As a result, some dots appear black, red (indicating the underlying adhesive boll) or golden, while others were missed by the man in charge of the final application of the gold. The situation is made even more complex by the fact that the person who first

98 Siena L.VI.25; Vatican, Urb. Lat. 1358; Florence, Magl. XI. 114 and Oxford, Bodleian, Canon. Class. Lat. 179.

99 Pavia, Aldini 490; Oxford, Bodleian, Canon. Class. Lat. 179 and Vatican, Vat. Lat. 3110.

100 Pavia, Aldini 490; Oxford, Bodleian, Canon. Class. Lat. 179.

101 It shares some iconographical patterns with the Cambridge, Fitzwilliam 260 (especially Gemini and Argo), but is different for other pictures (e.g.: Capricorn and Scorpio).

marked the positions of the stars with dots intended to function as 'placeholders' also added dots as a decorative feature within the constellations (such as Cepheus, Perseus and Auriga). As a result, when the artist came to add gold to the stars, there was ample scope for misinterpretation (fig. 17). For example, Cepheus is marked by 31 dots (!) all properly illuminated with gold, but some of them (one of the two on the right elbow) are not stars (*in cubito unam*); and some of the listed stars are obviously missing (*in sinistro humero, in dextro humero*).[102]

Whereas occasional agreements between the asterization and the manuscript could be cited as evidence of a close reading on the part of the illuminator (such as in the chapter on Delphinus [fol. 15*v*]),[103] the sheer number of discrepancies between text and illustration clearly dispels such a hope. The frequent misplacement of stars in this manuscript appears to be the result of the artist's rather casual attitude to a pictorial model.[104] The star disposition in Capricorn is inaccurate with six stars on the belly *(in ventre VII*), eight on the neck (*in interscapilio VII*) and one on the breast (*in pectore duas*). The asterization of Aquarius seems to mix different traditions, with an additional star on the tibia, a missing star on the hip (*in lumbo interiore*) and two stars not placed on the hands, as the text stipulates (*in utrisque manibus singulas*), but on the breast (following another reading: *in utrisque mammis singulas*).[105] Considering the major mismatches, at

102 It could be the reason of the confusing additional star on Perseus' head (fol. 11*r*), and probably of the confusion in the asterization of Aquarius (fol. 25*r*). See also Eridanus, who has an unwarranted golden dot above the right breast. Conversely, one small dot on the left hand of Sagittarius (fol. 23*v*), corresponding to *in manu priore unam*, seems to have remained unnoticed. Besides, some pictures are damaged, making quantifiable analysis of the stars difficult (as for Piscis Austrinus, with 12 stars instead of 13, the missing one possibly hidden by a *macula*, fol. 33*v*).

103 It has two stars placed *vertically* on the cheek, corresponding to *supra caput ad verticem duas alias* (instead of *ad cervicem versus duas*). Andromeda (fol. 9*v*) has only one star on the arm, in accordance with the variant manuscript reading *in sinistro cubito vel in brachio unam* (instead of *in sinistro cubito I, in brachio I*).

104 See Cancer, where the stars of the *chelae* are placed in a line in front of Cancer and not on the claws (similar to Vatican, Vat. Lat. 3110) and Leo has three stars on the chest (corresponding to *in scapulo tres*). In Scorpio, the three stars *in fronte* are placed in a line on one side of the shell, and the five stars *in cauda* are not marked with gold, but probably indicated by the little inky marks, which went unnoticed by the person in charge of highlighting the dots with gold. In Pegasus (fol. 16*v*), the horse has three stars on the left knee and one on the right knee (instead of two on each) due to an imprecise transposition from the model; in Taurus (fol. 18*r*), the star *in pectore* forms a square on the shoulder with the *interscapulo tres;* in Virgo (fol. 22*r*), one of the seven stars of the dress is misplaced under the right elbow; in Hydra, some stars of Crater and Corvus have been misplaced on to the body of Hydra.

105 See e.g.: Vatican, Vat. Lat. 3110. Argo probably represents a similar case (with two unlisted stars on the prow, and no stars on the mast, despite the descriptor *ad malum IIII* in the text). See also Cambridge, Fitzwilliam 260.

least 13 (and probably 15) pictures fail to agree with the star lists in the manuscript, either with missing or additional stars (Hercules, Cepheus, Perseus, Pegasus, Aries, Taurus, Gemini, Sagittarius, Capricorn, Aquarius, Orion, Centaurus, Argo, Hydra and Piscis Austrinus). The stars of Pegasus are difficult to identify: two are clearly missing (*in humero claram unam, in pectore unam)*, two probably misplaced *(in scapulo unam, in umbilico novissimam unam*, marked on the wings and above the neck) and one from the group of *in cervicibus quatuor obscuras*. One star is missing in Taurus (*in fronte mediam unam*), and four are missing in Aries (*in cauda unam*, *in cervice tres*). Pollux in Gemini has one unlisted star on each hand and Castor has two missing stars (*in sinistro humero, in dextro genu*). In Sagittarius, at least five stars are missing (*in arcu duas, in ventre unam, in scapilio duas*).[106] There is also one missing star in Centaurus,[107] two in Orion (on the hand and on the sword) and eight in Hydra.

10 Cambrai, Bibliothèque Municipale, 993

The positions of the stars in Cambrai 993, whose text appears to be often corrupt, are not congruent with the text.[108] In some cases, the absence of stars might reflect pictorial constraints[109] and the choice of the 'star-positioner' not to place stars on any hidden parts of the body.[110] For Orion (fol. 38*r*), there are three stars on the shoulders (instead of two) and none on the head (instead of three), but this only partially matches the corrupted text: *Hic habet <in capite stellas> tres claras: in utrisque humeris singulas*.[111] In general, it seems safe to conclude that the discrepancies

106 There is probably a dot marking the star *in manu priore unam*. The star *in pollice unam* (for *poplite*) could be the second star on the left hoof; there is an additional star on the armpit.

107 In fact, two stars are missing on the hindfeet (because *in poplitibus singulas* logically though implicitly refers to hindfeet) half compensated by one additional star on the right front foot.

108 In spite of some striking and original agreements, such as in Perseus where 2 stars are missing (16 instead of 18) both in text and picture: <*in ventre stellam unam, ad genu unam*>; or in Gemini, where 2 stars are missing for Castor <*in dextro humero alteram, in dextro genu I*>; or in Cetus with 7 stars in the belly instead of 6 (*sub ventre septem*).

109 Argo has only one oar instead of two (theoretically marked with stars) in Cambrai 993, as also occurs only in Cambridge, Fitzwilliam 260.

110 In Draco, two stars are missing on invisible parts of the snake's body (left temple and eye), as in Ursa Maior (the ears), or in Bootes, where the left hand hidden by the shield is not marked (*in manu sinistra stellas quattuor*).

111 Exactly the same text and the same placement appear in the Baltimore, Walters Art Museum, W 734.

Figure 18. Constellation of Andromeda. Oxford, Bodleian Library, University of Oxford 2016, Canon. Class. Lat. 179, fol. 35*r*. Ferrara, 1460-1470 (© 2016 Bodleian Libraries. All Rights Reserved)

between text and image are so numerous and diverse that it rules out both strategy and occasional accident. For the larger constellations, both the description and the star-markings are hopelessly muddled (cf. Argo, Hydra and Scorpio).[112] The usual repartition of the stars on Hydra is from head to tail within five curves, as it is precisely outlined in the text (fol. 43*v*: 3-6-3-4-2-8), but the distribution of the stars on the picture is 0-8-4-3-5-0. In most cases, stars are missing – especially for Pisces (17 stars marked among 29 listed, and instead of 41, which is the usual total for the

112 Compare edited text for Scorpio (*Hic habet stellas in his, quae Chelae dicuntur, in unaquaque earum binas, e quibus primae sunt clariores; praeterea habet in fronte stellas III quarum media est clarissima, in interscapilio III, in ventre II, in cauda V, in acumine ipso, quo percutere existimatur, II*) with the manuscript text of Cambrai 993 (fol. 31*r*): *Hic habet stellas in his, quae Chelae dicuntur, in unaquaque earum binas* [4 stars marked in front of the head], *e quibus primae sunt clariores; praeterea habet in fronte stellas III quarum media est clarissima* [only one star], *Interscapilio* (sic) *III* [three stars on the body], *in ventre II* [four stars], *in cauda V* [five stars], *in cacumine (sic) ipso, quo percutere existimatur.*

constellation). But in five pictures (Aries, Leo, Sagittarius, Aquarius and Centaurus), there is an additional star, which is not listed in the text. Apart from some conversions between right and left (in Hercules, Andromeda and Ophiuchus), or between hind- and forefoot (Leo), and the absence of a picture and its stars for Corona Austrina (although the text mentions it: *Corona autem Centauri est stellarum VII*), there are substantial discrepancies for 17 constellations (Draco, Ursa Maior, Bootes, Hercules, Andromeda, Pegasus, Ophiuchus, Aries, Taurus, Leo, Sagittarius, Aquarius, Pisces, Orion, Argo, Centaurus and Hydra). There is a clear disconnection between text, pictures and stars, but oddly it is the only manuscript to share the astronomically correct reading for Castor with Vatican, Reg. Lat. 123. In both cases, the figure is exceptionally situated on the right of the picture and has one star on each breast (*in utrisque mammis*) and not one star on each hand (*manibus*) as appears in all other manuscripts.[113]

11 Oxford, Bodleian Library, Canon. Class. Lat. 179

The Bodleian manuscript, Canon. Class. Lat. 179, is close to Milan, Ambrosiana T 47 sup. in its pictures,[114] and its often corrupted text[115] seems to have been written after the drawings.[116] The sequence appears to have been that the "*régleur*" set out the proportions of the page and, in some cases, ruled the lines (see fol. 40*v*), and then the *pictor* probably drew the pictures and marked the stars, before the *scriptor* added the text: witness the fact that the text sometimes bridges a blank left by the "*régleur*" in the middle of a line for a special shape (generally the head of the figure), and by the fact that the *scriptor* seems to have avoided a star stepping over the line (fig. 18).

The folios have been misassembled,[117] and there are numerous mistakes and various misplacements in the stars. In Ursa Maior, the 'star-positioner' failed to mark three stars on the tail (*in cauda ipsa tres*), and two (α, δ

113 Note that text and picture are missing in Oxford, Bodleian, Canon. Class. Lat. 179 for Gemini, and that the text is missing in Oxford, Bodleian, Digby 83 (without a star either on the hands or the breasts). In Florence, BNC, Magliabechi XI. 114, there is no picture, but the text is *manibus*.

114 Compare e.g.: pictures of Ophiuchus and Cancer in both manuscripts.

115 Apparently the scribe did not read Greek, leaving a blank on fol. 28*r* for χορευταί (*reliquae autem duae – dicuntur*); cf. linguistic blunders, such as *stellam urnaso* (fol. 30*v*), for *in naso*; etc.

116 As in Oxford, Bodleian, Digby 83; Vatican, Vat. Lat. 3109 and, probably, Milan, Ambrosiana T 47 sup.

117 See the sequence: Draco, Bootes (fol. 28*v*), Hydra (fol. 29*r*), Piscis Austrinus (fol. 29*v*), Sagittarius (fol. 30*r*) and Capricorn (fol. 30*v*).

UMa) of the brightest and most significant stars of the square (*in humero claram unam, in summo interscapilio unam*). In Draco, the text matches the star placements, with the shared omission of two stars (<*in oculis singulas*>); but in Bootes, the picture displays two stars on the breast, which are missing in the text (<*in utraque mamma singulas*>), and omits one listed star on the chest (*sub ea alteram obscuram*). Lyra has only 8 marked stars although nine are listed in the text, and there are missing stars in:

- Cassiopeia – one among *in sinistro femine duas*
- Andromeda – *in brachio unam*
- Pegasus – *in capite unam*, *in humero claram unam, in pectore unam*
- Aries – *in cervice tres*
- Cancer – two on the legs
- Capricorn – one of *in ventre septem*
- Sagittarius – one among *interscapilio duas*, and *in pollice unam*
- Canis Maior – one among *in cauda quatuor*
- Centaurus – *in prioribus poplitibus utrisque singulas, in lumbo equino unam*
- Hydra – *in capite stellas tres*.

Extra stars appear in:

- Ophiuchus[118]
- Cancer – on left claw
- Centaurus – on the belly
- Argo – three in the bow.[119]

In sum, many of the stars appear to have been loosely copied from a pictorial model and haphazardly placed.[120]

118 Six instead of five stars in Serpens (*in dorso Anguis ad ipsam corporis coniunctionem quinque*). Note that the posture of Ophiuchus and star numbers and misplacements are identical in Milan, Ambrosiana T 47 sup. and Florence, BNC, Magliabechi XI.114.

119 There is a possible influence of *De signis caeli* here, especially for Argo (*habet stellas in anteriori parte navis quatuor*), since in Hyginus' tradition the ship is constantly said to be deprived of bow (*Astr.* II.39: *divisa enim est a puppi usque ad malum*).

120 See e.g.: the shoulder stars (*in humero*) in Cepheus are misplaced on the breast (fol. 34*r*); the right thigh stars (*in dextro femore*) of Hercules are marked vertically below the waist and between the legs, rather than on the pubis (fol. 37*v*); the belly star (*in ventre*) of Sagittarius is placed on the chest; the back star (*interscapilio*) of Lupus is marked on the belly; and the succession of stars in Hydra is 9-6-3-5.

12 Vatican, Biblioteca Apostolica Vaticana, Urb. Lat. 1358

Urb. Lat. 1358 is very close to Pavia, Aldini 490, both placing the four stars of Bootes on the right hand (instead of the left, as all other manuscripts do).[121] Many decorative or accidental marks around the figure, as well as the placement of some stars out of it, make counting the stars extremely difficult (especially in Hercules, Cygnus, Aries, Taurus, Piscis Austrinus and Argo).[122] Urb. Lat. 1358 shares ten errors with the Pavia manuscript and as many distinctive omissions or additions. In five cases, stars are omitted in both manuscripts, which share exactly the same description:

- Lyra – 7 marked, but 9 listed[123]
- Aries – the three stars *in cervice* are missing,[124] and the three stars *in cornibus* are shown on the border of Triangulum
- Castor in the Gemini – *in dextro genu alteram*, *in sinistro humero unam*
- Hydra – *in capite tres*
- Argo – the three stars on the mast (also missing in the Pavia, Aldini 490) are not misplaced on the bow, but have been omitted.

In five cases, additional stars appear in both manuscripts:

- Ursa Maior has a second star on the shoulder (*in humero claram unam*)
- Andromeda has four stars above the waist, despite the lack of the corresponding section in the text (< *supra zonam quatuor* >)
- Ophiuchus has a star on Serpens (six *in coniunctionem v*)[125]
- Pisces has two extra stars on the cord

121 See Blume, Haffner, Metzger 2016a, 617: “Ob es sich indessen bei der Aldini Handschrift und dem Urbinas 1358 um direkte Abschriften oder um Schwesterhandschriften handelt, bleibt noch zu klären”. Apparently, the distinctive mistakes of each manuscript suggest that they derive from a common model, rather than one from the other. Note that Aldini 490 might have been written in Florence, as was Urb. Lat. 1358.

122 Hercules has unidentifiable marks on the hip, on the right hand, and on the foot, and some apparently duplicated dots (one empty circlet and one black dot overlapping); Cygnus has one dot on each wing, under the line of five, which are probably not stars (but considered as such by Lippincott in her description of the manuscript); Aries has two dots far above the rump of the ram, which could be stars (counted as such by Lippincott); Taurus apparently has an eighth star above the nose near the Pleiades; Argo’s hull is very dark, there is a clear and regular dot above the stern and another one on the bow.

123 The missing stars are probably *in scapulis ipsius testudinis ii*, but the technical terminology for Lyra’s parts must have been confusing for many.

124 Note that in the text there is a blank after *in cervice*, where the number of stars should have been mentioned.

125 Serpens’ textual sequence is 2-3-2-5-4-6 (22); and the pictorial sequence is 2-3-2-6-6-4 (23).

- Lepus has a star above the hare’s back (as in the Ambrosiana manuscript, T 47 sup.), which is probably due to a conflation with Pseudo-Bede’s catalogue (*in dorso nitidam unam*).

Some omissions are unique to Urb. Lat. 1358:
- Draco – one star on the body
- Cassiopeia – one in *in quadrato*
- Andromeda – *in brachio unam*
- Pegasus – one among *in cervicibus quatuor*
- Centaurus – *in manu unam, in medio pectore equino unam*
- Lupus in Centaurus – one star in only nine on the body.

Besides, various figures have additional stars, not listed in the text:
- Bootes – one on the left arm
- Cassiopeia – on the breast
- Sagittarius – two on the bow
- Cetus – one on the second curve
- Canis Maior – one on the hind feet
- Pisces – two near the tail.

The picture of Cancer is particularly unsound, with 18 stars marked (while only 15 are listed)[126] and in a great disorder – either before the head (whereas they are supposed to be on the claws or on the mouth) or unusually distributed on the five pairs of legs.

13 Pavia, Biblioteca Universitaria, Aldini 490

As mentioned above, Aldini 490 is almost the twin of Vatican, Urb. Lat. 1358 in both its illustrations and text. The text of the latter is slightly better,[127] while the Pavia, with illuminated drop caps and golden dots as stars, is slightly more deluxe. They share some peculiarities[128] but many of the omissions in the illustrations occur only in the Pavia manuscript:
- Ursa Minor – one star on the right foot

126 Part of the regular text is missing: < *in sinistro pede primo II, in secundo II obscuras* >.

127 According to Blume, Haffner, Metzger 2016a, 616, the Pavia manuscript is dependent on the Vatican manuscript, Urb. Lat. 1358.

128 Perseus’ hands and feet are reversed (*in sinistra manu, quod gorgonis caput vocatur* = right hand; *in sinistro femore ad genu unam* = right leg), as well as Auriga’s (*in manu duas* = right hand instead of left one) and Orion’s (*in cubito dextro* = on the left elbow). Note that 44 dots are marked in Corona Borealis, but only 9 (a little bigger and regularly placed) can be considered as stars. In Urb. Lat. 1358, the exterior of the crown is decorated with circlets as well.

- Hercules – two stars missing on the lion's skin
- Cepheus – *in cubito unam*
- Andromeda – *in sinistro cubito vel in brachio unam*
- Ophiuchus – *in sinistra manu tres*
- Pegasus – *in umbilico novissimam*
- Aquarius – *in capite duas, in lumbo interiore unam*
- Orion – *in zona tres*
- Crater – *ad fundum duas*.

In four other cases, stars are omitted in both manuscripts, which share exactly the same description:

- Lyra – 7 stars are marked, but 9 listed
- Aries – the three stars *in cervice* are also missing, and the three stars *in cornibus* are in fact on the edge of Triangulum
- Castor in Gemini – *in dextro genu alteram, in sinistro humero unam*
- Hydra – *in capite tres*.

In four cases, additional stars appear in both manuscripts:

- Ursa Maior – a second star in the shoulder (*in humero claram unam*)
- Andromeda – four stars above the waist, despite the lack of the corresponding section in the text (< *supra zonam quatuor* >)
- Serpens – one additional star (six *in coniunctionem v*)
- Pisces – two additional stars on the cord
- Lepus – an additional star above the hare's back (as in Ambrosiana T 47 sup.).

Three other additions occur only in Pavia, Aldini 490:

- Cancer – three stars
- Gemini – one star on the right arm of Pollux
- Cetus – a seventh star on the belly (*sub ventre sex*).[129]

In addition, some stars are slightly misplaced, especially in Virgo, Pegasus and Sagittarius. The star disposition of the stars in the four legs of Cancer does not match the description in the text, and also differs from the placement of the stars in the five legs of Cancer in Urb. Lat. 1358.[130] The three stars *ad malum* in Argo have been transferred to the bow.

129 In Sagittarius, the mark on the right cheek is probably not a star (as e.g.: in Eridanus and Orion).

130 The textual description is 1-1-1-1 (right), 2-2-1-1 (left); the picture in Aldini 490 has 1-1-2-1 (right), 2-2-1-1 (left). The Vatican manuscript has 1-1-1 (right), 2-1-2 (left).

14 Siena, Biblioteca comunale degli Intronati, L.VI.25

Siena L.VI.25 is a remarkable manuscript, with some apparently unique readings,[131] and only five instances where the pictures differ from the text.[132] Unfortunately, three folios are missing[133] and one folio is misbound,[134] so only 33 constellations can be checked. Some additions (*in margine* or *supra lineam*) agree with the actual asterization found in the pictures.[135] Serpens (*Anguis*) in Ophiuchus has only three stars on the head instead of five (*in summo capite stellas duas, sub capite tres*) and six instead of five on the back. Other mistakes concern zodiacal constellations: Aries has seven stars in the head, while only five are listed (*in capite unam, in utrisque*[136] *cornibus tres <in cervice II>*); and a similar situation occurs in the chapter on Pisces, where six stars are listed, and 13 are marked instead of the conventional dozen (*Coniunctio eorum habet ad aquilonem spectantes stellas tres, <ad alteram partem III, ad exortum III,> in commissura tres*). Two additional stars appear on the human right scapula and the left flank of Sagittarius, and the single star in the right wing of Virgo is probably due to a misunderstanding and the assumption that *Protrygeter* was distinct from the wings stars (*quarum una quae est in dextra penna ad humerum defixa, protrygeter vocatur*). On the other hand, one star is missing in Capricorn (*in priore* [*scil. pede*] *eodem alteram*).

131 Missing both in the text and picture are: the star *in poplite unam* in Hercules (fol. 35*r*); the star *in brachio unam* in Andromeda (fol. 37*v*); and the stars *in pede unam, in inferiore genu unam* in Sagittarius (fol. 44*r*).

132 Apart from the confusion between right and left, as in Ophiuchus (*in dextro crure* on the left), Gemini, etc.

133 Fol. 36 (with pictures and text for Cygnus and Cepheus); fol. 40 (with pictures and text for Aquila, Delphinus and Pegasus) and fol. 45 (with picture and text for Canis Maior, Canis Minor and the text for Argo).

134 Fol. 47 (with Pisces and Aquarius) is between Orion (fol. 46*v*) and Argo (fol. 48*r*). Fol. 47 has been reversed, so that Pisces is on the recto and Aquarius on the verso. Two constellations are also reversed (Cetus before Eridanus on fol. 46*r*).

135 For Pollux in Gemini (fol. 42*r*) *in utrisque pedibus singulas* is written in margin, and the two stars are actually marked. Virgo (fol. 43*r*) has seven stars on the dress, in accordance with a correction (six crossed out and replaced by *septem* in *passim dispositas stellas sex*).

136 *Utrisque* is written *supra lineam* from the same hand.

15 New York, Public Library, Spencer ms. 28

Spencer 28 provides a very accurate asterization with only eight constellations subject to mismatches (Ursa Maior, Bootes, Cygnus, Gemini, Cancer, Scorpio, Lupus and Hydra). Some corrections or additions appear in the margin without apparent impact on the asterization.[137] Aries has only 16 stars (instead of 18), but the illustration matches the text given in the manuscript; in a marginal gloss, seemingly by the same hand as the main body of the text, there is the mention of two additional stars (*in cauda unam, sub ventre unam*), which are missing from the picture; and the correction of *cruribus* into *cornibus* and *scapulo* into *interscapilio,* suggests the scribe used a control manuscript, but that there was no corresponding effect on the iconography of the pictures.[138] Cygnus has only 8 stars instead of 13, due to a misunderstanding of the text which results in the placement of only five stars on the wings (2 + 3), rather than five stars in each wing (*in utrisque pennis quinas*).[139] The number and disposition of the stars of Hydra are perfectly correct, which is really exceptional in our corpus. Mistakes are mostly minor:[140]

- Ursa Maior – two stars are missing, since there is only one instead of two on each ear (*in utrisque auribus binas*)
- Bootes – the stars *in sinistra manu* are on the left hand
- Gemini – one star is missing on the right shoulder of Castor (left Twin)[141]
- Scorpio – one of the two stars of the end of the tail (*in acumine*) is missing

137 fol. 49*r*: the two stars mentioned in the margin (*in cauda unam in ventre unam*) are missing in the illustration, and the correction *cornibus* for *cruribus* has no effect in the picture. On fol. 48*rv* there are no stars on Pegasus' ears and two extra stars on its legs, in agreement with the text (*cruribus*), textual mistake for *auribus*, which appears as a marginal correction. However, on fol. 52*r* (Scorpio) the illustration matches a correction occuring in the margin (*unam*) for the stars of the stings and not the plain text (*in acumine…duas*).

138 Note that on fol. 52*v* (Sagittarius), we find the reverse operation, with *interscapilio* commenting or replacing *scapulo* in the text. On this same page, *pollice* is written in the margin next to *poplite*, but the star is (correctly) on the thigh.

139 An identical mistake appears in Oxford, Bodleian, Digby 83 (fol. 46*r*). Note that the scribe did likely not recognize Greek names (see a blank for σύνδεσμον ὑπουράνιον (*syndesmon hypouranion*) on fol. 54*r*, Pisces); the name Protrygeter is added in the margin of fol. 51*v* for Virgo.

140 On fol. 42*r* there is a simple cross (four branches) on the left knee of Hercules, while all stars have regularly eight branches. The 'star-positioner' probably started to mark the star (maybe considering an accidental dot as a 'place-holder', and before marking the right knee) and changed his mind. We do not count it as a star, but the Freiberg manuscript mistakenly reproduced it (see *infra*). Note that on fol. 45*v* the star *in ventre* is on the back, since Perseus is portrayed from the back.

141 The star marked above Castor's left shoulder, close to the arm of the right Twin (Pollux), corresponds to the star on the hidden right elbow of Pollux.

- Lupus – two stars are missing on the head[142]
- Corvus in Hydra – two stars are missing on the tail (*infra pennam caudam versus duas*).

Cancer provides remarkable exceptions to this general harmony, however. In Cancer, 16 stars are marked (while 18 are listed), and the distribution is completely chaotic: only one star appears on a right leg (*in dextris pedibus singulas*), eight on the claws and none on the shell.[143]

16 Freiberg, Andreas-Möller Bibliothek, XI.4.9

The Freiberg manuscript derives directly for both text and illustration from Spencer 28.[144] Pictures were probably drawn before the insertion of text (see fols 31*v*, 31*r*, 41*v*), but the details of the process is unclear: three pictures are simple sketches without stars (Cancer, fol. 40*r*; Lepus, fol. 44*r*; Orion, fol. 44*v*); one picture is an uncoloured drawing marked with stars (Scorpio, fol. 41*r*); two pictures are coloured drawings without stars (Leo, fol. 40*r*; Virgo, fol. 40*v*).[145] The few corrections occurring in the margins of Spencer 28 are not taken in account by the Freiberg manuscript neither in the text, nor in the illustration.[146] In some cases golden decoration in Spencer 28 is reproduced in Freiberg manuscript (Bootes, Perseus, Aries, Capricorn). In three instances (Bootes, Pisces, Aries) there are textual omissions with respect to Spencer 28, but in spite of that the illustration coincides exactly with Spencer 28:[147]

- Bootes – two stars on the chest in the picture (but omission of the corresponding text: *in utraque mamma singulas*)
- Pisces – three stars are missing on the cord (but omission of the corresponding text: *ad alteram partem tres*)

142 Lupus is supposed to have eleven stars (*in utrisque pedibus unam* instead of the more common reading *inter utrosque pedes unam*), in spite of the given total (*sunt numero decem*), but it ends up having 9 (or 10?) stars due to the missing one(s).

143 Cancer has three stars on the ‘head’ (as in Scorpio, *in fronte stellas tres*), instead of one (*in ore unam*) and two on the shell (*in ipsa testa stellas duas*).

144 See the more circumspect comment of Blume, Haffner, Metzger 2016a, 605: “[...] kopiert sie fraglos die New Yorker Bilderfolge oder eine gemeinsame Vorlage”.

145 Note that the drop capitals are missing for Leo (L), Scorpio (S), Lepus (L), Canis Maior (C).

146 Spencer 28, fol. 48*r*: *auribus* for *cruribus*; fol. 49*r*, Aries: *cornibus* for *cruribus*, and addition of *in cauda unam sub ventre unam*. However, on fol. 42*v* (Pisces) *aequinoctialem* is erroneously added in margin (as in Spencer, fol. 54*r*) as a correction for (*coniunctionem ad*) *aquilonem*.

147 In one case (Cassiopeia) an omission is common with Spencer 28: *in <angulis> utrisque singulae* (fol. 34*v*).

- Aries – four stars corresponding to *in lumbis tres posteriore unam* (sic) (instead of *in lumbis tres <in pede> posteriore unam*).

The Freiberg manuscript shares the eight errors of Spencer 28 (for Ursa Maior, Bootes, Cygnus, Gemini, Cancer, Scorpio, Lupus, Corvus), with slight differences in two cases:
- Ursa Maior – four stars (instead of two in Spencer 28) are missing in the head
- Lupus in Centaurus: three stars are missing on the head and one on a foot (*infra [scil. stellam in priore parte pedum] alteram, in capite tres dispositas*) instead of two stars on the head, in Spencer 28.

The latter error is due to the fact that some stars on Lupus in Spencer 28 are dim, and in two other instances (Hercules, Aquarius) faint stars marked on brown-coloured parts in Spencer 28 (lion's skin, hairs) are responsible of omissions from part of the illuminator in Freiberg manuscript:
- Hercules – *in sinistro brachio*, *in sinistra manu unam, in sinistra manu quatuor*; there is an additional star on the left knee[148]
- Aquarius – *in capite stellas duas*

A similar blur on the head of Pegasus probably led the illuminator to mark two stars instead of one near to the ears (*in capite unam*).[149]

17 Florence, Biblioteca Medicea Laurenziana, Ashb. 1148

In the Laurentian manuscript, Ashburnham 1148, the same hand (and same ink) is responsible for both the pictures and the position of the stars, and the positioning and number of the stars generally matches the textual description, though there are some omissions in the pictures. For example, the conventional number of stars for Argo in Hyginus' text is 26 (*Ita tota est stellarum XXVI*), though only 18 stars are marked on the picture (fol. 58*r*), a unique case in our corpus (the other manuscripts featuring between 21 and 26 stars). This is in perfect accordance, however, with the text given (fols 57*v*-58*r*), which is quite different from the usual one: *Haec habet in puppi <IIII,> ad singula gubernacula ad primum stellas quinque, ad alterum quatuor, circum carinam quinque, <sub reiectu V,> ad malum quatuor [≠*

148 The star is half marked in Spencer 28.

149 In Spencer 28, there is a stain near the star on the head, which could have been considered as the trace of a star. Since the regular text is *in utrisque auribus* (and not *cruribus*) *singulas* the picture may also have been influenced by another pictorial model.

III].[150] The hypothesis that the 'star-positioner' has actually placed the stars on the pictures following the text of the manuscript is supported in many cases.[151] In the picture of Gemini, Castor has one star on each hand and no stars on the feet, which perfectly complies with the (corrupt) text provided by the manuscript: *in utrisque manibus* (instead of *mammis*)[152] *singulas,* [*in dextro genu I, in sinistro genu I, in pedibus utrisque singulas,*] *et infra sinistrum pedem unam, quae tropus* (sic) *appellatur.* In Aquarius, there are 11 stars listed for the water-carrier[153] and the stars in the Water have been increased to 19, most likely in order to raise the total number to 30, as outlined in the text.[154] The situation is actually more complex, however, and there are some puzzling discrepancies. For example, Ursa Minor is given 5 stars (instead of 7) and this is a basic mistake. One could always argue that the 'star-positioner' misunderstood the word *statio* (*in stationis unoquoque loco stellas singulas clare lucentes*), but there are other examples in the manuscript that are even more perplexing. The conventional Hyginian description of the Serpens (in Ophiuchus) lists the stars from head to tail. In the manuscript text, we read the distribution of 2-3 (elsewhere 4) -2-5-4-6 (22), while the stars on the pictures are marked 5-6-2 (13). Additionally, Aries has 4 additional stars and 3 missing ones. The stars' positions agree partly with the corrupt text: *in cervicibus III* (instead of *in cornibus III, in cervice II*), and *in lumbis tres* (instead *of sub ventre tres, in lumbis unam*), but there also appears to be the duplication of a group of four stars (*in scapulo quattuor*), which are placed *both* on the shoulder and on the neck. As far as I know, this is an iconographic hapax in the whole tradition of astronomical manuscripts. We have already seen how the word *interscapilium* (replaced here by *scapulum*)[155] has been misinterpreted in

150 A similar difference occurs with Centaurus (fol. 58*v*): among all Hyginus manuscripts with stars marked, this is the only one marked by only 14 stars, corresponding to the textual variant of the description.

151 See, for example, Andromeda (fol. 44*r*): there is only one star on the left arm (instead of two expected), following the text *in sinistro cubito uti brachio I* (instead of the regular *in sinistro cubito I, in brachio I*).

152 It has the same text and star position in the Laurentianus Plut. 89 sup. 43.

153 Pavia, Aldini 490 has the same number, but all the other manuscripts display more stars for Aquarius.

154 *Effusio aquae cum ipso Aquario est stellarum XXX*. On the confusion between *aqualis* and *Aquarius*, see *supra*. For a similar case, see Florence, Laurenziana, Plut. 89 sup. 43, where Aquarius has 14 stars and the Water has 16.

155 Note that in the other chapters where the Hyginian *interscapilium* is expected, the text is *intercapsilio* (sic) – except for Pegasus (fol. 48*v*: *in scapulo*) – and the stars are marked on the shoulders: Ursa Maior (fol. 38*v*); Taurus (fol. 49*v*); Leo (fol. 51*v*); Sagittarius (fol. 53*r*); Capricorn (fol. 53*v*); Centaurus (fol. 58*v*); but Scorpio (fol. 52*v*) has *interscapilio* and Canis Maior (fol. 57*r*) has *insterscapillio.*

some manuscripts (Cambrai 993; Cambridge, Fitzwilliam 260; Florence, Laurenziana Plut. 89 sup. 43), but this duplication of stars in Aries is difficult to explain and it looks as though the 'star-positioner' had wanted to represent both his reading of the text (marking the shoulder = *scapulum*) and the cluster that might have appeared in a model used to check the pictures where the text was *interscapilio* (on the backbone or on the neck). All things considered, the total of positioning errors (with respect to the text) is rather low (seven for 41 constellations: Ursa Minor, Hercules, Lyra, Perseus, Ophiuchus, Aries and Taurus). In this case, then, it seems safe to assume that the 'star-positioner' has either marked the pictures according to the text or, at least, corrected the model from which he was copying.

18 Cambridge, Fitzwilliam Museum, 260

The Fitzwilliam manuscript has only 33 pictures,[156] with stars marked in red,[157] which disagree with the text in most cases. The model for the illuminator was clearly not the same as the one used by the scribe, as appears in fol. 15*v*/16*r*, with a blank left for Triangulum (*solum*) after the text, and the picture of Aries intra Triangulum on the opposite page. There is no regular similarity in the pictures with any particular manuscript of the group, but the constellations are often very close to various Italian manuscripts. In two occasions the text is emended to correspond to the number of stars appearing in the picture (once in red ink, from the hand of the 'star-positioner').[158] Some lines of the text are missing for three constellations, but the corresponding stars are marked in the picture (Pegasus, Aquarius, Canis Maior). There are missing stars in eight figures:

- Pegasus – one among *in rostro stellas duas obscuras*
- Leo – one probably among the stars *in interscapilio tres*
- Gemini – *in dextro genu unam*

156 Five folios are missing (after fols 1*v*, 7*v*, 20*v*, 24*v*, 25*v*) with text (for Ursa Maior, Ursa Minor, Bootes, Scorpio, Cetus and Lepus) and pictures (for Ursa Maior, Ursa Minor, Draco, Cassiopeia, Virgo, Pisces and Eridanus).

157 Note the exception of Lyra (fol. 5*r*) where one of the nine stars, in a smaller size, is marked in the same black ink as the drawing.

158 Fol. 19*v* (Leo): *nouem* – in *decem et nouem*, which is the number of the listed stars – is crossed out and replaced by *octo* – which is the number of the *marked* stars; fol. 22*v* (Capricornus): addition in red ink (used for the marking of stars) of a unit in *omnino stellarum numerus xxi* (becoming *xxii*, in accordance with the picture). Note that a similar though erroneous correction occurs on fol. 21*v* (Sagittarius) where the number of the stars of Corona Australis (*Corona autem centauri est stellarum VII*), not represented in the picture, was crossed out and replaced by XIIIII, which is the number of the stars of the whole constellation on the facing page.

- Aries – *in cervice duas, in lumbis unam*
- Centaurus – one among *interscapilio quatuor*
- Lupus (in Centaurus) – probably *in priore parte pedum unam, infra alteram*[159]
- Argo – *ad malum tres*
- Hydra – no fewer than seven missing stars on the last part of the body.

Conversely, there are additional stars absent from the text given by the manuscript in nine cases, often due to textual lacunae:

- Hercules – a second star on the right foot (*in pede unam*)
- Ophiuchus – three stars on thigh and feet (while the corresponding 'standard' Hyginian text *in dextro crure unam, in utroque pede singulas* is missing in the manuscript)
- Serpens (in Ophiuchus) – six stars corresponding to *in dorso Anguis quinque*
- Pegasus – two stars on the body (corresponding to *in interscapilio I, <in umbilico novissimam I>* missing in the manuscript)
- Capricornus – seven stars instead of five *in ventre*
- Aquarius – three stars on thigh and feet (corresponding to *<in dextro crure unam, in utrisque pedibus singulas>* missing in the manuscript)
- Canis Maior – one star on the rear foot (corresponding to *<in pede dextro unam>* missing in the manuscript)
- Hydra – eight stars instead of six explicitly mentioned on the end of the tail (…*in tertia quattuor, in quarta duas, in quinta usque ad caudam <VIIII> omnes obscuras*)
- Corvus in Hydra – two additional stars on the wings.

Besides, stars are frequently misplaced, notably in Taurus (with seven stars in circle below the muzzle, that are supposed to be the Pleiades/*Vergiliae*),[160] Cygnus and Aquila, and less significantly in Hercules, Cepheus, Perseus, Cancer, Centaurus and Lupus. Apart from these discrepancies, star disposition falls in line with the other 15th-century manuscripts, with its regular mistakes:[161] in Sagittarius the star missing on the hindfeet (*in popliti* [sic] *unam*) appears on the thumb (pro *pollice*?); the four stars of Argo's

159 Stars are not consistently placed, with a distribution reminding the picture of Ambrosiana, T 47 sup (fol. 60*r*) and Trivulziana N 690 (31*v*).

160 Vergiliae should be *inter huius finitionem corporis et Arietis caudam stellae sunt*. A similar placement occurs in Trivulziana N 690 (fol. 18*r*), Siena L.VI.25 (fol. 41*v*), Laurenziana Plut. 89 sup. 43 (fol. 82*v*) and… Ratdolt's first edition (1482); cf. also Vatican, Vat. Lat. 3110 (fol. 72*r*), Pavia, Aldini 490 (fol. 87*v*) and Vatican, Urb. Lat. 1358 (fol. 131*r*).

161 See also the sequence of stars of Serpens is 2-3-6-6-2-4 on the picture, while it is 2-4-2-5-4-6 in the text.

mast (*ad malum quattuor*) are on the prow; the *interscapilio* stars are not regularly placed on the body,[162] which suggests that the 'star-positioner' or his model did not clearly understand the meaning of the word.[163]

19 Laurentianus Plut. 89 sup. 43

The Laurentian manuscript, Plut. 89 sup. 43, has 37 carefully-drawn and coloured pictures with stars that generally match the text, so that the stars missing in the picture are usually also missing in the textual description (cf. Perseus, Virgo, Aquarius and Argo).[164] On fol. 81*v*, the chapter on Aries immediately follows the chapter on Triangulum without a blank space left for a picture of the latter. This suggests that the scribe may have had the conflated model of "Aries intra Triangulum" in mind,[165] but the illuminator mistakenly used this section to illustrate only the constellation of Triangulum and entirely overlooked the picture of Aries. The Water in Aquarius has only 16 stars (and not 30) in addition to the 14 stars of Aquarius itself, but as with many other manuscripts in this tradition, the text mentions 30 stars in all for the complete constellation, replacing *aquali* (urn) by *aquario* (*Effusio aquae cum aquario ipsa stellarum est XXX*). The two stars missing on the left ear of Ursa Maior (9 for the head instead of 11) might be explained by the fact that only one ear is visible in the profile depiction of the bear's head (not to mention that the 'star-positioner' was running out of space to mark them). Other discrepancies are more difficult to justify, even by the constraints of the iconographical model, such as the missing stars on the head and on the thigh of Cassiopeia. In short, star-positioning or number is problematic for nine constellations (Ursa Maior, Bootes, Hercules, Cassiopeia, Gemini, Leo, Sagittarius, Centaurus and Corvus).[166] In Bootes, where the listed star on the right elbow is missing, a small black dot can be seen and could have been the equivalent of a 'position-holder' for the gilder; but there are other similar dots on the right hand of Bootes,

162 See also Cambrai 993; Florence, Laurenziana, Ashb. 1148 and Plut. 89 sup. 43.

163 The star is marked on the chest (Aries), on the shoulder (Taurus, Capricorn, Canis Maior), on the wing (Pegasus), on the back (Scorpio), on the belly (Lupus) and under the belly (Sagittarius).

164 This manuscript is close to Ratdolt edition and Vienna 3111. Quite surprisingly, they all represent Centaurus with cloven hoof as if the animal half were bovine, while it has elsewhere an uncloven hoof as a 'regular' ungulate.

165 Lippincott 2006.

166 Note also that on fol. 81*r* (Pegasus), a second hand has corrected both text and picture (by scratching and erasing), adding an omitted star on the nostril (in red instead of golden as the other dots are) and changing 18 into 17 (or the other way round?) for the total of stars.

as well as in some other pictures of the manuscript (Cassiopeia, Perseus, Gemini, etc.), that cannot be explained in the same way. The asterization of Leo is particularly puzzling, insofar as the lion has only 2 stars in front of the nose and none on the head (for *in capite stellas tres, in cervicibus duas*). For the constellation of Gemini, the picture combines the usual errors associated with the image:

- it inverts Castor and Pollux in the depiction
- it places Propous under the foot of Pollux
- it lists two stars 'on the hands' of Pollux instead of the breast (*in utrisque manibus singulas* instead of *in utrisque mammis singulas*),[167] only one being marked (the other one maybe hidden by Castor's arm)
- it misses the two stars on the knees of Pollux, although duly listed in the text (*in dextro genu unam, in sinistro genu unam*).

Sagittarius offers other challenges, but we have yet to identify a precise process (iconographic model? textual projection? combination of sources?) for the asterization: while one of the stars on the head is missing (*in capite stellas duas*) there is one eccentric star on the thumb, in full agreement with the variant in the depiction of the legs of Sagittarius (*in priore genu I,... in pollice (sic) i*).[168] The number of the problematic discrepancies between text and images, in this case, is not high (9 constellations). It could be reasonable, then, to assume that the 'star-positioner' did read the text and follow the textual description, given that no additional stars have been marked.

20 Vienna, Österreichische Nationalbibliothek, Vindob. Lat. 3111

Vienna 3111 is very interesting because it appears to be a direct copy of one of Ratdolt's Venetian editions of Hyginus (either 1482 or 1485), reproducing text and pictures with great attention.[169] Since the drop capitals are missing for each chapter, it should be considered as an unfinished

167 Note that, as mentioned for Bootes, there are two small black dots on the breast.

168 On fol. 52*v* of New York, Spencer 28, there is a marginal gloss '*pollice*' to *poplite* given in the text (seemingly by the same hand), which clearly refers to this variant, but probably not to this very manuscript. As a matter of fact, the iconographical models are quite different, especially for Centaurus, Eridanus, Auriga and Hercules. The Spencer manuscript has been dated to 1475-80 by Blume, Haffner, Metzger 2016a, 600, and prior to Florence, Laurenziana Plut. 89 sup. 43, which they date to 1482-83 – the same year as the first Ratdolt edition of the text of Hyginus. For a discussion of the problems in dating the Florence manuscript this late, see Lippincott (this volume).

169 A telling proof is given by the fact that the Vienna 3111 reproduces the descriptor *inter scapilio* (wrong for *in interscapilio*) from Ratdolt (Aries, Taurus, Leo, Scorpio, Sagittarius, Capricorn, Canis Maior and Centaurus) except in one case, where both texts give manuscript. In ten cases where Ratdolt's edition offers sound illustrations in agreement with the text, the Vienna manuscript adds errors in the asterization, which does not match the text (Ursa Maior, Cepheus, Perseus, Ophiuchus, Aquila, Pegasus, Capricorn, Canis Maior, Argo, Hydra). In two instances, it reproduces a mistake that already occured in Ratdolt's edition (Cassiopeia and Gemini).[170] The scribe, who is very likely also the illuminator, clearly did not check the text before reproducing the drawings. Sometimes the overall number of stars listed in the text wrongly suggests that the asterization is correct. For example, in Ursa Maior (21 stars) there is one star missing from the two on the front foot (*in pede priore duas*) and one extra star on the head (providing a total of 12 instead of the 11 listed in the text). In Cassiopeia, the Vindobonensis Lat. 3111 omits, as Ratdolt does, the star mentioned in the text as places on the throne (*in quadrato quo stella deformatur unam*).[171] In Gemini both omit a star on the (hidden) left hand of Castor (*in utrisque manibus singulas*). Most of the errors peculiar to Vienna 3111 are due to omissions,[172] which are sometimes unexpected (as in Aquila, where one star among four – *in cauda unam* – is missing, or in Ophiuchus, which has three stars missing);[173] but there are also a few additions (such as in Cepheus, who receives two stars instead of one on the side – *in latere dextro obscuram unam*) and Hydra, where the text of the manuscript describes the distribution of stars along the body as 3-6-3-4-2-8 = 26. This number and distribution are respected by Ratdolt in his illustrations (3-6-3-4-10 = 26), but not by the Vienna manuscript, which has 3-6-3-2-4-10 = 28.[174] There are also a few slightly displaced stars in Draco, Aries, Leo, Hydra and Virgo.[175]

in scapilio in the description of Pegasus. The name given in red letters as caption to the picture of Centaurus in Vienna 3111 as 'Phillirides' also appears in Ratdolt, as 'Phyllirides'.

170 Note that the later edition of Thomas de Blavis in Venice, which reverses Ratdolt's illustrations, also omits the stars that are not included in Ratdolt's edition (see Taurus and Sagittarius).

171 Not to mention the placing beside the haunch of the two stars of the leg (*in sinistro femore duas*).

172 Perseus: *in dextro femore unam* (missing); Pegasus: *in rostro stellas duas* (both missing); Castor in Gemini: *in utrisque manibus singulas* (one missing on the left one); Capricorn: *inter scapilio habet stellas septem* (one missing); Canis Maior: *in pede posteriore* [*scil. sinistro*] *unam* (probably missing on the left hind leg); Argo: *sub reiectum quinque* (one missing).

173 The stars missing are *in dextro crure unam, in capite stellam unam* and on the right foot (*in utroque pede singulas*).

174 In this case, the overall number of stars for the constellation is also correct, since Corvus is deprived of two stars (*infra pennam caudam versus duas*).

175 For Virgo, the seven stars *in veste passim dispositas* are marked by a straight line on the knees, but the model shows the same mistake. On Sagittarius, the star is wrongly placed on the left elbow (*in dextro cubito unam*).

Appendix 1. Corpus of Hyginus' Illustrated Manuscripts Marked with Stars

Name	cent.	books	image pagination	situation	comment	Viré
Baltimore, Walters Art Museum, W 734	XII	1-exc.[1] 2,3,4	01*r*-18*r*	cum libro III		GV-n°3
Cambrai, Bibliothèque Municipale, 993	XV	1,3-exc. 2,4	11*r*-45*r*	cum libro III		GV-n°11
Cambridge, Fitzwilliam Museum, 260	XV	2,3	2*r*-33*r*	cum libro III		GV-n°12
Florence, Biblioteca Nazionale Centrale, Magliabechi XI.114	XV	exc. 1,2–3,4	9*r*-11*r*	cum libro III		GV-n°20
Florence, Biblioteca Medicea Laurenziana, Ashb. 1148	XV	2,3	39*r*-60*v*	cum libro III		–
Florence, Biblioteca Medicea Laurenziana, Plut. 89 sup. 43	XV	all (3,4,1,2)	72*r*-91*r*	cum libro III		GV-n°19
Freiberg, Andreas-Möller Bibliothek, XI.4.9	XV	all	31*r*-47*v*	cum libro III	image first?	GV-n°24
Leiden, Bibliotheek der Rijksuniversiteit, Gronovius 21	XI-XII	3, exc. 4,2	55*rv*	cum libro III		GV-n°32
Milan, Biblioteca Ambrosiana, T 47 sup.	XV	3	47*v*-61*r*	cum libro III	image first?	GV-n°47
Milan, Biblioteca Trivulziana, N 690 (E. 83)	XV	3	1*r*-23*v*	cum libro III		GV-n°48
New York, Public Library, Spencer ms. 28	XV	all	40*r*–59*r*	cum libro III		GV-n°52
Oxford, Bodleian Library, Canon. Class. Lat. 179	XV	all (1,2,4,3)	28*r*-41*v*	cum libro III	image first	GV-n°53
Oxford, Bodleian Library, Digby 83 (S.C. 1684)	XII	2,3	44*r*–67*r*	cum libro II-III	image first	–
Pavia, Biblioteca Universitaria, Aldini 490	XV	3	77*v*-97*r*	cum libro III		–
Siena, Biblioteca comunale degli Intronati, L.VI.25	XV	all	34*r*-49*v*	cum libro III		GV-n°66
Vatican, Biblioteca Apostolica Vaticana, Reg. Lat. 123	XI	exc. 2 + 4,3	174*r*–204*v*	cum libro II-III		GV-n°75
Vatican, Biblioteca Apostolica Vaticana, Vat. Lat. 3109	XV	2,3	32*r*–50*r*	cum libro III	image first	–

Name	**cent.**	**books**	**image pagination**	**situation**	**comment**	**Viré**
Vatican, Biblioteca Apostolica Vaticana, Vat. Lat. 3110	XV	1–4 ; 3–4	65*r*-78*r*	cum libro III		GV-n°81
Vatican, Biblioteca Apostolica Vaticana, Urb. Lat. 1358	XV	all	123*r*-139*r*	cum libro III		GV-n°79
Vienna, Österreichische Nationalbibliothek, Vindob. Lat. 3111	XV	3, praef.1	112*v*-129*v*	cum libro III		GV-n°86

1 Exc. = excerpts of book.

Appendix 2. Sum of Stars for Each Constellation in the Manuscripts

	Hygin	Baltimore	Cambrai	Cambridge	Florence-Ashb-1148	Flor. Magl. XI-114	Flor. Plut. 89.43	Freiberg	Milan T 47 sup
number of pictures		38	37	33	38	10	38	37	38
Ursa Maior	21	18	17	Abs	21	21	19	17	21
Ursa minor	7	6 [+ 5]	7	Abs	5	7	7	7	7
Draco	15	15	13	Abs	15	15	15	15	15
Bootes	14	13	10	14	14	14	13	14	13
Corona Borealis	9	9	9	9	9	9	9	9	9
Hercules	19	19	18	19	18	19	19	14	19
Lyra	8 or 9	8 (9?)	8	9	8	9	8	9	8
Cygnus	13	13	Abs	13	13	Abs	13	8	13
Cepheus	19	19	Abs	19	19	Abs	19	19	19
Cassiopeia	12 or 13	13	13	Abs	13	Abs	11	12	13
Andromeda	20 or 21	17	18	20	20	Abs	20	20	20
Perseus	18	16	16	17	19 (-2?)	Abs	17	17	17
Auriga	7	7	7	7	7	7	7	7	7
Ophiuchus + Serpens	17 + 23	17 + 0	17 + 16	17 + 23	17 + 12	17 + 23	17 + 23	17 + 19	17 + 23
Sagitta	4	Abs	4	4	4	4	4	4	4
Aquila	4	4	4	4	4	4	4	4	4
Delphinus	10	10	10	10	9 or 10	Abs	10	10	10
Pegasus	18	14	17	17	18	Abs	17	19	14
Triangulum	3	3	3	3	3	Abs	3	3	3
Aries	17	17	18	14	18	Abs	Abs	16	18 (or 15)
Taurus (Hyades) + Pleiades	14 + 7	15 + 0	12 + 0	14 + 7	13 + 5	14 + 7	14 + 6	14	13 + 7
Gemini	8 + 10	8 + 8	8 + 8	8 + 10	6 + 8	Abs	8 + 7	8 + 10	9 (or 8) + 9
Cancer	18	17	15	18	18	Abs	18	0	17
Leo	19	18	18	18	19	Abs	16?	0	19
Virgo	21	18	18	Abs	18 (?)	Abs	18	0	18
Scorpio + Libra	15 + 4	16 + 4	13 + 4	15 + 4	15 + 4	Abs	14 + 4	14 + 4	10 (or 11) + 4
Sagittarius (+ Corona Australis)	15	15	14	15	13	Abs	13 + 7	15 + 7	15 + 7
Capricornus	20 or 22	20	20	22	22	Abs	20	22	21
Aquarius	14 + 30	14 + 24	15 + 30	14 + 16	11 + 19	Abs	14+16	14 + 16	14 + 16
Pisces	41	11 + 16	17	Abs	38 or 39	Abs	41	41	30
Eridanus	13	13	13	Abs	13	Abs	13	13	13
Cetus	13	14	14	13	13	Abs	13	13	13
Lepus	6	6	6	6	6	Abs	6	0	7
Orion	17	15	15	17	17	Abs	17	Abs	17
Canis Maior	19	19	15	19	19	Abs	19	19	19 or 18
Canis Minor	3	4	3	3	3	Abs	3	3	3
Argo	26	23	22	23	18	Abs	21	23	22
Centaurus + Lupus	24 + 10	23 + 0	22 + 0	23 + 8	14 + 10	Abs	21 + 10	24 + 7	22 + 7
Ara	4	4	4	4	4	Abs	4	4	4
Hydra + Corvus + Crater	26 + 7 + 8	26 + 9 + 8	20 +7+7	20 + 9 + 8	26 + 7 + 8	Abs	26 + 5 + 8	26 + 5 + 8	22 + 7 + 8
PsA	12	10 ?	12	12	12	Abs	12	12	12

Milan Triv. N 690	New York	Oxford Bodley 179	Oxford Digby 83	Pavia	Siena	Vat. BAV Lat.-3109 (1)	Vat. BAV Lat. 3109 (2)	BAV Lat. 3110	Vat. Reg. Lat. 123	Vat. Urb. Lat 1358	Vienna	Radtolt
38	38	30	38	38	31	38	37	38	41	38	39	39
21	19	16	21	22	13	>10	7	>10	19 & 14	22	21	21
7	7	7	7	6	7	7	7	7	7 & 7	7	7	7
15	15	15	15	15	15	14 or 15	15	15	15	14	15	15
14	14	13	12	13	14	13	13	14	17	15	14	14
9	9	9	10	9	9	9	9	9	9	9	9	9
18	19	19	19	17	18	14	15	19	13 or 15	16 (19)?	19	19
8	9	8	9	7	8	9	9	8	8	7	9	9
13	8	13	8	13	Abs	13	13	13	13	13 (or 15)	13	13
18 (or 31)	19	19	18	18	Abs	16	18	19	20	19 (18)	20	19
13	12	13	12	13	12?	13	12	13	13	14	13	13
20	20	20	19	19	20	16 > 20	21	20	23	20	20	20
17	17	17	16	17	17	18	17	17	17	17	16	17
7	7	7	7	7	7	8	7	7	10	7	7	7
17 + 22	17 + 19	17 + 23	17 + 23	14 + 23	17 + 21	10 + 14	11 + 12	17 + 23	12 + 6	17 + 23	14 + 22	17 + 22
4	4	4	3	4	4	0	Abs	4	4	4	4	4
4	4	4	4	4	Abs	4	4	4	5	4	3	4
10	10	10	9	10	Abs	10	10	10	9	10	10	10
14	18	15	12	17	Abs	14	13	18	18	17	16	18
3	3	3	3	3	3	0	1	3	3	3	3	3
14 or 15	16	15	21	14	18	13 > 16	16	15	18	16 (+ 2)	18	18
13 + 6	14	Abs	14	14 + 7	14 + 7	10 or 11 + 6	14 + 0	14 + 7	18	14 + 7 (or 8)	14 + 6	14 + 6
10 + 8	8+10	Abs	8 + 10	8 + 9	8 + 10	10 + 10	9 + 8	7 + 9	8 + 8	8 + 8	8 + 9	8 + 9
18	16	17	15	21	18	16	15	18	17 or 19	18	18	18
19	19	19	14	19	19	19	15	19	20	19	19	19
18	18	Abs	16	17	19	18 > 20	18	17 or 18	19	18	17	17
10 or 15 + 4	14 + 4	Abs	19	15 + 4	15 + 4	14 + 4	15 + 4	15 + 4	15 + 4	15 + 4	15 + 4	15 + 4
12 or 13 + 6 (?)	15 + 7	13 + 7	15	15 (or 16) + 7	14 + 7	9 + 0	8	15 + 7	15	16 + 7	15 + 7	15 + 7
21	22	21	19	21	21	16 or 17	20	21	26	22	21	22
14 + 15	14 + 16	Abs	13	11 (or 12) + 16	14 + 30	15 + 12	29	14 + 16	16 + 8	15 + 16	14 + 16	14 + 16
37 or 38	41	Abs	38	43	42	34	36	42	40	43	41	41
14	13	13	14	13	13	11	13	13	12	13	13	13
13	13	13	13	14	13	13	13	13	13	14	13	13
6	6	Abs	7	6	6	6	6	6	6	6	6	6
15	17	Abs	17	14	17	16 or 17	17	17	20	17	17	17
18	19	18	19	19	Abs	17	18	19	19	20	18 or 19	19
3	3	3	3	3	Abs	3	3	3	3	3	3	3
19	23	26	21	22	23	24	22	22	27	19(?)	22	23
23 + 7	24 + 9	22 + 10	23 + 8	24 + 10	24 + 10	17 + 6	24 + 7	24 + 10	18 + 8	22 + 9	23+10	23+10
4	4	4	4	4	4	4	4	4	4	4	4	4
18 + 7 + 7 (?)	26 + 5 + 8	23 + 7 + 8	25 + 7 + 8	22+ 7 + 6	26 + 7 + 8	32 + Abs + Abs	14 + Abs + Abs	23 + 7 + 8	3 + 4 + 3	23 + 7 + 8	28 + 5 + 8	26 + 7 + 8
11	12	12	12	12	12	11	12	12	12	12	12	12

Appendix 3. Discrepancies Between Text and Illustration

Name	number of discrepant chapters
Baltimore, Walters Art Museum, W 734	9(40)
Cambrai, Bibliothèque Municipale, 993	17(39)
Cambridge, Fitzwilliam Museum, 260	12(34)
Florence, Biblioteca Nazionale Centrale, Magliabechi XI.114	1(12)
Florence, Biblioteca Medicea Laurenziana, Ashb. 1148	7(41)
Florence, Biblioteca Medicea Laurenziana, Plut. 89 sup. 43	9(40)
Freiberg, Andreas-Möller Bibliothek, XI.4.9	14(36)
Milan, Biblioteca Ambrosiana, T 47 sup.	20(41)
Milan, Biblioteca Trivulziana, N 690 (E. 83)	15(41)
New York, Public Library, Spencer ms. 28	8(41)
Oxford, Bodleian Library, Canon. Class. Lat. 179	15(33)
Oxford, Bodleian Library, Digby 83 (S.C. 1684)	18(41)
Pavia, Biblioteca Universitaria, Aldini 490	15(41)
Siena, Biblioteca comunale degli Intronati, L.VI.25	5(34)
Vatican, Biblioteca Apostolica Vaticana, Reg. Lat. 123	20(41)
Vatican, Biblioteca Apostolica Vaticana, Vat. Lat. 3109	23(40)
Vatican, Biblioteca Apostolica Vaticana, Vat. Lat. 3110	9(41)
Vatican, Biblioteca Apostolica Vaticana, Urb. Lat. 1358	19(41)
Vienna, Österreichische Nationalbibliothek, Vindob. 3111	12(41)

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Blume, D.; Haffner, M.; Metzger, W. (2012b). *Sternbilder des Mittelalters. Der gemalte Himmel zwischen Wissenschaft und Phantasie: 800-1200: Text und Katalog der Handschriften*, Bd. 1, Tbd. I.2. Berlin: Akademie Verlag.

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Hyginus, Michael Scot (?) and the Tyranny of Technology in the Early Renaissance

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Abstract Whereas the earliest history of illustrations accompanying the text of Hyginus's *De Astronomia* remains a mystery, the iconography found in fifteenth-century illuminated manuscripts is relatively straight-forward and fairly consistent. Intriguingly, however, the woodblock images in the first illustrated edition of the text (Venice: E. Ratdolt, 1482) do not appear to follow any known Hyginian model, but closely resemble the idiosyncratic drawings that accompany the texts of Michael Scot's *Liber introductorius*. This paper explores current assumptions about Ratdolt's pictorial model and traces the impact of his illustrations on subsequent generations of astro-mythological treatises.

Keywords Astronomy. Manuscripts. Incunables Classical Tradition. Book Illustration. Illumination. Italian Humanism.

The production of deluxe, illustrated astro-mythological manuscripts in fifteenth-century Italy was centred largely on two classical texts: the *De Astronomia* of Hyginus and the Germanicus translation of Aratus's *Phaenomena*. There are seventeen known copies of the former and at least eleven surviving examples of the latter.[1] Not surprisingly, given the highly collaborative nature of the humanist scholars and their scribes across Italy during this period, there is a high degree of homogeneity in both the texts and illustrations of these two manuscripts families.

The earliest edition of the Hyginus text was printed in Ferrara in 1475 by Agostino Carnerio.[2] Philological evidence suggests that the text was copied

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1 Illustrations and analyses of all these manuscripts can be found in Blume, Haffner, Metzger 2016 and on The Saxl Project website, *ad vocem*.

2 Hain906; GW n0368; ISTC ih00559000; USTC 994237. For further information on the Carnerio press (which appears to have been started by Antonio's father, Bernardo, in 1474 and ceased operation in 1478), see Baruffaldi 1777, 60-69; Antonelli 1830, 30-31 (no. 26); Cittadella 1873, 13-15; Fumagalli 1905, s.v. "Ferrara"; BMC 1909, X, 106; Scholderer 1925-66; *DBI* (P. Veneziani), XX, 1977, 464-65; McKitterick 2003, 76; McKitterick 2014.

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from a contemporary, fifteenth-century manuscript, keeping all theidiosyncratic readings. As the textual relationship amongst these manuscripts is so close, it is difficult to trace the exact manuscript (if, indeed, it still survives).[3] One simple, but telling, detail can be found in the description of Sagittarius, however, where the star that should be listed as being *in poplite* ('in the knee') appears as *in pollice* ('in the thumb') (fig. 1). As the detail of the text from the late twelfth- or early thirteenth-century Hyginus manuscript in the British Library shows,[4] a transposition from *in poplite* to *in pollice* would have been an easy mistake for a slightly inattentive scribe to make (fig. 2). In the Hyginus manuscripts from the 15th century, though, this small oddity becomes the norm, with at least twelve manuscripts preserving the error in the text and/or in the illustrations of the constellation.[5]

The 1475 Ferarrese edition was not illustrated, but spaces were left in the text for decorative capitals and images. As is well known, this was not an uncommon practice with the earliest books printed in Italy and, especially, those printed by native Italians.[6] It is not clear whether this was due to the fact that Italian printers had yet to master the specialist skill of woodcut book illustrations, or that their clients preferred books that could be more elaborately illuminated by accomplished miniaturists. The former is certainly plausible, given the level of technical expertise required to complete this process successfully. If the latter is the case, however, it is easy to imagine such a decision reflecting a combination of purely aesthetic preference, the desire to personalise and 'add value' to what might have been perceived as a 'mass-produced object' and, perhaps, a certain degree of inherent conservatism – although, as David McKitterick has warned: 'It is always dangerous to make assumptions about the

3 Michael Reeve's call to arms for a full study of the manuscripts of Hyginus's text ('Has any classical text been so ill-served by recent scholarship as this?') remains, sadly, unanswered. Reeve 1983, 187-89.

4 London, British Library (BL), Arundel 339, fol. 82*v*. The manuscript originated in Southern Germany, almost certainly from the Benedictine Abbey of St Peter at Kassel. Saxl, Meier 1953, 93-98; Blume, Haffner, Metzger 2012, I, i, 302-07 (dating the manuscript to ca. 1200 and before 1222 on account of the list of abbots 'huius loci', which ends in 1222 [fol. 151*v*]).

5 It is worth noting that modern editors of Hyginus, such as Le Boeuffle and Viré, do not include readings from these fifteenth-century manuscripts as part of their apparatus. The star 'in pollice' appears in Cambridge, Fitzwilliam Museum, ms. 260; Florence, Bibl. Laurenziana, Ashb. 1148 (with a marginal correction) and Plut. 89, sup. 43; Milan, Bibl. Ambrosiana, T. 47 sup.; New York Public Libr., Spencer 28; Oxford, Bodleian Libr., Can. class. lat. 179 and Can. misc. 46; Pavia, Bibl. Universitaria, Aldini 490; Siena, Bibl. Comunale, L VI 25; Vatican, Biblioteca Apostolica Vaticana (BAV), Urb. lat. 1358 and Vat. lat. 3110.

6 For an overview of this practice, see Armstrong 1994, 35-47. Note especially her observation that: 'The technology of printing woodcuts simultaneously with the text was well developed in Germany in the 1470s, but with few notable exceptions, Italian printers had resisted incorporating many woodcuts into their publications until the end of the 1480s', 45. See also Brown 1891, 27; Gerulaitis 1976, 18-19; Armstrong 1991; McKitterick 2013, 68-82.

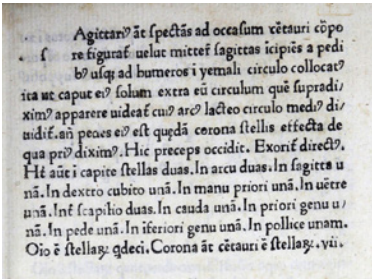

Agittari⁹ āt spectās ad occasum cētauri cōpo
re figurat uelut mittet sagittas icipiēs a pedi
b⁹ usq; ad humeros i yemali circulo collocat⁹
ita ut caput ei⁹ solum extra eū circulum quē supradi/
xim⁹ apparere uideat cui⁹ arc⁹ lacteo circulo medi⁹ di/
uidit. aū pedes ei⁹ est quedā corona stellis effecta de
qua pri⁹ dixim⁹. Hic preceps occidit. Exorit direct⁹.
Ht aūt i capite stellas duas. In arcu duas. In sagitta u
nā. In dextro cubito unā. In manu priori unā. In uētre
unā. Int scapilio duas. In cauda unā. In priori genu u/
nā. In pede unā. In iferiori genu unā. In pollice unam.
Oio ē stellaꝝ qdeci. Corona āt cētauri ē stellaꝝ. vii.

Figure 1. *Sagittarius* from Hyginus, *De Astronomia*, Book III. Ferrara: Augustino Carnerio, 1475. Oxford, Bodleian Library, Auct. L. 4. 26 (The Bodleian Library, University of Oxford)

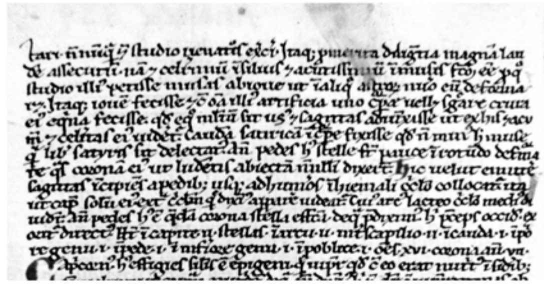


Figure 2. *Sagittarius* from Hyginus, *De Astronomia*, Book III. London, British Library, Arundel ms. 339, fol. 82*v* (© The British Library Board)

expectations of readers'.[7] With regard to the Carnerius edition of Hyginus, McKitterick has noted that only three of the fourteen known copies of the volume have had manuscript illustrations inserted.[8]

The first illustrated edition of *De Astronomia* was published by Erhard Ratdolt in 1482.[9] In this version, each of the 42 constellations that Hyginus describes in Book III is followed with a relatively large woodcut figure in which the stars have been marked (fig. 3).

There are two things to note about this pairing of text and image. First, the text of Ratdolt's edition was also based on a fifteenth-century exemplar (note, for example, the appearance of the tell-tale star in the thumb of Sagittarius). The editors of the volume are named as Jacobus Sentinus and Johannes Lucilius Santritter, both of whom provide self-promotional poems at the end of the volume. Sentini was responsible for editing the text and Santritter – who is often praised by contemporaries for his mathematical

7 McKitterick 2013, 70.

8 McKitterick 2003, 75-79, fig. 20 and McKitterick 2013 citing Cambridge, Trinity College, Grylls 3. 290; Naples, Bibl. Naz., S.Q.VII.C. 6 and Rome, Bibl. Lancisiana, Inc. 44. As McKitterick notes, the illustrations in the Trinity College volume strongly reflect the pictorial traditions found in fifteenth-century manuscripts of Hyginus. To his citation of the similarities between some of the Trinity illustrations and those in the Paduan manuscript, Milan, Bibl. Trivulziana, T. 47 sup., one might also add the close resemblance of the depiction of Argo to those in Florence, Biblioteca Nazionale Centrale (BNC), Magl. XI, 141; Oxford, Bodleian Libr., Can. class. 179 and Verona, Bibl. Capitolare, ms. 261. The Lancisiana pictures also appear to have been copied from a fifteenth-century Hyginus manuscript.

9 For more on Ratdolt and his activities, see Redgrave 1894; Schramm 1943, 3-15; Geru-laitis 1976; Eisenstein 1979, II, 587, no. 34; Lowry 1991, 211-13; Landau, Parshall 1994, 180 and 381, no. 13; De Simone 2004, 54-56 and 75-77.

skills – was possibly the advisor or 'artist' behind the woodcut figures.[10] The text relies on a manuscript very close to the one used by Carnerio or – despite Santritter's claims that their edition is better than existing manuscripts and the previous edition – it could have been copied more-or-less directly from the Ferrarese edition itself, with the only significant differences being the page lay-out and the abbreviations used.[11]

Second, although the *text* has a clear connection to extant fifteenth-century Hyginus manuscripts, the link between the woodcut illustrations in Ratdolt's edition and existing Hyginus manuscripts is less apparent. This perception may be due partly to the 'Germanic' pictorial style in which the illustrations have been executed, which is markedly different from the suavely classicizing or charmingly courtly illuminations that appear in most contemporary Italian manuscripts of Hyginus's text. Nevertheless, in 1983, Ulrike Bauer[12] proposed that the images of the constellations in Ratdolt's volume were not related to existing Hyginus manuscripts but, instead, were drawn directly or indirectly from the illustrations that appear in the late-medieval manuscripts of Michael Scot's *Liber introductorius* and the related *Liber de signis et ymaginibus celi*.[13]

10 Sentini calls Santritter 'doctus' in his colophonic poem. See Redgrave 1894, 18; Hind 1935, II, 462; Pollard 1914, 24-25; McKitterick 2014, 73. It is worth noting that the two poems celebrating Sentini and Santritter's collaboration disappear from subsequent editions, while the longer descriptive poem by Sentini remains.

11 'If what you have here does not please you, compare it with the manuscripts, or with the earlier printing (*quae pressa fuere prius*), and you will be able to judge for yourself'. McKitterick 2014,75.

12 Bauer 1983, 12. Although Georg Thiele signalled a connection between the 'woodcuts of the oldest prints' ('die Holzschnitte der ältesten Drucke') of the constellations with the Viennese manuscript, Vindob. 2352 – the author of which he appears not to have known and describing the manuscript only as 'a pedestrian medieval description of the sky' ('gehört zu einer mittelalterlichen prosaischen Himmelsbeschreibung', cf. Thiele 1898, 149-50) – Bauer was the first to make the connection between Michael Scot and the Ratdolt illustrations explicit. She notes that the woodcuts in Ratdolt's 'second' edition (1485) have been copied from Michael Scot, but does not mention that the same is true for the 1482 edition (though she does cite the earlier edition on page 71). She also draws attention to the repeated use of the woodblocks in Ratdolt's 1488 Augsburg edition of the *Flores Astrologiae* of Albumasar, and cites the similar Michael Scot-based images in the Germanicus *Aratea* (Venice: de Strata, 1488), the Ratdolt edition of Leopold of Austria's *Compilatio de astrorum scientia* (Venice, 1489 OS) and the illustrations in the *Astronomici veteres* (Venice: A. Manuzio, 1499; see Pontani, Lugato in this volume), as well as in two large-scale decorative cycles. On the subtleties of how these images were adapted and evolved.

13 The exact relationship between the texts of the tri-partite *Liber Introductorius* and the much more compact *Liber de signis et ymaginibus celi* (as well as the 'authorship' of the surviving versions of both texts) remains the subject of scholarly debate. For the differing views, see Edwards 1978, xx-xxii; Edwards 1985; Burnett 1994; Ackermann 2008; Grebner 2008a, 285-86; Grebner 2008b, 253-56; Ackermann 2009, 66-75.


poꝛe deuenit ad terram: qui cum totus occidit vt pendere pedibus ex arctico circulo videatur. Exoriēs ante pedibus ꝙ reliquis mē/bris. Habet autem in capite stellā vnam. In sinistro brachio vnā. In vtroqꝫ humero singulas clare lucentes. In manu sinistra vnā. In dextro cubito vnam. In vtroqꝫ latere singulas: sed clarioꝛem in sinistro. In dextro femoꝛe duas. In genu vnam. In poplite v/nam. In crure duas. In pede vnam que dicitur clara. In sinistra manu quattuoꝛ. quas pellē leonis nōnulli esse dixerunt. Ita sunt omnino decem ꝛ nouem.

Hercules

Figure 3. *Hercules* from Hyginus, *De Astronomia*, Book III. Venice: Erhard Ratdolt, 10 October 1482. Munich, Bayerische Staatsbibliothek, 4 Inc.c.a.234a (`http://inkunabeln.digitale-sammlungen.de`)

Those who have studied the history of illustrated astronomical manuscripts are only too well acquainted with the habit of some medieval scribes using the images normally attached to one text to illustrate another.[14] Perhaps naively, modern scholars tend to see this blurring of boundaries as a kind of invention either borne out of necessity – that is to say, we assume it as the natural response to a lack of resources – or to be regarded as a ‘natural trait’ of the scholastic temperament, in which the act of compila-

14 See, for example, the use of illustrations normally associated with the pseudo-Bedan *De signis caeli* in early manuscripts of Hyginus (cf. Lippincott 2014, 14). See also the eloquent response to Salvatore Settis’ plea for clear philological and iconographic *stemmata* of the corpus of astro-mythological manuscripts in Orofino 2013, 25 (responding to Settis 1985, 21-22).

tion often was seen as a preferable method to textual or pictorial integrity.[15] Discovering that the first Renaissance edition of a widely-circulated classical text has been illustrated with constellation images taken from a medieval compilation, however, seems more disconcerting – primarily because it appears to run contrary to everything we have been taught to believe about the ethos of early Renaissance scholarship. Be that as it may, a sense of discomfort is fully warranted in this particular case, as nothing about this apparent 'contamination' turns to be straight-forward.

Citing Scot as the source for Ratdolt's woodcuts raises a number of issues. The first concerns the textual and pictorial sources that Michael Scot himself used when compiling his treatise. In 1898, Georg Thiele noticed that some of Michael Scot's illustrations seemed to 'imitate' (anknüpfen) the images that appear in the twelfth-century Germanicus manuscript now in Madrid (hereafter Madrid 19),[16] which preserves the Latin translation of the *Phaenomena* of Aratus interspersed with sections of prose text – known as the '*scholia Strozziana*' – that provide ancillary information about the mythological origins of each constellation and a list of the positions of the stars.[17] Several aspects of this fascinating manuscript – such as the place of its manufacture and its possible travels after it was written – remain the subject of intense scholarly debate.[18] Moreover, its precise connection to the text and illustrations of Michael Scot's manuscripts continues to be disputed.[19] As will become apparent below, many of these unresolved issues are critical to our understanding of the illustrations in Ratdolt's edition of Hyginus.

Identifying the textual and pictorial sources that Michael Scot used to compile his descriptions of the constellations is complicated by the fact that the manuscripts present a unique vision of the constellations and their astro-mythical significance. The format in which the information is conveyed varies from manuscript to manuscript, but the shared content is as follows (fig. 4):[20]

15 As, for example, with the eleventh-century compilation from Santa Maria di Ripoll, Vatican, BAV, Reg. lat. 123. Lippincott 2014.

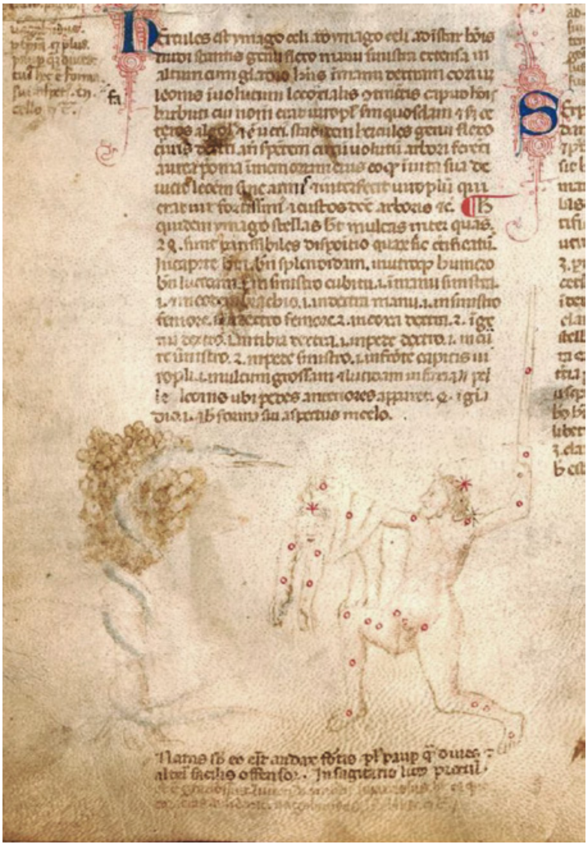
16 Thiele 1898, 149-50. Madrid, Bibl. Nacional, Matritensis 19 (*olim* fol. A. 16).

17 So-called on account of their appearance in Florence, Bibl. Laurenziana, Strozzi 46, a fourteenth-century manuscript once owned by the great Florentine humanist, Coluccio Salutati. For additional information, see Ullman 1963, 168, 188-89 and pl. VII, 2; de la Mare 1973, I, 41; Reeve 1980, 511-12.

18 The range of views on Madrid 19 is well summarised in Orofino 2013, 32-39.

19 For the most recent discussions of the relationship between Madrid 19 and Michael Scot's illustrations, see Orofino 1994, 135-41; Bauer 2008; Ackermann 2009, Grebner 2008b; Blume, Haffner, Metzger 2012, I, 202ff, 346ff, no. 32; Orofino 2013, 32-41; Blume, Haffner, Metzger 2016, II, i, 30-48.

20 Thorndike 1923-58, II (1923), 327; Thorndike 1965, 97; Ackermann 2009, 77-83; Blume, Haffner, Metzger 2016, II, i, 31-32. Scholars have yet to trace Scot's source for the sec-



Figre 4. *Hercules* from Michael Scot, *Liber Introductorius*. Munich, Bayerische Staatsbibliothek, clm. 10286, fol. 80*v* (http://daten.digitale-sammlungen.de)

1. an explanation of the identity and catasteristic myth behind each figure
2. a list of the position of the stars in each figure
3. an illustration
4. an astrological formula for the appearance, character and, sometimes, fate of people born under the influence of the constellation.

Michael Scot's reliance on a source similar to Madrid 19 is apparent in two aspects of his descriptions. The first is the list describing the placement

tions describing the astrological influence of each constellation, arguably the sections of these descriptions in which the majority of his readers would have been most interested. Ackermann has signalled a forthcoming publication on this topic ('*Natus in hoc signo erit*... Predictions for a person's future in Michael Scot's *Book of the Stars*') in the bibliography of her 2013 edition, which may resolve this issue.

of the stars in each constellation, which has been drawn nearly word-for-word from the star-lists provided by the *scholia Strozziana*.[21] Taking the constellation of Hercules as an example, we find the following:

scholia Strozziana[1]	Michael Scot, *Liber de signis*[2]
in capite 1	in capite 1 bene splendidam
in singulis humeris singulas splendidas	in utroque humero 1 bene lucidam
in sinistro cubito 1	in sinistro cubitu 1
in eadem manu 1	in manu sinistra 1
in eodem brachio 1	in eodem brachio 1
in sinistro femore 1	in sinistro femore 1
in dextra parte femoris 2	in dextro femore 2
in dextra coxa 2	in coxa dextra 2
in eadem tibia 1	in tybia dextra 1
ΕΠΙΓΟΝΑΤΟC 1	[missing][3]
in crure 2	in crure sinistro 2
in eodem pede 1	in pede sinistro 1
in dextro pede 1	in pede dextro 1
in dextra manu 1	in dextra manu 1
in clava, quam tenet in eadem manu 1	in gladio 1
in leonina pelle 4	in faxiali pellis leonis, ubi pedes anteriores apparent, 4
sunt omnes 24	24 sunt parisibiles

1 Dell'Era 1979, 180.

2 Ackermann 2009, 176.

3 This apparent failure to list this star might raise questions concerning Scot's ability to translate from the original Greek source, or it might simply reflect the inability of a later scribe to understand the significance of these letters. The former has been previously argued by Sarton 1927-48, III, 2 (1931), 581; Prioreschi 2003, 337-39.

The second parallel is the similarity in the illustrations, which has been fully documented by Bauer.[22] Here, the arguments that Madrid 19 itself was the actual manuscript used by Michael Scot to compile his treatise begins to unravel slightly, since a close comparison between the set of illustrations in Madrid 19 and any of the known Scot manuscripts reveals a disconcerting number of pictorial differences. Some of them are minor and could be attributed to inexperienced or inattentive artists, but others are quite major and suggest the likelihood of more than one intermediary be-

21 Ackermann also notes a series of distinctive readings found in Madrid 19, which influence Scot's text and tie it directly to this branch of the philological stemma: Ackermann 2008, 274-78; Ackermann 2009, 83-88.

22 Bauer 1983, 32-79 and 105-07. See also Ackermann 2009, 337-412; Blume, Haffner, Metzger 2016, II, i, 32-38.

tween Madrid 19 and Michael Scot's original composition and/or between Scot's original work and the earliest surviving illustrated manuscripts. Of course, it must be remembered that our understanding of Scot's models is hampered by several factors, the most troublesome being the fact that the earliest surviving illustrated version of the works in question postdate Michael's death by more than eighty years. The oldest illustrated version of the *Liber introductorius* is the Paduan manuscript, Munich, Bayerische Staatsbibliothek (BSB), clm. 10268, datable to ca. 1320;[23] and the oldest manuscript containing an illustrated version of the *Liber de signis* is the north-Italian manuscript in St. Petersburg, which bears a date of 1348.[24]

Nevertheless, the discrepancies between the sets of illustrations seem somewhat puzzling given the obvious closeness between the text of the *Liber de signis* and Madrid 19. For, as Silke Ackermann has pointed out, several of Michael Scot's idiosyncratic readings seem to stem directly from his apparently having misunderstood the sorts of scribal abbreviations that are evident in the text of the Madrid manuscript.[25] As is true in so many other cases, though, this seeming antithesis between textual and pictorial traditions reflects a fundamental aspect of manuscript production that is often overlooked: namely, that there are at least three separate elements that come into play when a manuscript is being compiled. The scholar tends to be interested primarily in preserving or recapturing what he or she thinks is the most authoritative form and meaning of the text, while a professional scribe's proficiency is measured by the ability to create a faithful copy, often regardless of whether the model preserves an exemplary or miserable version of the text. By analysing the evidence left by these various incursions, modern philologists can often create convincing *stemmata* that provide historical overviews of when and how a text has changed and developed. Conversely, an artist's talent is most often gauged by the level of 'creativity' shown in response to an image or verbal description. As a result, the pictures have a much greater tendency to diverge from their purported models and, often, in quite unexpected ways. Art historians are left to quantify how much change within a kind of free-form continuity signals the arrival of new pictorial or stylistic influences, evidence of collaboration, changes in fashion or the relegation of certain tasks to a workshop assistant. In the very circumscribed arena of astro-mythological manuscripts, the genealogies of the textual tradition vary enormously from the pictorial ones. This fact is usually side-stepped

23 Bauer 1983 (says ca. 1340); Ackermann 2009 (ca. 1320); Blume, Haffner, Metzger 2016, II, i, 186-91 (1320-30).

24 Ackermann 2009, 528-30 (ca. 1350); Blume, Haffner, Metzger 2016, II, i, 192-97 (third quarter 14th century, ca. 1350?).

25 Ackermann 2008, 275-78; Ackermann 2009, 83-87.

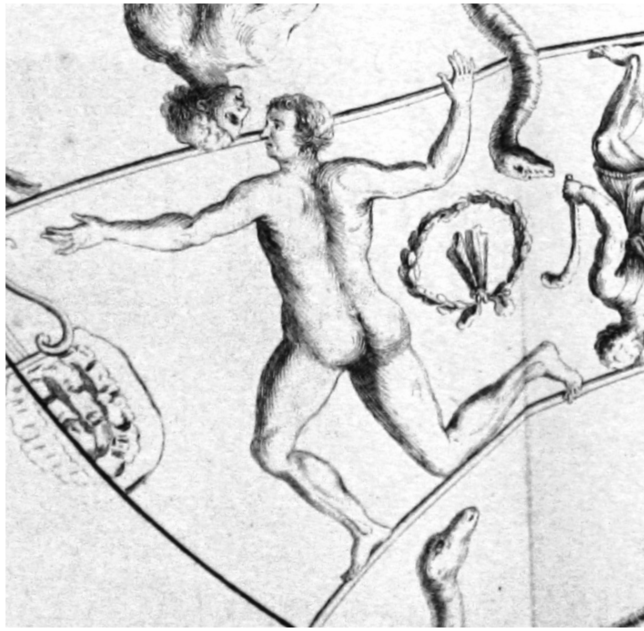


Figure 5. 'Engonasin' (*Hercules*) from the planispheric maps derived from the Farnese globe. Marcus Manilius, *Astronomica*. Richard Bentley (ed.) London 1739 (Author's photograph)

by modern scholars, since philologists tend not to look at pictures and art historians rarely read the texts. Historians of science, who are often looking for quantifiable data, simply despair.

By-and-large, Michael Scot's descriptions of the constellations show him to be, literally, a fairly prosaic scholar in that he shows minimal interest in the text of Germanicus. To take one example, the text of the poem itself provides relatively little information about the identity or form of the constellation of Hercules. The figure is not named, but only described as kneeling on his right knee with his palms upwards as if praying to the gods.[26] Germanicus also mentions that the figure's left foot stands on the temple of the dragon (Draco), that his right hand is raised and that he looks as though he has been working very hard and is worn out with his toil (fig. 5).[27] This is not the image of the demigod that makes its way into the Madrid manuscript or into Michael Scot's text and image, both of

26 Germanicus, *Aratea*, vv. 67-68: diversaque tendens / bracchia, suppliciter passis ad numina palmis. LeBoeuffle 1975, 5

27 Germanicus, *Aratea*, vv. 271-72 (LeBoeuffle 1975, 18). The characterization of the figure with his left foot on Draco's head reflects Germanicus's incorporation of Hipparchus's correction of the descriptions of Eudoxus and Aratus, both of whom claim it is the right foot that rests on the Dragon's head. See Hipparchus, *In Arati et Eudoxi Phenomena*..., I, ii 6 (Manitius 1894, 10-13).

which depict the Hercules accomplishing one of his twelve labours, that of stealing the golden apples from the Garden of the Hesperides.

Given his apparent neglect of the content of the poem itself, it is worth remembering that, far from being a champion for the Classical tradition, Scot himself argues that the pagan myths underpinning the forms of the constellations provide little value to the 'modern' astrologer.[28] This may well be the impetus behind his decision not to provide a simple digest of the mythological information contained in the *scholia Strozziana*; but, instead, he uses both the texts and pictures to craft his own bizarrely sensationalised versions of the each set of myths. For, while it is possible that Scot's versions of these tales are based on a series of genuine misunderstandings of the Classical myths and/or an inability to 'read' the details of a Classical image, it seems more likely that his version of the catasteristic myths reflects a personal, possibly culturally-motivated animosity towards the behaviour of the gods and heroes of the pagan world.[29]

To take one example, Scot's description of Andromeda is typical of the way in which he distorts his sources (fig. 6).

> Andromeda fuit filia Cephei et Casiepie, que, cum esset pulcherrima iuvenis, dictum est a Iove, quod ipsa valde vexabatur libidine et quod tradatur Cetui ad devorandum. Que suspensa est ramis arborum quercus inter duos montes et hec inventa a Perseo liberata est. Quem amplexans, stricte numquam voluit parentes videre nec alium virum, quam ille Argis conduxit letanter.
>
> Et quia sic urebat intrinsecus, figuratus est femina desuper et masculus ab umbilico deorsum. Et hec mulier partim erat vestita et partim nuda pro facti significacione.[30]

> Andromeda was a daughter of Cepheus and Cassiopeia. As she was a very beautiful girl, Jupiter said she was possessed by lust and ordered that she be thrown to a sea monster to be eaten. She was hung between two hills on the branches of an oak tree. Here she was found by Perseus, who freed her. She embraced him and then consistently refused to see her parents or any other man. He [Perseus] then joyfully brought her to Argos.

28 Ackermann 2009, 126 (A 29): "Insuper dicendum, quod predicte ymagines a multis recitantur fabulose, qualiter suam habent formam et unde originem habuerunt, et recitatur de illis in figura picturarum. Sed illarum fabulas in hoc libro non curamus, eo quod non sunt alicuius utilitatis".

29 See the characterisation of Scot's myths as focussed on 'rape and sexuality' ("Im Mittelpunkt stehen in seiner Fassung zumeist die Liebschaften, Vergewaltigungen und Sexualität, also Bereiche, die von der Astrologie und den Geistern in besonders starkem Maße beeinflusst wurden". Cf. Blume, Haffner, Metzger 2016, II, 1, 31).

30 Ackermann 2009, 190-92.

Figure 6. *Andromeda* from Michael Scot, *Liber introductorius*. Munich, Bayerische Staatsbibliothek, clm. 10286, fol. 81*v*. (`http://daten.digitale-sammlungen.de`)

> And because she suffered this internal torment, she is depicted as a woman in her upper part, and as a man from her navel downwards. And this woman was partly clothed and partly naked to mark this fact.[31]

With a stroke of his metaphorical pen, Michael Scot has managed to transform the beautiful Ethiopian princess, whose only crime is to have a vain and ambitious mother, into a tormented and lustful hermaphrodite.[32] Several other constellations meet with a similar fate, revealing Michael Scot as a rather peculiar medieval inversion of Thomas Bowdler.

Again, hoping not be overly prejudiced in one's assumptions about what sort of illustrations a fifteenth-century printer might find appropriate to place in an edition aimed specifically, one assumes, at a well-educated market with 'humanist' inclinations, it remains difficult not to be somewhat baffled at Ratdolt's apparent choice to use Michael Scot's figures. One possible explanation might be that Michael Scot's reputation amongst the academics in the university towns of Padua and Bologna was so high that using the illustrations from manuscripts of his texts would be seen as acceptable. Another possibility, suggested recently by the authors of *Sternbilder des Mittelalters und der Renaissance*,[33] is that it could have been Ratdolt's original intention to print an illustrated version of Michael Scot's *Liber de signis* and that he had already begun the process of cutting the blocks based on the illustrations in a manuscript copy of the text, but then he changed his mind when he realised that the market in Venice favoured classical authors. As the major expense of cutting the blocks had already been incurred, it was more 'cost efficient' to use them to illustrate the potentially more lucrative venture of an illustrated Hyginus. This suggestion sounds much more in keeping with the sorts of concerns that would inform the business decisions of a fifteenth-century printer, especially if he could take advantage of the fact that the text had already been edited by Carnerio in Ferrara few years earlier.[34] Nevertheless, the

31 I have suggested elsewhere that this description of Andromeda as a hermaphrodite may come from clever philological manipulations between Greek and Latin (Lippincott 1993, 43-44). A similar suggestion has been made, possibly independently, in Mariani Canova 2001, 396. I now wonder if it simply reflects a pictorial mis-reading of the knot holding her skirt just below her waist as male genitalia.

32 Blume, Haffner and Metzger more generously characterise Scot's interpretations of the classical myths and their illustrations as evidence of his intelligent, reflective and 'quasi-scientific' approach to this material. Blume, Haffner, Metzger 2016, II, i, 37-38.

33 Blume, Haffner, Metzger 2016, II, i, 131-33.

34 There is a possibility that Santritter's edition could have been, despite his claims of editorial superiority and originality, largely based on Carnerio's text. As his tax records show, Ratdolt was one of the wealthiest men in Augsburg soon after his return to the city from Venice. See Wehmer 1955, 151 as cited by Landau, Parshall 1994,180.

decision to use Scot-based images to illustrate the text of Hyginus generates two additional problems.

First, although the positions of the stars described by Scot bear a close resemblance to those listed in the *scholia Strozziana*, they are markedly different from those provided by Hyginus. For example, a comparison of the placement of the stars in Sagittarius shows:

Hyginus, *De Astronomia*[35]	Michael Scot, *Liber de signis*[36]
in capite stellas duas	In capite habet 2
in arcu duas	in arcu 2
in sagicta unam	in latitudine acuminis sagitte 2
in dextro cubito unam	in dextro cubitu 1
in manu priori unam	in manu dextra 1
in ventre unam	in ventre thauri (!) 1 bene claram
inter scapilio duas	in spina dorsi 2
in cauda unam	sub cauda 2
in priori genu unam	in quolibet genu pedum anteriorum 1
in pede unam	
in inferiori genu unam	
in pollice (sic) unam	
omnino est stellarum quindecim	Sagittarius habet stellas multas, inter quas sunt 19 parisibiles
Corona autem centauri est stellarum septem.	sub cruribus sunt 7, sed parve, quare raro videntur, et nisi qui habet subtilem visum et longinquum, nemo eas umquam videt.

Second, the illustrations that appear in Michael Scot's manuscripts reflect a very different pictorial tradition from that found in a 'typical' fifteenth-century Hyginus manuscript.[37] As a result, the configurations of each

35 As per Ratdolt 1485. In English, the text reads: "He has two stars on his head, two on his bow, one on the arrow, one on the right elbow, one on the leading hand, one on the chest, two on the shoulder blades, one on the tail, one on the front knee and one on the foot, one on the hind knee, one on the thumb (sic). In total, there are 15 stars. There are also seven in the crown of the Centaur".

36 See Ackermann 2009, 162. In English: "Sagittarius has many stars, among which 19 are visible and are arranged as follows: there are 2 in the head, 2 in the bow, 2 in the wide (?) end of the arrow, 1 in the right elbow, 1 in his right hand, 1 nicely clear one in the belly of the steer, 2 in the spine of the back, 2 under the tail, 1 in each knee of the front feet. There are 7 under the legs, but they are small, which explains why they are rarely seen, and then only by someone who has particularly good eyesight for distant objects". Incidentally, the stars listed do not total nineteen.

37 See Appendix 2.

constellation, as well as many of their attributes, have been significantly altered. The task is not only to reposition that stars, but to place them within a figure that regularly has a totally different arrangement of limbs and accessories.

Nevertheless, if one compares the star positions in Ratdolt's figures with the descriptions in the accompanying Hyginian text – as well as with contemporary manuscript illustrations of Hyginus and those found in Michael Scot illustrations – it does seem that there has been an attempt to place the stars in accordance with the star lists of Hyginus, but that this process has met with limited success. To cite a few examples:

	Michael Scot	**Hyginus, Book III**	**Ratdolt Hyginus image**
Aries	3 stars in the nose	none in the nose	none in the nose
	1 in each front foot	1 in the right front foot	1 in the right front foot
Bootes	3 in the right hand	none in the right hand	none in the right hand
	1 on each knee	none on the knees	none on the knees
	4 on the right hand	4 on the right hand	none on the right hand
Hercules	1 in the sword (gladio)	not mentioned	none in the raised club
Cepheus	7 on the sword's strap	not mentioned	none on the strap
	1 on the right hip	none on the hip	none on the hip
Eridanus	17 stars on the man's body	none on the figure	none on the figure

The repositioning of the stars raises some doubts over the otherwise attractive hypothesis made by Blume, Haffner and Metzger that Ratdolt previously had commissioned a series of blocks to illustrate an edition of Michael Scot and simply substituted these figures for his new edition of Hyginus. Given the technical realities of the relief-printing process, in which the uncut surfaces take the ink, the figures and their stars would have to have been cut at the same time. Therefore, the Hyginus-based positioning of the stars proves that the woodblocks were commissioned and executed specifically for an edition of the *De Astronomia*. The question of why Scot-derived figures were used remains open, but the fact that these figures and their stars were executed specifically to illustrate his edition of Hyginus seems fairly clear. Perhaps this was the 'scientific' aspect of the project that required Santritter's particular skills. If so, one admires his stamina and inventiveness.

Whereas the relationship between the Scot images and those that appear in Ratdolt's woodcuts is relatively close, there is a sufficient number of significant differences between the two to suggest that the actual model for Ratdolt's edition was either a Michael Scot manuscript with a decidedly altered corpus of images, or that there was an unknown quantity of intermediary manuscripts in which the pictorial changes had been introduced. The first possibility is supported by the number of cases where variant imagery can be found amongst the surviving Scot manuscripts.[38] The second seems equally possible, given that Michael Scot imagery was widely disseminated throughout Europe from the early fourteenth to the mid-15th century, and served as the model for several writers on astronomical and astrological subjects, such as Bartolomeo da Parma,[39] Domenico d'Arezzo,[40] Ludovicus de Angulo,[41] and Fazio degli Uberti.[42] For example, Ratdolt's departure from what seems to be canonical Scot iconography in the depiction of Ophiuchus standing on the back of Scorpio, can be found in two illustrated manuscripts of Domenico d'Arezzo's *Fons memorabilium* where the Scorpion is missing;[43] the similarly unusual Ratdoltian image of Corona borealis as a metal crown also appears in the Domenico d'Arezzo manuscripts, as well as in a French translation of Lodovico de Angulo's *De figura seu imagine mundi*;[44] and the 'peasant' Cepheus and exposed Andromeda are included amongst the illuminations of Fazio degli Uberti's *Dittamondo.*[45]

A third option is raised if one considers the possibility that neither Ratdolt nor Santritter was responsible for deciding to use illustrations derived from Michael Scot's, but that they actually possessed a Hyginus manuscript in which that process had already been achieved.

In 1966, Patrick McGurk noted a group of fifteenth-century Italian manuscripts containing texts of the so-called 'Sicilian Germanicus' in which 'particular groups of texts and pictures always maintain the same alliance'.

38 As noted in Appendix 2.

39 Bartolomeo da Parma, *Breviloquium de fructu artis tocius astronomiae* (composed in Bologna in 1326). For additional information, see Narducci 1885; Duhem 1916, 210-29; *DBI* VI, 1965, 747-50 (Bruno Nardi); Burnett 2001; Ackermann 2001; Blume, Haffner, Metzger 2016, II, i, 41, 48 and *ad vocem* for the manuscripts.

40 Domenico Bandini (d'Arezzo), *Fons memorabilium universi* (begun before 1374; the final version dates to 1408-13). See Thorndike 1934, III, 560-67 and 759-61; Hankey 1957; Hankey 1960.

41 Ludovicus de Angulo (*alias* Louis de Lange, Louis de Langle and Luís de Angulo), *De figura seu imagine mundi* (completed in 1456). See Fernández-Pousa 1941; Hustache 1988; Blume, Haffner, Metzger 2016, II, i, 133-36 and *ad vocem* for the manuscripts.

42 Fazio degli Uberti, *Dittamondo* (begun in 1346 and not completed at his death, sometime after 1367). See Zanotto 1835; Corsi 1952; Cudini 1978, 52-71; Milanesi 1994; and Blume, Haffner, Metzger 2016, II, i, 48 and *ad vocem* for the manuscripts.

43 Madrid, Bibl. Nacional, Matritensis 1983, fol. 116*v* and Vatican, BAV, Vat. lat. 3121, fol. 12*r*.

44 Madrid, Bibl. Nacional, Matritensis 1983, fol. 115*v* and Vatican, BAV, Vat. lat. 3121, fol. 10*v*. The Ludovicus de Angulo image appears in Paris, BN, fr. 612, fol. 102*v*.

45 Paris, Bibliothèque nationale de France (BNF), ital. 81, fol. 165*v* (Cepheus) and fol. 176*r* (Andromeda).

From this group, five manuscripts could be said to form a single iconographic family,[46] but the relationship between two of these bears closer examination. The ordering of their respective texts is as follows:

		Vatican, BAV, Urb. lat. 1358	**Florence, Bibl. Laur., Plut. 89, sup. 43**
	Arati genus	fols 2*r*-2*v*	fols 3*r*-4*r*
1.	Excerpts from the *scholia Strozziana*	fols 2*v*-4*v*	fols 4*r*-6*r*
2.	Germanicus, *Aratea*	fols 4*v*-37 [illustrated]	fols 6*v*-48*v* [illustrated]
3.	*Arati Phaenomenon reliquiae*	fols 37*r*-39*r*	fols 48*v*-50*v*
4.	*Aratea de Sole et Luna*	fols 39*r*-41 bis r	fols 50*v*-54*v*
5.	First excerpt from Pliny 18	fols 41 bis v-45*r*	fols 55*r*-57*v*
6.	Second excerpt from Pliny 18	fols 45*v*-47*r*	fols 57*v*-60*v*
7.	*De polis mundi*	fols 47*r*-47*v*	fol. 60*v*
8.	Third excerpt from Pliny 18	fols 47*v*-54*v*	fols 61*r*-70*r*
9.	Hyginus, Books I-IV	fols 57*r*-121*v*	-
10.	Hyginus, Books III and IV	fols 123*r*-152*r* [illustrated]	fols 72*r*-108*r* [illustrated]
11.	Martianus Capella, *De nupt. Phil. et Merc.*, VIII, 844-45	fols 152*r*-152*v*	fols 108*r*-117*v*
12.	Hyginus, Books I and II, (paraphrase)	fols 157*v*-161*r*	-
13.	Martianus Capella, *De nupt. Phil. et Merc.*, VIII, 316-331	fols 161*r*-163*v*	fols 117*v*-121*r*
14.	*De polis*	fols 163*v*-165*r*	fols 121*r*-123*v*
15.	Hyginus, Books I and II, (paraphrase)	-	fols 127-169*r*

46 McGurk 1966, xvii-xix. These are:

1. Vatican, BAV, Vat. lat. 3110 - Florence, ca. 1370; owned by Coluccio Salutati (1331-406)
2. Florence, BNC, Magl. XI. 114, 1 - Italy (Florence?), early 15th century
3. Vatican, BAV, Urb. lat. 1358 - Florence, early 1470s; made for Federico da Montefeltro, prior to his elevation to Duke of Urbino in 1474; written by the scribe of the 'Vite di Vespasiano di Bisticci'; illuminated by Bartolomeo Fonzio
4. Florence, Bibl. Laurenziana, Plut. 89, sup. 43 - Florence, early 1470s; written by the scribe of the 'Vite di Vespasiano di Bisticci' and illuminated by Gherardo di Giovanni
5. Pavia, Bibl. Universitaria, Aldini 490 - Italy, 1470-80

For additional information about this family of fifteenth-century manuscripts, see Haffner 1997; Orofino 2013; Blume, Haffner, Metzger 2016, II, i, 111-21; The Saxl Project (cf. the commentaries on the Hyginus and Germanicus textual and pictorial traditions, and *ad vocem* for the individual manuscripts).

At first sight, the fact that the Laurentian manuscript omits the third rendition of Hyginus's text, which appears on fols 57*r*-121*v* of the Vatican manuscript, might suggest that it was copied from the latter, as repetitive texts tend to get omitted rather than added. For our purposes, though, the most important feature of these two manuscripts is that they each contain illustrated versions of both the Germanicus *Aratea* and Book III of Hyginus, *De Astronomia*; and that these sets of illustrations are not identical. In the Vatican manuscript, the Germanicus text is illustrated with figures common to the group of fifteenth-century manuscripts, which share several iconographic features with the aforementioned twelfth-century Germanicus manuscript, Madrid 19, including: Jove riding an eagle, Ophiuchus standing on the back of Scorpio, Auriga in a chariot, Cancer at the feet of the Gemini, Aquarius and Capricorn depicted in the same scene, and a depiction of Austronotus. The Hyginus illustrations accord with other fifteenth-century Italian Hyginus manuscripts, and reproduce several of the idiosyncratic features that characterise these productions, such as Andromeda fleeing, Aries with the triangle of Deltoton on his head, and a horned Eridanus.

In the Laurentian manuscript, a change has taken place. The illustrations accompanying the Germanicus text follow the Vatican version of the Germanicus pictures quite closely. The constellations set within the Hyginus text in the Laurentian manuscripts, however, are not derived from the same fifteenth-century Hyginian models, but exhibit an iconography seen only in Michael Scot manuscripts.[47] These features include Cepheus depicted as a peasant, Auriga in a cart drawn by two horses and two oxen, Orion with a club in his hand and holding a large shield in front of him and Eridanus reclining by a stream. Not all the images in the Laurentian manuscript follow Michael Scot's illustrations – for example, Cassiopeia does not have blood flowing from her right hand, Andromeda is suspended from flanking trees (but is resolutely female) and Ophiuchus does not stand in the back of the Scorpion – but the appearance of Scot-related images within a Hyginian context raises the question: might this manuscript (or one sufficiently like it) be the context from which Ratdolt drew inspiration for the woodcuts in his edition of Hyginus?

The first task is to establish consensus concerning the date of the Laurentian manuscript, which has recently been dated to both ca. 1470 and to post-1482. If the Laurentian manuscript predates 1482, it provides evidence that there was an existing tradition of Hyginus illustrations resembling those that appear in Michael Scot manuscripts that Ratdolt could

47 McGurk 1966, 26-29 (whose observation that the illustrations of the Hyginus section are identical to the nine images in Florence, BNC, Magl. XI, 1 is correct, save for the depiction of Auriga).

have used to create his set of woodcuts.[48] If the Laurentian manuscript post-dates 1482, it could still reflect a variant manuscript tradition behind Ratdolt's choice; but a later date also raises the possibility that the Laurentian drawings are, themselves, copied from a printed book.[49] One additional factor in the resemblance between the Laurentian manuscript and Ratdolt's edition is that the positions of the stars within the manuscript illuminations have been altered to follow the star lists of Hyginus's text. Again, one wonders, did this development take place in Florence or Venice? Does one commiserate with Gherardo da Monte or with Santritter? Personally, I believe that the evidence in support of an earlier dating of the Laurentian manuscript to the early 1470s is more convincing – primarily owing to Albinia de la Mare's attribution of the handwriting in both the Vatican and Laurentian manuscripts to the same scribe, the so-called 'Master of the Vite di Vespasiano di Bisticci'.[50] Since both manuscripts were written and illuminated in Florence, and the Vatican manuscript can be securely dated to sometime before 1474,[51] it seems most likely that the Laurentian manuscript was completed sometime in the early 1470s as well.

If there had been an ancillary iconographic tradition for illustrating the text of Hyginus circulating amongst the most august humanist circles of Naples and Florence during the first half of the 15th century, it only solves half a dilemma. One is slightly more free to reinterpret Ratdolt's seemingly incomprehensible choice to adopt and adapt a series of fanciful medieval iconographic hybrids derived from Michael Scot as now indicating that his illustrations may well reflect the conscious decision to copy images from a manuscript tradition that was not only fashionably *au courant* – with sister manuscripts in the collections of Federico da Montefeltro and the Medici – but one that came with the highest humanist pedigree, being

48 Leone 2013, who summarises previous opinions about the date of the manuscript and argues in favour of an earlier date. She cites the attribution of the miniatures to Gherardo di Giovanni (cf. Ciardi Duprè dal Poggetto 1976, 75; Garzelli 1985, I, 95; II, 585) and the script to the scribe of the 'Vite di Vespasiano di Bisticci' (cf. de la Mare 1985, I, 463, 542-43).

49 In the text and catalogue entry for the Laurenziana manuscript in Blume, Haffner, Metzger 2016, Haffner reiterates her belief that it postdates 1482. Her opinion is based largely on stylistic grounds and the resemblance to the woodcuts in Ratdolt's Hyginus, but she also cites the fact that it is not listed in the early Medici inventories. See Haffner 1997, 113, no. 291; Blume, Haffner, Metzger 2016, II, i, 117, 619-24 and II, ii, 974.

50 See de la Mare 1985.

51 Leone 2013,116. The Montefeltro stemma, which appears on fol. 2*r* of the Vatican manuscript, does not include the depiction of Papal Keys, the right to which was awarded to Federico upon his elevation to Duke of Urbino by Pope Sixtus IV in 1474. As additional support for an earlier date, Leone cites the laurel wreath encircling the Medici stemma on the 'antiporta' and the frontispiece of the Laurentian manuscript as indicating a direct connection with the patronage of Lorenzo de' Medici. The miniatures in the Vatican manuscript have been attributed to Bartolomeo Fonzio by Garzelli (cf. Garzelli 1985, I, 90-91).

only two steps from Coluccio Salutati's own autograph manuscript. But pushing the problem from 'commercial' Venice to 'humanist' Florence does not actually solve the problem of why and how these illustrations become attached to the text of Hyginus. Leone's suggestion that the images in the Laurentian manuscript reflect the iconographic tradition associated with the *scholia Strozziana* derived from a southern Italian prototype (of which one also sees similar echoes in Madrid 19) is certainly alluring and raises the question of whether or not one can push the 'authority' of this attachment as far back as the thirteenth-century Sicilian scriptorium of Frederick II.[52] At this stage, however, rather than succumb to that particular siren's song, it seems timely to return to the issue of the later influence of Ratdolt's illustrations.

It is impossible to know whether or not this sort of 'antique' authority – if either somehow recognised or assumed – would have mattered to Ratdolt or his contemporaries. To modern eyes, the rough and ruralising 'Germanic' style of his woodcuts seems the very antithesis of what one now has to be slightly wary of calling a 'Renaissance aesthetic'. Nevertheless, once these images appeared in print (despite the fact that they are largely non-sensical iconographic hybrids with no astronomical value whatsoever), they became the undisputed model upon which astronomical book illustration relied for the next forty years.[53]

In Ratdolt's second edition of Hyginus, printed in Venice in 1485, the text has been re-set into longer lines and the second poem by Sentini and Santritter's verse have been deleted (perhaps suggesting a falling out between Ratdolt and his 'doctus' advisor). The illustrations record the re-use of the blocks that previously had featured in the 1482 edition, with a few minor changes. In purely commercial terms, one can understand the logic of any printer wanting to re-use existing woodblocks, rather than incur expense in carving a new set. Nevertheless, it does seem slightly curious that, even when Ratdolt leaves Venice to return to Augsburg in 1486, certainly taking his blocks with him,[54] his images continue to dominate the book trade – not only in Venice, but also in Augsburg and Paris.

Two years after Ratdolt's departure, in 1488, Thomas de Blavis published in Venice an edition of Hyginus, which was illustrated with a set of rather crude reverse copies of the pictures in Ratdolt's 1485 edition.[55] As

52 Leone 2013, 121-23.

53 For fuller descriptions of these books, see Appendix 1.

54 Redgrave 1894, 18 (who claims that Santritter had kept some of Ratdolt images when the latter left Venice); Hind 1935, II, 410-12; Landau, Parshall 1994, 381, no. 15; De Simone 2004, 55.

55 The copies were clearly made after the 1485 edition and not the 1482 edition, as Prince d'Essling suggests. Witness the depiction of Scorpio, in which the stars of its face are drawn such, when they were printed, the figures were reversed. Little is known about de Blavis, apart from a record of his publications, which have been characterised by modern scholars as inferior in quality to most of his contemporaries at both a technical level and in his choice of texts, which had been previously better edited by others.[56] One can see evidence of this lack of technical skill in a number of instances: owing to clumsy cutting, the lion's eyes have fallen out; Auriga has lost his chin; the snake of Ophiuchus has lost its lower jaw and Centaurus has a double profile along his back (fig. 7). These idiosyncrasies conveniently enable modern scholars to trace the re-use of de Blavis's block through the various editions printed by subsequent publishers. For, despite modern views of his limited skills, the reversed images created by de Blavis have an extraordinary longevity and influence.

In 1488, de Blavis's blocks were re-used to illustrate Germanicus's translation of the *Phaenomena,* contained in the *Scriptores astronomici*, printed by Antonio de Strata.[57] In attempting this task, the publisher faced the challenge of taking the images from their original positions in the Hyginus text – attached to discrete chapters describing each constellation – and inserting them into the right place between the text of Germanicus's poem and its *scholia*. As part of this process, however, de Strata makes several mistakes. He mis-identifies and, therefore, misplaces four of the images and fails to find any spot at all for nine constellations (fig. 8). Judgement by hindsight may be both unreliable and unfair, but this startling inability to recognise the identity of the constellation figures and place them appropriately tends to undermine any hope we might have had that the early publishers of these Classical astro-mythological texts were motivated by a profound desire to uncover and disseminate the scientific wisdom of the ancients.

In 1499, Aldus Manutius published his version of the Germanicus poem.[58] Its illustrations are a combination of re-used blocks from de Blavis's 1488 edition of Hyginus and a new set of pictures. In some cases, the original blocks have been re-cut and, in the process, slightly refined. This may be due to the fact that de Blavis's original blocks had begun to deteriorate. In other cases, new blocks have been cut, which are based on the illustrations in de Blavis's edition itself and not the original blocks (again suggesting damage and loss). As a result, when these images are printed, they appear reversed from the woodcuts in de Blavis's Hyginus edition. Somewhat

within the contours of the head. See d'Essling 1907, I, i, 273.

56 See, for example, the assessment by Alfredo Cioni in the *DBI* 1968, X, 491-93.

57 For a further discussion, see Pontani, Lugato, this volume.

58 For a detailed examination of this compilation, see the contribution of Filippomaria Pontani and Elisabetta Lugato in this volume, with a full bibliography.

Figure 7. *Centaurus* with a double backbone from Hyginus, *De Astronomia,* Book III. Venice: Thomas de Blavis, 7 June 1488 (Venezia, Biblioteca Nazionale Marciana, Inc. V. 0736) (Internet culturale, MiBACT)

Figure 8. *Orion* as 'Perseus' from 'Fragmentum arati phaenomenon per germanicum in latinum conversi cum commento nuper in sicilia repertum'. Venice: Antonio de Strata, 25 October 1488. Munich, Bayerische Staatsbibliothek, 4 Inc.c.a.561a (http://inkunabeln.digitale-sammlungen.de)

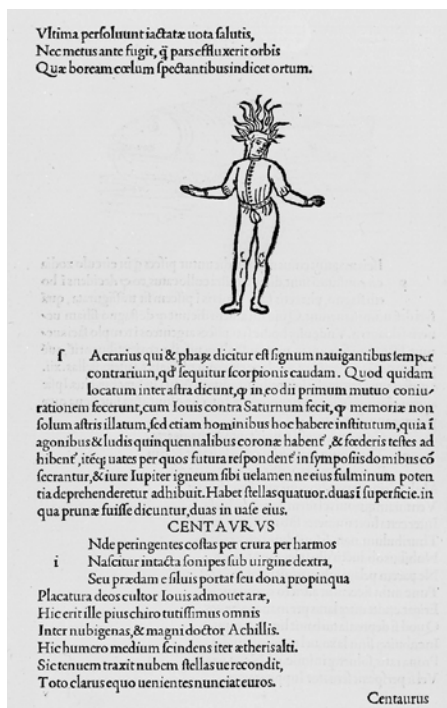


Figure 9. Ara (?) from 'Fragmentum arati phaenomenon per germanicum in latinum conversi cum commento nuper in sicilia reperto'. Venice: Aldo Manuzio, June and [17] October 1499. Munich, Bayerische Staatsbibliothek, 2 Inc. c. a. 3720 (http://inkunabeln.digitale-sammlungen.de)

surprisingly, Manutius copies de Strata's mistakes regarding the identity of three of the constellations and, similarly, he fails to find any space for six of the constellations (Cepheus and Ophiuchus being the lucky ones to find a home). He also introduces an extremely unusual depiction of the constellation of Ara (fig. 9).[59]

In August 1502, Johannes Baptista Sessa published yet another 'new' edition of the Sentini version of Hyginus's poem.[60] He, too, relied on the De Blavis woodcuts, but reworked several of them. Sometimes, this is merely a case of copying the original figure, but doing so in a finer and more fluid graphic style. Now and then, he 'Italianises' them by redrawing the figures with more normative, 'Renaissance' proportions (fig. 10). In a few images, he has reduced or deleted the ancillary 'mythological' components (such as Andromeda's landscape). In several instances, Sessa's pictorial changes necessitate repositioning the stars, but none of these changes appears to indicate an attempt to make the illustrations more astronomically accurate. The overall effect, therefore, is that nearly all of Sessa's figures remain fairly closely tied to their 'Ratdoltian' origins despite the stylistic manipulations.

The first significant change in the format of these well-worn images appears in the edition of Hyginus published by Sessa's brother, Melchior, in September 1512.[61] The text remains Sentini's version and several of the pictures are based on a combination of figures taken from de Blavis and Johannes Baptista Sessa. There is, however, a subtle alteration to in some of the figures in that they are now portrayed from the rear. This modification points to Melchior Sessa's illustrator having used either a celestial globe or a depiction of a celestial globe as an inspiration (figs. 11-12).[62] The most relevant model that I have been able to trace is the two illustrations of a celestial globe published in the Venetian edition of Vitruvius's *De architectura* by Ioannis de Tridino (alias 'Tacuino') in 1511.[63] Other changes

59 For the depiction of Ara, see Pontani, Lugato, this volume.

60 Curi Nicolardi 2010, esp. 88-90.

61 d'Essling 1907, I, i, 274 (no. 289) is incorrect in his description of these figures having been derived directly from Johannes Baptista Sessa's 1502 Hyginus. I would argue that his view that the 1512 woodcuts are generally inferior in quality to the 1503 ones is equally misleading. See also, Ascarelli, Menato 1989, 327; Curi Nicolardi 1984.

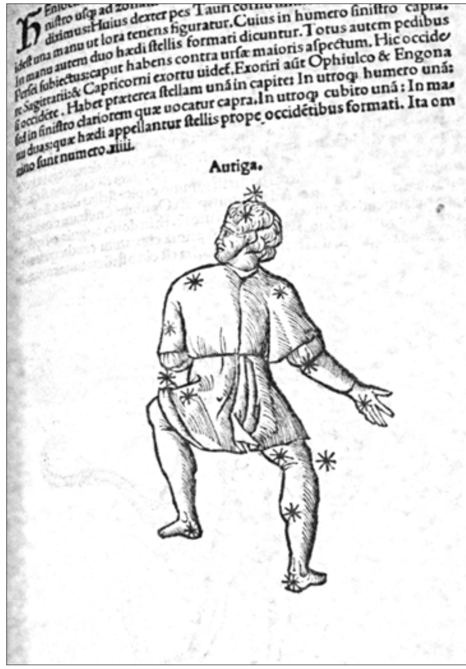
62 For the convention of depicting constellations as if seen from behind (the so-called 'Hipparchan rule'), see Dekker 2013, 34-38.

63 *De architectura. M. Vitruvius per Jocundum solito castigatior factus cum figuris et tabula ut jam legi et intelligi possit*, Venice: Ioannis de Tridino alias Tacuino, 1511. The volume was edited by the architect, engineer, scholar and Franciscan friar Fra Giovanni Giocondo (da Verona). For additional information, see Ciapponi 1984; Vitruvius 1997. Several of the constellations in the woodcuts bear an intriguing resemblance to the globe held by the Farnese *Atlas*, an object Fra Giocondo could have seen in Rome in the early 1490s. For additional in-

PErſeus.Hui⁹ ſiniſtrũ crus & humeꝝ leuũ:circul⁹ æſtiu⁹a reliquo
corpe diuidit.Ipſe manu dextra arcticũ circulũ tãgit:dextro pe
de caput aurigæ ꝑmere uelut currẽs uidet.Idẽ occidẽs Sagitta
rio & Capricorno exorto ĩclinat ad caput uerſus:cũ Ariete & Tauro
rect⁹ exorit.Habet ãt ĩ utroq; humero ſtellã unã.In manu dextra clare
lucentẽ unã qua falcẽ tenere dicit:quo telo Gorgonã interfecit.In ſini
ſtra alterã q̃ caput Gorgonis tenere exiſtimat.Habet ꝑterea in uentre
ſtellã unã.In lumbis alterã:in dextro femore unã. Ad genu in tibia
unã.In pede unã obſcurã.In ſiniſtro femore unã.In genu alterã. In ti
bia duas.In ſiniſtra manu qđ Gorgonis caput uocat ſtellas q̃tuor:toi
no ẽ ſtellaꝝ nũer⁹ decẽ & ſeptẽ.Caput ei⁹ & falx ſine ſiderib⁹ apparẽt
Hũc Aratus cũ diceret inter ſidera cyconis menõ figuratũ:acceperũt
cõplures eũ puluerulẽtũ dicere:qđ minime cõuenit poſſe iter ſidera ẽt
puluerulentũ accipe.Q đ ſi eẽt:dignior erat Orion cui idẽ aſcriberet.
Primũ q; aſſidue ẽ uenatus & ſemp ĩ terra fuit. Deniq; adhuc iter ſide
ra uenari uidet. Perſeus aũt qui aſſidue uolabat:nõ põt puluerẽ hre:
Quid igit ẽ cũ uellet aratus eũ currẽtẽ obſcure ſignificare:uſus atho
loꝝ cõſuetudine ceconis menõ dixit:atholi.n.cũ uolũt aliquẽ decurre
re ſignificare ceconiſſe dicũt id.Q đ Aratus uoluit demõſtrare:non ut
illũ uolãtẽ aſſidue puluerulẽtũ dicat.Q đ a multis ꝑperã ẽ itellectũ.

Perſeus

Figure 10. *Perseus* from Hyginus, *De Astronomia*, Book III. Venice: Giovanni Battista Sessa, 25 August 1502. Munich, Bayerische Staatsbibliothek, 4 A. lat. b. 330 (`http://inkunabeln.digitale-sammlungen.de`)



HEnioc[...]
niſtro uſq; ad zo[...]
dirimus:Huius dexter pes Tauri cornu[...]
ideſt una manu ut lora tenens figuratur.Cuius in humero ſiniſtro capra.
In manu autem duo hædi ſtellis formati dicuntur.Totus autem pedibus
Perſei ſubiectus:caput habens contra urſæ maioris aſpectum.Hic occide
re Sagittarii:& Capricorni exortu uidet.Exoriri aũt Ophiulco & Engona
ſi occidẽte. Habet præterea ſtellam unã in capite: In utroq; humero unã:
ſed in ſiniſtro clariorem quæ uocatur capra.In utroq; cubito unã: In ma
nu duas:quæ hædi appellantur ſtellis prope occidẽtibus formati. Ita om
nino ſunt numero .xiiii.

Auriga.

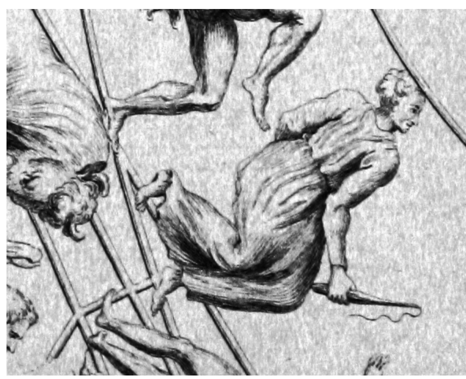


Figure 11. *Auriga* from Hyginus, *De Astronomia*, Book III. Venice: Melchior Sessa and Pietro da Ravenna, 15 September 1512. London, British Library, 1359. F. 41 (London BL, Author's photograph)

Figure 12. *Auriga* from the planispheric maps derived from the Farnese globe. Marcus Manilius, *Astronomica*. Richard Bentley (ed.) London 1739 (London BL, Author's photograph)

made by Melchior Sessa include the deletion of more of the background scenes and, perhaps most importantly, the constellation of Eridanus has returned to its original celestial form as the segment of a stream. Again, both these developments bring the figures more in line with those found on a celestial globe.

One might think that this development, which seems to promise a gradual reunion of Hyginus's text with the images of the constellations derived from a celestial globe – the supposed starting point for Hyginus's own descriptions of the heavens – ends the story of Ratdolt's legacy, but the story is far from finished. In 1513, Jacobus Paucidrapius reprints the Sentini version of the *De Astronomia* in Pavia with illustrations that are free copies of the Ratdolt pictures;[64] and, in Venice, Melchior Sessa reissues his edition in March 1517 without any changes.[65]

Another path of transmission opens with yet another copy of Sentini's edition of the text being published by Thomas Kees in Paris in May 1512. His illustrations appear to be new copies taken directly from de Blavis's 1488 Hyginus edition (sometimes with embellishments) (fig. 13) and Johannes Baptista Sessa's 1502 Hyginus. In this form, the proliferation of Ratdolt-based illustrations explodes, but tracking Kees's version of Ratdolt's illustrations is slightly difficult as the volumes often do not include Kees's name in the colophon as it tended to be the custom with early French printed books that the vendors – and not the printers – were credited as being the 'publishers'. For example, the *Summa Philosophiae* of Paulus Venetus (Paulus Nicolettus) was reprinted eleven times in Paris between 1512 and 1520. Of the six I have been able to examine, four have constellation illustrations using the blocks of Thomas Kees's 1512 Hyginus, but only three mention his name[66]

In addition to this, Thomas Kees used his own blocks from 1512 for the 1514 edition of Tommaso Radini Tedeschi's *Sideralis Abyssus*; and Jean Lambert reused the same illustrations in his two editions of Hyginus (1514 and 1517), though Thomas Kees's name does not appear in the colophon. Lambert's edition is the first publication to provide a new text of the *De Astronomia* by the then very young Johannes Lodovicus Vives Valentinus

formation on this possibility, see Lippincott 2016. The major argument against these images being based on the Farnese Globe, however, is the inclusion of the depiction of Equuleus, which does not appear on the Globe. I thank Elly Dekker for pointing out this anomaly.

64 This volume is often wrongly cited as having been printed in Venice by Ottaviano Scoto, despite the fact that Pavia is clearly listed as the place of publication, Jacob Paucidrapensis de Burgofranco (also known as Giacomo Pocatela, Jacobus Papiensis or Parvi/Paucidrapis) as the printer, and there is a dedication to the deceased (*quondam*) Ottaviano Scoto, whose heirs and friends helped to pay for the printing.

65 Curi Nicolardi 1984, 51 (who cites only the March edition).

66 See Appendix 1.

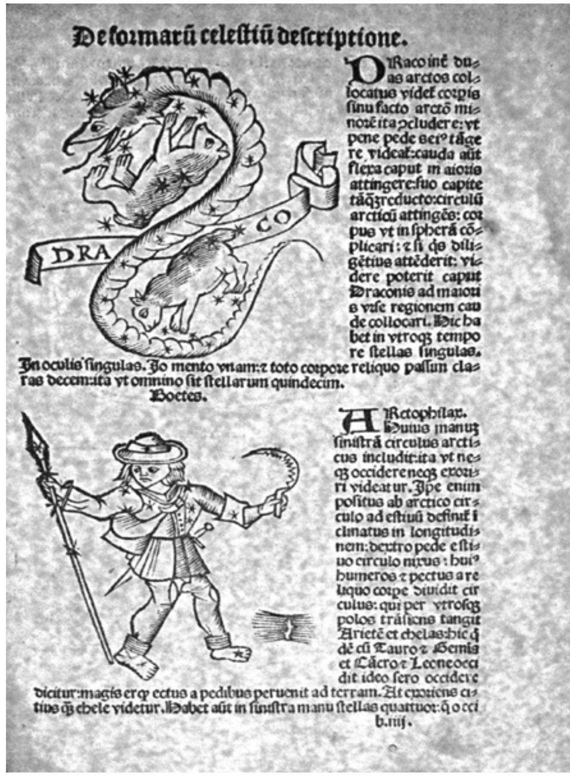


Figure 13. *Draco inter arctos* from Hyginus, *De Astronomia*, Book III. Paris, Thomas Kees, 24 May 1412 [1512]. London British Library, I.A. 41616/2 (London BL, Author's photograph)

(Juan Luis Vives de Valencia). The Sentini poem still appears at the end of the 1514 volume, followed by a poem by Vives; but in the 1517 version, the Sentini poem has been dropped.

As we have seen, the influence of Ratdolt's illustrations was pervasive and long-lived, despite the fact that the pictures did not 'illustrate' the text of Hyginus *per se* and were astronomically nonsensical. Additionally, though, there are two further chapters to this story that demonstrate the influence of Ratdolt's illustrations in another context.

Whereas it is unclear whether the Florentine Hyginus manuscript discussed above is the model for or a copy after Ratdolt's Hyginus, the fifteenth-century Florentine Basinio da Parma manuscript in the Biblioteca Marucelliana definitely appears to be a manuscript in which some of the illustrations have been copied from a printed book.[67] Two different artists

67 Florence, Bibl. Marucelliana, C. 251. See McGurk 1966, 29-32; Angeli 1999, 180; Blume, Haffner, Metzger 2016, II, ii, 100 and 698-700 (who mis-identify the source as Ratdolt's 1482 Hyginus).

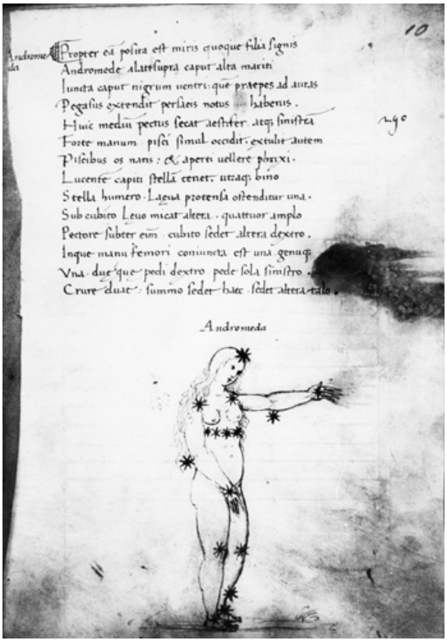


Figure 14. *Andromeda* from Hyginus. *De Astronomia*, Book III. Florence, Biblioteca Marucelliana, ms. C.CCLI, fol. 10*r*. (London, The Warburg Institute, Iconographic Database)

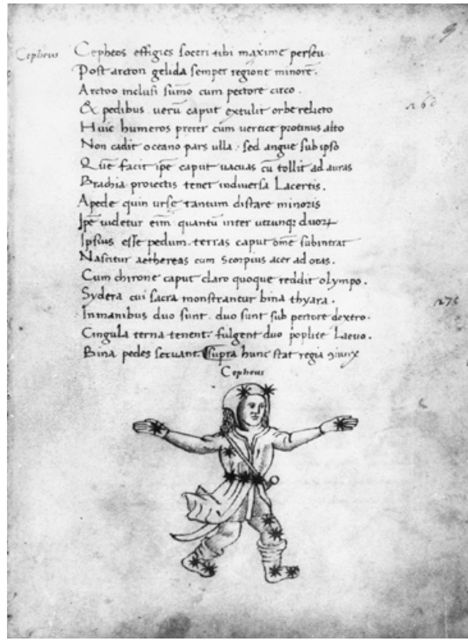


Figure 15. *Cepheus* from Hyginus. *De Astronomia*, Book III. Florence, Biblioteca Marucelliana, ms. C.CCLI, fol. 9*r*. (London, The Warburg Institute, Iconographic Database)

16. *Andromeda* from 'Hyginius' (Michael Scot). Augsburg: Erhard Ratdolt, 8 August 1491. Munich, Bayerische Staatsbibliothek, 4 Inc c.a.837 (`http://inkunabeln.digitale-sammlungen.de`)

appear to have worked on this manuscript. Six illustrations were probably added soon after the text of the manuscript had been completed. These figures are finely drawn and fit easily into the Hyginus-based pictorial tradition found in other Basinio manuscripts (fig. 14).[68] The remaining illustrations were added to the manuscript after 1513. The second group of drawings is considerably more crude. Stylistically and iconographically, they are exact copies of the rough constellation pictures found in the Hyginus edition printed by Jacobus Paucidrapius de Burgofranco in 1513 (fig. 15) It would seem that one of the owners of the Marucelliana manuscript inherited an incompletely illustrated manuscript and, sometime after 1513, this fault was remedied. But, by this time, the most readily available pictorial source for constellation illustration was the Michael Scot-based illustrations taken from Ratdolt's Hyginus woodcuts.[69]

The second interesting incident involves Ratdolt himself. As mentioned, Ratdolt left Venice in 1486, returning to Augsburg and taking his constellation blocks with him. We know this because he printed what he claimed to be a German translation of Hyginus's text in Augsburg in 1491, which contains woodcuts made from his 1485 blocks. The title page reads:

> Hyginius von den.xij. zaich[en] und xxxvj. pildern des hymels mit yedes stern. Auch die natur v[o]n eygenschafft der menschen so die darundter geborn werden. Und was in eim yeden.xij. zaichen zethun [= for 'zu tun'] oder ze lassen ist so der mond darinn ist. Auch von der eygenschafft der siben planeten.

When one actually consults the text, however, it is immediately clear that this is not a translation of *De Astronomia* – as one can most quickly appreciate from the description of the lusty Andromeda (fig. 16). Instead, it is actually a German version of Michael Scot's *Liber introductorius*.[70]

Ratdolt's German 'Hyginius' raises several new questions about his humanist credentials and, to my mind, seriously challenges the idea that the choice of illustrations for his original 1482 edition of Hyginus reflected a

68 Hercules, Andromeda, Aries, Gemini, Leo and Pisces appear to be by the first hand.

69 One other example of a Hyginus manuscript where the illustrations have been copied from a printed edition occurs in the Austrian or south German manuscript, Vienna, Österreichische Nationalbibliothek (ÖNB), Vindob. 3111, which is dated 1491 and in which the figures are closely based on Ratdolt's 1485 edition of Hyginus. Blume, Haffner, Metzger 2016, II, ii, 648-51.

70 Admittedly, some modern scholars have noted this anomaly, including – most recently – the authors of Blume, Haffner, Metzger 2016, II, i, 132. Curiously, though, all the library and incunable catalogues I have consulted list this work as the first version of Hyginus's text to have been printed in Germany. None recognises this work as *editio princeps* of the German translation of Michael Scot.

considered use of the most appropriate 'humanist' manuscript, and returns us to Ulrike Bauer's suggestion that he merely lifted the images from some readily available illuminated manuscript – either from Michael Scot or from a Hyginus manuscript showing signs of contamination from the iconographic tradition of southern Italian Germanicus manuscripts, such as the Laurentian manuscript, Plut. 89, sup. 43. His re-use of the blocks in his Augsburg edition tends to support the former hypothesis. One can imagine that, when Ratdolt returned home to Augsburg, he found a local market that was more amenable to an illustrated edition of a German translation Michael Scot – for which, luckily, he had the right set of illustrations (albeit with the stars in the wrong places). Nevertheless, one is still left to wonder why he decided to veil this enterprise under the spurious identity of 'Hyginius'.

In conclusion, the benefits of printing as a medium for reducing the costs of text production and increasing the accessibility of information to the general populace have been explored in depth and rightly lauded. The disadvantages of the technical efficiency of the printing press are discussed less often. One of the few fifteenth-century laments, made by the Venetian scribe, Filippo de Strata, focuses on three aspects of the development: first are the morally corrupting forces that printers have introduced to the impressionable youth of Venice through their low-cost publications of Tibullus and Ovid; second is the fact that more reputable scribes were being driven from their homes by poverty, unable to compete against these ignorant and profit-minded foreigners; and third is that when information is too readily available, it leads to a kind of intellectual wantonness – for 'writing is a maiden with a pen, a harlot in print'.[71] It is the kind of call to arms one hears today, prompted by a similar step-change in how quickly information (and mis-information) is being disseminated by digital media.

It would seem a mistake to identify speed of delivery as the sole culprit in this instance, however. For, as we have seen, Michael Scot's fantastical renderings of the constellations were very successfully spread across Europe via the very slow medium of the manuscript. Nevertheless, there is something disconcerting about the way in which Ratdolt's decision to use a certain set of illustrations all but calcified the iconography of the heavens for nearly fifty years; and that it has taken scholars over 500 years to begin to untangle the after-effects.

71 Filippo de Strata's 'Polemic against Printing', addressed to Doge Nicolò Marcello in 1473-74 and preserved in Venice, Bibl. Marciana, Ital., class I, 72 (5074), fols 1*v*-2*r*. See Grier-Lowry 1986 (unpaginated). See also the arguments made in *De laude scriptorum manualium* by the German abbot and polymath, Johannes Trithemius (1462-1516), who did not disparage against the process or product of printing itself, but argued that there were greater spiritual benefits for monks (at least) to be gained from the practice of writing-out texts by hand. Brann 1981, esp. 144-74.

Appendix I

Astronomical and astrological treatises with constellation illustrations directly influenced by the illustrations in Ratdolt's 1482 edition of the *De Astronomia* of Hyginus.[72]

1 Hyginus. Venice: Erhardt Ratdolt, Pridie Idus [10] Octobris 1482

[Hain *9062; GW n0374; ISTC ih00560000; USTC 994236]

Clarissimi Viri Iginij Poeticon Astronomicon Opus utilissimu[m] Foeliciter Incipit. De Mundi [et] spherae ac utriusq[ue] partiu[m] declaration[n] e. // Hoc Augustensis ratdolt germanus Erhardus.... Anno salutis. 1482. Pridie Idus. Octobris. Venetiis.

The text is based on a fifteenth-century north Italian manuscript model (derived from Salutati's manuscript). Book IV is followed by three poems to the reader: one by Jacobus Sentinus Ricinensis (Giacomo Sentini); one by Sentini praising Santritter; and one by Johannes Santritter (named as Johannes Lucilius Hebronnensis).

The illustrations resemble those in Michael Scot's *Liber Introductorius*.

2 Hyginus. Venice: Erhardt Ratdolt, 22 January 1485

[Hain *9063; GW n0375; ISTC ih00561000; USTC 994235]

CLARISSIMI VIRI HYGINII POETICON ASTRONOMICON. OPUS UTILISSIMUM FOELICITER INCIPIT. De Mundi & sphęrę ac utriusq[ue]

72 This text was first compiled as part of my doctoral thesis in 1987. This version contains an updated and, I hope, corrected version. The title-pages, colophons and illustrations for each of these can be found on The Saxl Project (manuscripts and early printed books). As all these printers and publishers regularly re-used their picture blocks in varying formats, this list does not include works in which only diagrams, planetary gods or zodiac signs appear without the fuller range of constellations. Such volumes include Ratdolt's 1482 Venetian edition of Sacrobosco's *Sphaerae mundi* and his 1488 Augsburg edition of Johannes Angelus's *Astrolabium planum*, where 96 new illustrations of the decans (*facies*) and *paranatellonta* of each zodiacal sign feature (see also, the free copy of Ratdolt's volume printed in Venice on 1494 by Johannes Emericus de Spira for Lucantonio Giunta). See also Ratdolt's 1488 and 1495 Augsburg editions of the *Flores Albumasaris*, which has planet gods and zodiac signs and his Albumasaris *Introductorium in astrologiam* (Augsburg 7 Feb 1489), where he introduces a new set of planet-gods alongside his earlier ones. For an overview of these publications, see Schramm 1943, 11-12.

p[ar]tiu[m] declaratione. // Anno salutifere incarnationis Millesimo quadringentesimo octogesimo quinto mensis Ianuarii die vigesima secunda. Impressum est pręsens opusculu[m] per Erhardu[m] Ratdolt de Augusta. Venetiis.

The text remains the same, but has been reset into slightly longer lines. The descriptive poem by Sentini is included at the end of the text, but the second poem by Sentini mentioning Santritter and Santritter's own poem have been deleted.

The illustrations and decorated capitals from Ratdolt's 1482 HYGINUS have been reused, with the exception of:

- an additional block of planispheric globe showing the major circles, line of the ecliptic and an line marking the 'Oblique horizon' (*horizon obliquus*). The diagram is labelled: *scemmus sphaeraecina* (*sic*) *secundum Hyginii descriptionem*.
- a new image of 'Galaxia' follows the final paragraph of Book II (*Praeterea ostenditur circulus quidam in sideribus… deformationem dicere instituimus*: cf. Viré 1992, 194)
- a new, reversed image of Scorpio
- Saturn has been rotated 90° anticlockwise.

3 Hyginus. Venice: Thomas de Blavis, 7 June 1488

[Hain *9065=9064; GW n0373; ISTC ih00562000; USTC 994234]

CLARISSIMI VIRI HYGINII POETICON ASTRONOMICON. OPUS UTILISSIMUM FOELICITER INCIPIT De mundi & sphæræ ac utriusq[ue] partium declaratione. // Anno salutifere incarnationis Millesimo quadringentesimo octogesimo octavo mensis Iunii die septima. Impressum est præsens opusculum p[er] Thomam de blavis de alexandria. Venetiis.

The text follows Ratdolt's 1485 HYGINUS edition, including Sentini's poem. de Blavis also copied Ratdolt's page format, initials, the 'scemmus sphaeraecina' and the image of Galaxia after Book II.

The illustrations are copies after 1485 HYGINUS, which are less fine and, in most cases, reversed from the originals. This suggests that the illustrations were traced from the printed images on to new blocks, hence reversing them. Labels for most figures are placed on the vertical borders of each block. There are idiosyncracies in some of the figures arising from defects and breakages in the printing blocks, which make the de Blavis blocks easily identifiable when they are later re-used. These include:

- the lion of Hercules with blackened eyes

- distortion in the mouth of Auriga, where part of the wood has broken
- mis-cut mouth of Serpens
- closed eyes in Eridanus
- closed eyes in Sagittarius
- a double contour line along the back of Centaurus.

4 Avienus, *Opera*; Aratus, *Phaenomena*;
Quintus Serena, *De medicina praecepta saluberrima*.
Venice: Antonio de Strata, 25 October 1488

[Hain *2224; GW 3131; ISTC ia01532000; USTC 994236]

[descriptive paragraph of the contents of the volume following the introductory letter by Victor Pisanus] Hic codex avienii co[n]tinet epigram[m]a. eiusde[m] arati phænomena geographia[m] carmine heroico: & oras maritimas trimetro iambico: germanici quoq[ue]: & marci tulli arati fragmenta: & sereni versus de variis curandis morbis. // [FRAGMENTUM ARATI (Germanicus *Aratea* with the *scholia Strozziana*) Fragmentu[m] arati phænomenon per germanicum in latinu[m] conversi cum co[m]mento nuper in sicilia repertum. // Hoc opus impressumq[ue] Venetiis arte & ingenio Antonii de strata Cremoneosis. Anno salutis. M.ccccxxxxviii. octavo calendas novembres.

de Strata re-uses de Blavis's 1488 HYGINUS blocks. There has been an attempt to rearrange the constellations according to the order in which they are described by Aratus. As a result, a number of mistakes occur in matching illustrations with text. For example:

- the figure of Orion is used to illustrate Hercules and Perseus
- Hercules is used to illustrate Ophiuchus
- Sagittarius is used to illustrate Orion.

In addition to this:

- a new planisphere has been added as the first illustration (*Hic est stellarum ordo… = scholia Strozziana*, cf. Breysig 1867, 107).
- there is a new depiction of Bootes as an oxen-driver
- the block for Pegasus has been used twice – first, as the front half of the horse emerging from clouds; second, with the clouds and wings cut off. Both appear to illustrate the section on Pegasus
- Triangulum appears twice – first, above the head of Aries; and second, on its own
- there is a new representation of the Pleiades as 7 female figures
- there is a new representation of Ara as a standing nude male wearing a cap with donkey's ears and from whose head flames issue

- the illustrations for Galaxia, Andromeda, Ophiuchus, Sagitta, Scorpio, Capricorn, Cetus, Canis Maior and the five planet-gods (Saturn, Jupiter, Mars, Venus and Mercury) have not been used

5 ‘Hyginius’, Von den zwölf Zeichen...
Augsburg: Erhardt Ratdolt, after 8 August 1491

[Hain 9067 (as Hyginus); GW n0376 (as pseudo-Hyginus); ISTC ih000563000 (as Hyginus); USTC 745887 (as Hyginus)]

Hyginius von den.xij. zaich[en] und xxxvj. pildern des hymels mit yedes stern. Auch die natur v[o]n eygenschafft der menschen so die darundter geborn werden. Und was in eim yeden.xij. zaichen zethun [= for ‘zu tun‘] oder ze lassen ist so der mond darinn ist. Auch von der eygenschafft der siben planeten. // Gegen zu augspurg. am achten tag des Merczen jm.lxxxxj. jar. Gedruckt zum Augspurg durch Erhart ratdolt jn dem.lxxxxj jare.

The text is not Hyginus, but taken from a German version of Michael Scot. The zodiacal and planetary figures use the blocks from Ratdolt’s 1485 HYGINUS, with the exception of individual representations of Libra and Scorpio from Ratdolt’s 1488 *Astrolabium Planum* (see above, note 78). The extra-zodiacal constellations have also been taken from Ratdolt’s 1488 HYGINUS, with the following changes:
- *Draco inter arctos* has been rotated 90° clockwise.
- there is a new image for Equus secundus as a full, winged horse
- there is a new image for Vultur cadens of a youth (Ganymede) seated on an eagle; the eagle stands on an arrow
- Galaxia appears as Demon meridionalis
- Terebellum and Vexillium have been added.
- a new depiction of the geocentric cosmos with the orbs of the planets has been added (taken from Ratdolt’s 1482 Venetian edition of Sacrobosco’s *Sphaerae mundi*; see above, no. 78, above).
- small versions of the zodiac signs, also re-used from prior Ratdolt publications, appear between the depictions of Sol and Venus.

6 Fragmentum Arati from *Scriptores astronomici veteres*. Venice: Aldus Manutius, June and [17] October 1499

[Hain *14559; GW 9981; ISTC if00191000; USTC 760281]

[table of contents] Arati Phænomena Germanico Cæsare interprete cum commentariis & imaginibus. // ARATI VITA E GRAECO IN LATINUM, ALDO MANUTIO ROMANO INTERPRETE. [A]ratus Athenodoro patre fuit.... // FRAGMENTUM ARATI PHAENOMENON PER GERMANICUM IN LATINUM CONVERSI CUM COMMENTO NUPER IN SICILIA REPERTO. [C]oELUM circuli quinq[ue] distinguitur... // Venetiis cura, & diligentia Aldi Ro. Mense octob[ris] M.ID. Cui concessum est ab Ill. S.V. ne hos quoq[ue] libros alii cuiquam impune formis excudere liceat.

The illustrations are a combination of reused blocks from Blavis's 1488 HYGINUS and newly-cut, more delicate copies of the de Blavis illustrations. In some cases, the figures have been reversed. Many of the mistakes in placement and identification that appeared in the 1488 de Strata FRAGMENTUM ARATI have been repeated, such as using the illustration of Orion for Hercules and Perseus, and of Sagittarius for Orion. Differences from the 1488 de Strata edition include:

- *Draco inter arctos*, Bootes, Corona, Triangulum, Pleiades have been re-cut and refined
- the figure of 'Equus dimidius' reuses the Pegasus block, rotated 90° clockwise and only the fore-section is printed
- Pisces have been inverted
- Ophiuchus and Cetus reappear
- the pictures for Galaxia, Andromeda, Sagitta, Scorpio, Capricorn and Canis maior have not been used.

7 Hyginus. Venice: Johannes Baptista Sessa, 25 August 1502

[BMC 12545; USTC 762104]

[frontispiece] Clarissimi Hyginij Astronomi De Mundi Et Sphere Ac Utriusq[ue] Partium Declaratione Cu[m] Planetis Et Varijs Signis Historiatis. // CLARISSIMI VIRI HYGINII POETICON ASTRONOMICON. OPUS UTILISSIMUM FOELICITER INCIPIT. De mundi & sphæræ ac utriusq[ue] partium declaratione. // Impressum Venetiis Per Ioannem Baptistam Sessa Anno Domini. M. CCCCC. II. Die. XXV. Mensis Augusti.

The text is based on the Sentini edition and his poem appears at the end of the volume. There is a new frontispiece with a bearded man, labelled

'Hyginius', enthroned and holding an astrolabe raised in his left hand and an armillary sphere in his lap with his right hand. He is flanked by two semi-nude female figures. One reads a book and is labelled: Astronomia; the second looks to the heavens and is labelled 'Urania'.

Also, there is the depiction of an armillary sphere held by a hand emerging from the clouds and labelled 'scemma sphericum secundum Higinii descriptionem'. The format has been copied from Ratdolt's 1482 edition of Sacrobosco's *Sphera mundi*, but this version first appears in JB Sessa edition of Sacrobosco printed in Venice on 1 December 1501. Half the constellation illustrations in this edition appear to be new copies of Ratdolt's 1485/1488 HYGINUS images and, as such, retain the original orientation. In general, they are executed in a finer, more fluid line, with fewer indications of shading and more normative, 'Renaissance' proportions. The rest have also been reworked, but are based on the de Blavis 1488 HYGINUS pictures. During this process, some of the stars have been repositioned, as well.

- The figures that best retain a Ratdoltian, 'Germanic' feel are: Galaxia, Lyra, Cygnus, Cepheus and Auriga.
- The new figures loosely based on the postures of Ratdolt's figures are Bootes, Andromeda (having lost her clothes and her landscape), Perseus (beardless, without his mantle and more dynamic), Pegasus (with forelegs crossed), Sagittarius, Aquarius, Orion and Centaurus
- Hercules, Cassiopeia, Ophiuchus, Sagitta, Aquila, Delphinus, Aries, Taurus, Leo, Virgo, Scorpio, Canis Maior and Minor, Navis, Lepus, Ara, Hydra/Crater/Corvus and Piscis austrinus have all been refined and reversed
- The planet gods have also been refined, reversed and updated.

8 Hyginus. Paris: Thomas Kees, 24 May 1412 (1512)

[STC, 235; Moreau II, 365; FB 74663; USTC 180671]

[frontispiece] Hyginii historiographi verissimi simul [et] philosophi p[ro] fu[n]dissimi Aureu[m] opus historiasq[ue] ad amussim p[er]tracta[n]s una p[ar]iter cu[m] multis astronomice rationis ambagibus [et] signis poetaru[m] locis prope infinitis exacte calle[n]dis no[n] mediocriter co[n] ducturis in luce[m] editum habes, candidissime lector, q[uod] pauxilla tibi pecu[n]ia [com]p[ar]ari poterit. [OLIVIER SENANT] // Clarissimi viri Hyginii Poeticon Astronomicon. Opus utilissimum ffeliciter incipit. De mundi & sphere ac utriusq[ue] partium declaratione // Impressum Parrhisiis per Thoma[m] Kees Wesaliensem Anno D[omi]ni M.CCCCxij. (*sic*) Die. xxiiij,]. mensis Maij.

The text is the Sentini edition and is followed by his poem. The illustrations appear to be a mélange of images copied from de Blavis's 1488 HYGINUS edition (sometimes with embellishments) and Johannes Baptist JB Sessa's 1502 HYGINUS. The allocation is as follows:

- de Blavis 1488-influenced are: *Draco inter arctos* (with the addition of a banderole labelled 'DRACO'), Bootes, Sagitta, Aquila, Pegasus, Orion, Canis Maior, Ara and Navis
- JB Sessa 1502-influenced are: Galaxia, Hercules, Cepheus, Cassiopeia, Andromeda, Perseus (with the addition of a labelled banderole), Auriga, Delphinus, Cetus, Eridanus, Lepus, Centaurus, Hydra/Crater/Corvus and the planet gods
- new formulations are: Ophiuchus. Aries, Taurus, Gemini, Cancer, Leo, Virgo, Scorpio, Libra, Sagittarius, Capricorn, Aquarius, Pisces.

9 Hyginus. Venice: Melchior Sessa et Petrus de Ravani, 15 September 1512

[BMC 13166A; USTC 836044]

(frontispiece) Clarissimi Hyginii Astronomi De Mundi Et Sphere Ac Utriusq[ue] Partium Declaratione Cu[m] Planetis Et Varijs Signis Historiatis. // CLARISSIMI VIRI HYGINII POETICON ASTRONOMICON. OPUS UTILISSIMUM FOELICITER INCIPIT. De mundi & sphæræ ac utriusq[ue] partium declaratione. // Impressum Venetiis per Melchiorem Sessa Anno Domini. M.CCCCC.XII. Die. XV. Mensis Septembris

The text is the Sentini edition, with his poem included at the end.

The format of the volume is based on the Johannes Baptisa Sessa HYGINUS 1502 edition in terms of the title page, pagination, characters and numbers. The title page itself has been reworked and 'tidied' – so much so that the banderoles are missing their letters. There are a number of new decorated capitals throughout. The depiction of an armillary sphere held by a hand emerging from the clouds and labelled 'scemma sphericum secundum Higinii descriptionem' (as in JB Sessa HYGINUS 1502) has been re-cut, so the sleeve no longer overlaps the bottom frame of the image.

In general, it seems that the press used the occasion of a new edition of Hyginus to create a completely new set of blocks. They are still loosely based on the long-standing Ratdolt – de Blavis – Sessa images, but a subtle change has been introduced in that several of the figures are now portrayed from the rear, suggesting that Melchior Sessa's illustrator has used a celestial globe as an inspiration. Also, most of the background scenes for the figures have been deleted (such as for Bootes, Hercules, Andromeda and Bootes) – again, bringing the figures more in line with those found on a celestial globe. The figures that are most telling in this regard are:

- Bootes with his left hand extended upwards
- Cepheus seen from the back, carrying two short sticks in his upraised hands
- Cassiopeia seen in her throne from the back
- Andromeda with arms outstretched and fleeing, with her back to the viewer
- Auriga and Hercules without mythological attributes
- Taurus and Gemini have been reformed, with Taurus exhibiting the long horns usually associated with Arabic-based *Sufi latinus* illustrations
- Aquarius and Virgo are shown from the rear
- Sagittarius has lost all his Michael Scot-derived accoutrements, and raises his right foreleg
- Orion is depicted in a lunging posture with his scimitar and shield reaised above his head
- Eridanus is depicted as a stream.

10 Hyginus. Pavia: Jacobus Paucidrapis de Burgofranco, 12 January 1513

[BMC 13899; USTC 836045]

CLARISSIMI VIRI HYGINII POETICON ASTRONOMICON OPUS UTILISSIMUM FOELICITER INCIPIT. De mu[n]di [et] sphęrę ac utriusq[ue] partiu[m] declaration[n]e. // Habeo lector ca[n]didu[m] aureu[m] Higinij opus: novissime i[n]finitis pene errorib[us] eme[n]datu[m]: maximaq[ue] dilige[n]tia PAPIAE Impressu[m]: arte [et] industria IACOB Paucidrape[n]sis de Burgofra[n]co: Sumptib[us] v[ir]o heredum quondam Nobilis viri d[omi]ni Octaviani Scoti [et] sociorum. Anno D[omi]ni. M.DXIII.Die.XII.Ianuarij.

The text is the Sentini edition, with the customary poem at the end. There is a second poem written to Io. Andreas de Flandria Salutiensis commending the utility of the edition. The frontispiece is a loose copy of JB Sessa's 'Sphaera mundi', with the addition of a semicircular starry sky at the top.

The illustrations are free copies of the original Ratdolt 1482/85 blocks, simply and somewhat crudely drawn. The only notable changes are that:

- Draco inter arctos has been rotated 90° anticlockwise
- Hercules does not bend his knees
- Scorpio with Libra have been reversed
- Centaurus has lost some of his attributes

11 Paulus Venetus, *Summa philosophia naturalis…*

The treatise was reprinted at least eleven times in Paris between 1512 and 1520. The editors of the text vary, but Thomas Kees appears to have been the printer for several of these volumes. Of the six I have been able to examine, four have constellation illustrations using the blocks of Thomas Kees HYGINUS 1512:

a. 14 November 1513 – Thomas Kees for Gilles de Gourmont [Moureau II, 679; FB 81940]
b. 14 November 1513 – Thomas Kees for Ponset Le Preux [Moreau II, 679; FB 81941]
c. 1514 – Thomas Kees for Gilles Gourmont [Moreau II, 921; FB 81946]
d. [1514] – Thomas Kees (?) for Jean Lambert and Olivier Senant [Moreau II, 919; FB 81944]

12 Hyginus. Paris, Jean Lambert, 31 March 1514

[STC, 235; Moreau II, 881; FB 74663; USTC 144250]

[frontispiece] Hyginii historiographi Verissimi simul et philosophi profundissimi. Aureum opus historias ad amussim pertractans una cum multis astronomice rationis ambagibus. [et] signis poetarum locis prope infinitis. exacte callendis. no[n] mediocriter co[n]ducturis, in lucem editum habes candidissime lector. q[uod] pauxilla a te pecunia comparari poterit. Jehan Lambert Venundantur parhisiis in clause brunello sub signo div [ ] Claudii sedente. // Clarissimi viri Higinij Poeticon Astronomicon. Opus utilissimu[m]. // Vale Parrhisijs pridie Kal[endas]. aprilis M.CCCCCXIIII.

The text is a new edition by Johannes Lodovicus Vives Valentinus (Juan Luis Vives de Valencia). The Sentini poem still appears at the end of the volume, but is followed by a poem by Vives.

The illustrations are the reused blocks from Thomas Kees's HYGINUS 1512.

On the reverse of the frontispiece, there are two images: a coat of arms and a depiction of nude men and woman in a bathing pond.

13 Radinus Todischus, *Sideralis Abyssus*. Paris: Thomas Kees for Hémon LeFèvre, May 1514

[STC, 371; Moreau II, 954; FB 84225]

[frontispiece] Sideralis Abyssus…. Venalis est liber in via Jacobea sub signo Lunae crescentis. Iuxta aede[m] divo benedicto sacra[m]. // Luteciae impressum op[er]a Thomę Kees: impensis vero honestissimi bibliopolę Hedmo[n]di Fabri. Anno ab orbe rede[m]pto Millesimo supra quingentesimum decimu[m]quartum: mense Maio.

The text is by Tommaso Radini Tedeschi of Piacenza (1488-1527), a Dominican Friar and vociferous opponent of Martin Luther.

Flanking the Prohemium, there is an image of the armillary sphere held by a hand, copied from the JB Sessa exemplar.

The illustrations are those used by Thomas Kees in his 1512 HYGINUS edition. The only anomalies are:

- Galaxia is inserted between Cygnus and Cepheus as the ‘constellation’ of Circulus Iunonium (= Galaxia)
- A partially printed image of Serpentarius – where the two ends of the Snake have not been registered – has been inserted between Sagittarius and Capricorn alongside the poem entitled ‘Elegia Amicitiæ’. The image is labelled ‘Tarde cito’.

14 Hyginus. Venice: Melchior Sessa et Petrus de Ravani, 24 March 1517

[BMC 13176; USTC 836046]

[frontispiece] Clarissimi Hyginii Astronomi De mundi Et sphæræ Ac utriusq[ue] Partium Declaratione Cum Planetis Et Variis Signis Historiatis // CLARISSIMI VIRI HYGINII POETICON ASTRONOMICON. OPUS UTILISSIMUM FOELICITER INCIPIT. // Impressasq[ue] Venetiis exactissima cura per Melchiorem sessam & Petrum de Ravanis socios Anno d[omi]ni M.ccccc.xvii. Die. 24. Mar.

The text has been reset (witness different lengths of lines) from the Melchior Sessa 1513 HYGINUS edition.

The illustrations use the same blocks as the 1513 edition, but the colophon of the mouse-catching cat has been updated and reversed.

15 Hyginus. Paris: Pasquier Lambert, 31 August 1517

[STC, 235; Moreau II, 1639; FB 74665; USTC 144770]

Hyginii hystoriographi et phylosophi augustissimi libri quattuor.... // Vale Parrhisijs pridie Kal[endas] Septe[m]bris M.D.XVII.

The text is reprint of Jehan Lambert's 1514 edition of HYGINUS.

The illustrations are the reused blocks of Thomas Kees's HYGINUS 1512. The coat of arms and bathing scene have been deleted.

There is an additional image of nude man standing within a circle with the four cardinal directions marked; and the disembodied hand holding the armillary sphere appears on the final page of the volume.

Appendix 2

Pictorial differences between the illustrations of Hyginus (Oxford, Bodleian Library, Can. class. lat. 179 and Milan, Bibl. Trivulziana, N 690) and Michael Scot (Munich, BSB, clm 10268), with reference to Ratdolt's 1482 edition of Hyginus (** indicates discrepancies with the Michael Scot image)

Draco inter Arctos	Hyginus shows a single grouping of the three constellations; Scot depicts an additional Draco. ** Ratdolt does not add the extra Draco.
Bootes	Hyginus shows Bootes as a warrior holding a shield in front of him so it covers most of his extended arm, raising a club behind his head and stepping on a small platform or box with his leading foot; Scot depicts him as a farmer with a sickle and a spear. Ratdolt follows Scot.
Corona Borealis	Hyginus has two concentric circles (a wreath); Scot has the same. ** Ratdolt depicts a metal crown. [Corona is depicted as a metal crown in Milan, Bibl. Ambrosiana, I 90 sup., it is also a metal crown in the Hyginus manuscript, Milan, Bibl. Trivulziana, N 690]
Hercules	In Hyginus, Hercules holds a whole lion by its hind foot in one hand, and holds a club in the other hand; in Scot, he is accompanied by a tree and a snake (representing the Garden of the Hesperides). Ratdolt follows Scot.
Lyra	In Hyginus, Lyra is a two-stepped zither with a curl on the right side; in Scot, it is a lyre with a frame made of a bull's horns. Ratdolt follows Scot.
Cepheus	The Hyginian Cepheus is an aristocrat (with a crown or a mitre on this head); Scot's Cepheus is slightly less well-dressed and wears a sword at his hip, with a strap running across his chest. ** Ratdolt's Cepheus is a peasant, walking to the right, with a sword on his hip and a strap across his chest. [The 'peasant' Cepheus appears in Scot manuscripts: Berlin, Staatsbibl., germ. fol. 244 and Vienna, ÖNB, Vindob. lat. 2378.]

Cassiopeia	In Hyginus, she is seated on a bench with her arms extended; in Scot she is seated on a high-backed throne and has blood pouring from her left hand. ** Ratdolt follows Scot, with the additional feature of the back of her throne being composed of branches. [The stick throne appears in Scot manuscript: Berlin, Staatsbibl., germ. fol. 244; St Petersburg, Nat. Lib., lat. F. V I.X, no. 1; Vienna ÖNB, Vindob. lat. 2352 and Vienna, ÖNB, Vindob. lat. 2378.]
Andromeda	In Hyginus, Andromeda is a partially nude, walking female figure, who grasps her skirt with one hand and trails the other arm behind her; in the Scot manuscripts, she is hung by her arms from two trees and her skirt is raised to expose male genitalia. Ratdolt follows Scot, but omits her skirt. [Andromeda has exposed legs in London, BL, Add. ms.. 41600; Milan, Bibl. Ambrosiana, I 90 sup.; Padua, Bibl. Seminario, cod. 48; St Petersburg, Nat. Lib., lat. F. V I.X, no. 1; Vienna, ÖNB, Vindob. lat. 2352 and Vienna, ÖNB, Vindob. lat. 2378.]
Perseus	The Hyginus Perseus is seen from the rear, dressed in armour and holds Medusa's severed head in his left hand. The Scot Perseus is nude, with winged feet, and holds a bearded male head in his left hand. ** Ratdolt follows Scot, but his shield is slung over his back and he holds a female head in his left hand. [The female head appears in Scot manuscripts: Berlin, Staatsbibl., germ. fol. 244; and there is no shield in Darmstadt, Landesbibl, ms. 266 and Vienna, ÖNB, Vindob. lat. 2378 and Vienna, ÖNB, Vindob. lat. 5442.]
Auriga	In the Hyginus manuscripts, Auriga is dressed in rags and has one goat on his shoulder and two smaller goats in his outstretched hand; the other hand holds a long flail shaped like a palm lead. In the Scot manuscripts, he rides in a wooden cart, drawn by two oxen and two horses and holds a spear vertically in his right hand. Ratdolt follows Scot, save that the spear is missing.
Ophiuchus	In Hyginus, he is nude, walking and has the Serpens wrapped around his hips; in the Scot manuscripts, he stands on the back of Scorpio. ** Ratdolt's figure faces the viewer and does not stand on Scorpio.

Sagitta	Hyginus depicts an arrow on its own; Scot has an arrow beneath the feet of Aquila/ Vultur volans, beneath the feet of Vultur cadens and between the feet of Sagittarius. ** Ratdolt has an arrow and a bow on its own.
Aquila	Hyginus depicts an eagle on its own; Scot shows two eagles (Aquila / Vultur volans with an arrow in its claws and Vultur cadens bearing Ganymede). ** Ratdolt follows Hyginus. [There is an Aquila without an arrow in Milan, Bibl. Ambrosiana, I 90 sup.]
Delphinus	In the Hyginus, Delphinus is placed on his back and has a beaky snout and a pronounced wattle; Scot has him swimming normally. Ratdolt follows Scot.
Pegasus	The Hyginus Pegasus has raised wings and wears a bridle; Scot's is similar but without a bridle. ** Ratdolt shows Pegasus emerging from clouds without a bridle.
Triangulum	(see ARIES below) The Scot and Ratdolt images show a separate Triangulum.
Aries	One defining feature amongst almost all the Renaissance Hyginus manuscripts, is the depiction of Aries placed with its head 'intra triangulum'. Scot has a leaping ram without the triangle encircling his head (and sometimes a ram bearing a cross). ** Ratdolt has a ram walking to the left, while looking back over his shoulder.
Gemini	Hyginus shows two nude youths shaking hands; one raises his hand in salutation and the other holds what appears to be a flame in his other hand. Scot depicts the Gemini as two winged youth, holding a curved stick and a lyre. Ratdolt follows Scot.
Cancer	The Hyginian Cancer is a round-bodied crab, often with a crescent on his posterior; Scot depicts an ordinary crab. Ratdolt follows Scot.
Virgo	In Hyginus, Virgo is winged and holds a blade of wheat or a palm frond in one hand and raises her other hand in front of her chest. In Scot, Virgo is winged and holds a caduceus and blades of wheat. Ratdolt follows Scot.
Libra	In Hyginus, Scorpio holds the scales of Libra in its claws. The Scot Libra is a seated man holding a balance. ** Ratdolt shows Scorpio holding Libra in its claws.
Scorpio	In Hyginus, Scorpio holds the scales of Libra in its claws. Scot's Scorpio appears twice: once as a scorpion without the balance (as a zodiac sign), and once beneath the feet of Ophiuchus.

Sagittarius	The Hyginus Sagittarius is a youthful centaur with a drawn bow. In the Scot manuscript, the figure is bearded, has horns and a lion-skin cape fluttering out behind him, with a double-headed arrow between his hooves and a knot in his tail. ** Ratdolt follows Scot.
Capricorn	Hyginus's Capricorn is a goat with a snaky tail ending in a curl. Michael Scot's Capricorn has a slim tapering tail with no knot** Ratdolt's Capricorn stands on one foreleg and has a knot in its tail.
Aquarius	Hyginus's Aquarius is a youth holding an upturned urn in one hand. Scot's Aquarius is a standing nude male, with a farmer's hat and pouring water from an urn.
Pisces	The Hyginus Pisces have both backs towards the top of the page, and their mouths are connected by a tube or string. Scot's Pisces are placed belly-to-belly and their mouths are connected with a line. Ratdolt follows Scot.
Cetus	The Hyginus manuscripts depict Cetus as half dog/half tapering-tailed fish; in the Scot manuscripts, Cetus is a large fish. *** Ratdolt follows Scot, but adds a pointed nose, tusks and a nautilus around its eye.
Eridanus	Eridanus is a standing nude (female?), with an urn held horizontally on her. In the Scot manuscript, Eridanus is a bearded male figure reclining (swimming) by a stream, with one hand held to his cheek and the other extended behind him. Ratdolt follows Scot.
Orion	Hyginus's Orion stands frontally and holds a sword upright in one hand, while resting the thumb of his other hand in his belt. Scot's Orion is dressed in armour and holds a body-length shield, while holding a sword above his head. ** Ratdolt's Orion is dressed in armour, his shield has a face on it and he raises a club. [The shield with a face on it appears in Scot manuscripts: Berlin, Staatsbibl., germ. fol. 244. It is also a feature of the image of Mars in Berlin, Staatsbibl., germ. fol. 244; Darmstadt, Hessische Hochschulbibl., ms. 266; Prague, DK, XXVI. A.3; Salzburg, Univ-bibl., M. II. 180; Vatican, BAV, Pal. lat. 1370; Vienna, ÖNB, Vindob. lat. 2352.]
Navis	The Navis is a full ship in Hyginus; it is half-a-ship in the Scot manuscripts, with a small tortoise appearing at the point where the hull is cut-off. Ratdolt follows Scot.

Centaurus	Centaurus in Hyginus is a centaur, holding a dead rabbit in one hand, which is extended in front of him; in the Scot version, he is a centaur and holds a dead animal extended in front of him in his right hand with a flask hanging from the wrist of that hand, and he has a rabbit hanging from a spear that rests on his other shoulder. ** Ratdolt follows Scot, except the figure is half-man and half-cow. [The figure has cloven feet in Scot manuscripts: Berlin, Staatsbibl., germ. fol. 244; St. Petersburg, Nat. Lib., lat. F. V I.X, no. 1; Vienna ÖNB, Vindob. lat. 2352 and Vienna, ÖNB, Vindob. lat. 2378.]
Ara	The Hyginus Ara is a two-tier, circular altar; the Scot image is a flaming cup surrounded by four demons. Ratdolt follows Scot, but has two demons.
Hydra, Crater,	Hydra is a two-legged dragon in Hyginus, with Crater and Corvus on his back; in CORVUS Radtolt follows Scot.
Piscis Austrinus	The Hyginus Piscis is a large fish; the Scot image has a large fish on its back, with a smaller one resting on the larger one's stomach. ** Ratdolt follows Scot, but the image is inverted so the larger fish is upright and the smaller fish is beneath it.

Abbreviations

BMC = *Catalogue of Books Printed in the Fifteenth Century, Now in the British Museum*. London: British Library, 1908-2007.
DBI = *Dizionario biografico degli Italiani*. Rome: Istituto della Enciclopedia italiana, 1960 -.
FB = Pettegree, Andrew; Walsby, Malcolm. *French Books III & IV.* Books published in France before 1601 in Latin and Languages other than French. Leiden: Brill, 2012.
GW = *Gesamtkatalog der Wiegendrücke*. Leipzig: Hiersmann, 1925 -.
IGI = *Indice generale degli incunaboli delle Biblioteche d'Italia*. Roma: Libreria dello Stato, 1943-1981.
ISTC = British Library, *Incunabula Short Title Catalogue* (`http://www.bl.uk/catalogues/istc`)
Hain = Hain, Ludwig. *Repertorium bibliographicum*. Stuttgart-Paris: Cotta-Renouard, 1826.
Moreau = Moreau, Brigitte. *Inventaire chronologique des éditions parisiennes du XVIe siècle*. Paris: Service des Travaux Historiques de la Ville de Paris, 1972-2004.
The Saxl Project (`http://www.kristenlippincott.com/the-saxl-project`)
STC = *Short-title Catalogue of Books Printed in France and of French Books Printed in Other Countries from 1470-1600 in the British Museum.* London: The British Museum, 1966.
USTC = Universal Short Title Catalogue (`http://www.ustc.ac.uk`)

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Certissima signa
A Venice Conference on Greek and Latin Astronomical Texts
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On Aldus' *Scriptores astronomici* (1499)

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Abstract The *Scriptores astronomici veteres* were published by Aldus Manutius in Venice 1499. This book represents the most ambitious humanist attempt to reconstruct ancient astronomical wisdom by presenting the original texts of ancient authors. As such, the volume raises several questions. What is the rationale of Aldus' selection? What do we know about his manuscript sources and the editorial process? What is the history of the incunable's remarkable illustrations (most notably those in Firmicus' books 2 and 6, and in Germanicus' Aratea)? How does this edition fit into one of the most difficult periods of Aldus' Venetian enterprise? This paper attempts to tackle some of these issues.

Keywords Astronomy. Manuscripts. Incunables. Classical Tradition. Editorial Technique. Aldine Press. Book Illustration. Illumination. Italian Humanism.

The substantial incunable (376 pages), edited by the Venetian press of Aldus Manutius in October 1499 and known by the conventional title of *Scriptores astronomici veteres*, has not been the object of a systematic study in modern times.[1] Still, despite its conspicuous absence from the editorial program spelled out by Aldus in the preface to his 1497 edition

1 IGI 8846; H *14559; GW 9981; BMC V.560. In the frontispiece the contents are described as: *Iulii Firmici Astronomicorum libri octo integri et emendati, ex Scythicis oris ad nos nuper allati; Marci Manilii Astronomicorum libri quinque; Arati Phaenomena Germanico Caesare interprete cum commentariis et imaginibus; Arati eiusdem phaenomenon fragmentum Marco T.C. interprete; Arati eiusdem Phaenomena Ruffo Festo Avienio paraphraste; Arati eiusdem Phaenomena graece; Theonis commentaria copiosissima in Arati Phaenomena graece; Procli Diadochi Sphaera graece; Procli eiusdem Sphaera, Thoma Linacro Britanno interprete*.

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of Crastone's *Dictionarium*,[2] the volume shows several features that can illuminate both Aldus' *modus operandi* and his general ideas about the propagation of Greek and Latin technical doctrine – the books "tamquam ab inferis ad superos revocati".[3] In what follows, we shall try to deal very briefly with some of the larger, mostly unsolved issues posed by this incunable. The first part of the paper will deal with its rationale, and the second part will investigate the possible sources of the texts it carries.[4]

1 Contents and Ordering

1.1 A Miscellany

The 1499 incunable is the first Aldine edition that gathers together the works of different ancient authors into a single volume. Earlier in the same year, Aldus had published a volume of the *Greek Epistolographers*, but that collection was composed of additions clustering around an original core that to some extent had already existed in the Byzantine manuscript tradition.[5] In contrast, apart from the Manilius-*Aratea* cluster of texts, the combination of Greek and Latin texts is entirely the fruit of the editor's initiative. Structurally, the incunable is constituted of four different parts that were sold separately as late as 1503, and that still circulate separately in several modern libraries:[6]

- The first section (cc. *1 - kk 8: the colophon points to June 1499)[7] contains Firmicus Maternus' *Mathesis*, which is introduced by two prefaces: one by Aldus to Guidubaldo da Montefeltro (Oct. 16th, 1499) and one by Francesco Negri to Ippolito d'Este (Aug. 29th, 1497).

2 *AME*, 20.

3 Quoted from Aldus in his letter to Guidubaldo da Montefeltro, which serves as a preface to the edition of Firmicus Maternus' *Mathesis* in the 1499 incunable (*AME*, 27).

4 Sections 1.1-4 and 1.6 are the fruit of the cooperation of E. Lugato and F. Pontani, whereas the remaining parts are written by Pontani.

5 On the genesis of this incunable, and on the important role played in it by Markos Mousouros, see Sicherl 1997, 155-290.

6 The 1503 catalogue of Aldus' output lists under the *Libri Graeci*: "Leontii Mechanici de Sphaerae Arati constructione; Arati Solensis Phaenomena cum commentariis Theonis; Procli Diadochi Sphaera graece et latine" (*AMT*, 119). This item disappears from the 1513 catalogue of the press.

7 The colophon on c. kk 8*r* reads: "Venetiis in aedibus Aldi Romani mense Iunio MID. Ne quis impune integros hos ac emendatos Materni libros hinc ad annos decem formis iterum queat excudere cautum est".

- The second section (cc. A 1 - N 6; no prefaces and no colophon) includes Manilius' *Astronomica* and the three Latin *Aratea* by Germanicus, Cicero and Avienius.
- The third section (cc. N 1 - S 10; no prefaces and no colophon) contains the Greek treatise *De Arati Sphaerae constructione* by a certain Leontius Mechanicus, and the Greek text of Aratus' *Phaenomena* with the scholia of Theon of Alexandria.
- The fourth, final section (cc. T 1-8; the colophon points to October 1499)[8] carries Ps.-Proclus' *Sphaera* in the Greek original with the Latin translation by Thomas Linacre. There are three prefaces: one by Aldus to Alberto Pio di Carpi (Oct. 14th, 1499), one by William Grocyn to Aldus himself (Aug. 27th, 1499), and one by Linacre to Arthur Tudor (undated).

1.2 A Bilingual Book

The *Scriptores astronomici* is the only Aldine edition containing a collection of both Greek and Latin texts. Apart from vocabularies and grammars (or works with translations, such as the 1501 Philostratus and the case of Politian's Greek epigrams in his 1498 *Opera*), the only comparable instance is that of the *Poëtae Christiani Veteres* (4 vols., 1501-1504), in which Greek and Latin works coexisted, albeit to a lesser extent. In that case (just as with his 1505 edition of Aesop), Aldus devised a sophisticated system of Latin translations printed on removable quires interfoliated with the quires of the Greek text.[9] To the best of our knowledge, however, there are no other Aldine publications in which Greek and Latin authors are juxtaposed as they are in the 1499 *Scriptores astronomici*.[10]

8 The colophon on c. T 8*r* reads: "Venetiis cura et diligentia Aldi Ro. Mense octob. MID. Cui concessum est ab Ill. S.V. ne hos quoque libros alii cuiquam impune formis excudere liceat".

9 See the preface to the 1501 volume (*AME*, 35-36; the same in the 1504 Gregory Nazianzen, see *AMT*, 104 and 131) and the Aesop reader (*AMT*, 139-40; see already the complicated history of the Musaeus: *AMT*, 30 and Sicherl 1997). Aldus himself had devised this system in order to enable a simultaneous reading of Greek and Latin for beginners, without forcing the more experienced readers to endure it. Dionisotti 1995, 131.

10 The 1503 and the 1513 catalogues of Aldus' output list the book under the *Libri Latini* (*AMT*, 120 and 169).

1.3 An Illustrated Book

The *Scriptores astronomici* is also one of the very few Aldine editions to carry a significant apparatus of illustrations.[11] These illustrations should be considered not only in relation to the extant traditon of printed illustrated astronomical treatises, but also in connection with the Aldine publication of the highly-illustrated *Hypnerotomachia Poliphili* in December 1499, the origin and significance of which remains highly controversial among scholars.[12] The relationship between the *Polifilo* and our incunable is proved not only by technical features demonstrating that they were produced simultaneously in Aldus' atelier,[13] but also by the fact that:

a. the same artist who is found at work on the *Polifilo* (perhaps Benedetto Bordon, or the 'Second Master of the Griffo Canzoniere') drew at least one image in our incunable (see below § 2.3);
b. there was a long-standing personal acquaintance between the sponsor of the *Polifilo*, the Veronese lawyer Leonardo Grassi, and the editor of Firmicus Maternus, the Venetian scholar Francesco Negri (see below, Appendix);
c. the dedicatory letters of both books are addressed (in one case by Leonardo Grassi, in the other one by Aldus himself) to the same man, namely Guidubaldo I, Duke of Montefeltro (1473-1508), who had been in Venice in the spring of 1499;[14] and
d. in at least one case (but more instances might perhaps be identified through a closer investigation of the enigmatic novel), a mythographical reference contained in the text of the *Polifilo* can be explained only by assuming that the author knew the scholia to Germanicus' *Aratea* (the so-called *scholia Strozziana*), which were first edited in our 1499 incunable.[15]

11 Davies 1995, 26. In the 1513 catalogue the illustrations of the Germanicus section are advertised as: "Arati Phaenomena Caesare Germanico interprete cum commentariis et imaginibus" (*AMT*, 169).

12 E.g. Casagrande, Scarsella 1998 and Scarsella 2005, with earlier bibliography.

13 Harris 2006, 119-20.

14 Menegazzo 1966, 448-49, who also insists on some (in our view doubtful) stylistic affinities between the Latin prose of the *Polifilo* and that of Negri's preface to Firmicus Maternus.

15 The detail concerns Molorchus, who is said to be the former owner of the club by which Heracles slew the Nemean lion: Pozzi, Ciapponi 1980, I.54, I.14 and II.88. The same story about Molorchus' club is also told by Ampelius, *Liber memorialis* 2.5, a text that remained unknown to the West until the rediscovery by Claude Saumaise in the 17th century.

1.4 From Latin to Greek, from Astrology to Astronomy

The presence of Greek texts in the second part of the 1499 incunable is neither accidental nor the fruit of an unthinking gathering.[16] Instead, it reflects a precise cultural idea, revealed by the very ordering of the ancient works printed – an ordering which proceeds by-and-large *à rebours* from the most recent text to the most ancient one.

Working chronologically backwards, the final book of the *Mathesis* of the 4th-century astronomer Firmicus Maternus owes a great debt to the 1st-century Latin poet Manilius,[17] who in his turn could not have conceived his *Phaenomena* without ruminating over Cicero's and Germanicus' *Aratea* (1st ca. BCE),[18] which in their turn are, of course, poetic renderings (rather than translations *stricto sensu*) of the Greek text of the *Phaenomena* by Aratus of Soli. This chronological chain almost looks like a manifesto for the return *ad fontes*, namely from each text to its model, a process which – as always in Classical culture – inevitably leads to a Greek source.[19]

Nonetheless, the arrangement of the material also follows another line: the one that moves the focus of enquiry from astrology and speculation on the influence of the stars on human life to the descriptive 'scientific' approach of Aratus' poem.[20] That is to say that astrology is a pivotal topic of Firmicus' *Mathesis*, which opens specifically with an apology of pagan astrology. It is a much less prominent issue in Manilius, and an even less important one in the Latin *Aratea*. In this framework, the Greek and Latin *Sphaera* of Ps.-Proclus (which is, in fact, a collection of excerpts from Geminus' *Introduction to Astronomy*, see below § 2.6) appears as a last-minute addition.

16 As mentioned, for some years the Greek parts were sold separately from the rest. Printing Greek was not an easy task. It is not by chance that the main peculiarity of the fake reprint of our incunable issued by Francesco Mazali in Reggio Emilia in 1503 (c. kk 8*r*: "Impressum Rhegii Langobardiae expensis & labore Francisci Mazalis calcographi diligentissimi. MDIII. Cal. Augusti") is that it omits both Greek sections (Aratus and Proclus, cc. N 1 - T 6), embracing only the quires from c. *1 to c. N 6, and it also employs, in the few Greek inserts of the Latin volume, very rudimental fonts, both more rigid and less clear and simple than Aldus'; however, it had the woodcuts re-fashioned *ad hoc*. The exemplar of this book preserved in the Biblioteca Nazionale Marciana displays a note of its former owner, the 18th-century scholar Apostolo Zeno: "Desunt sequentia", but also a remarkable set of annotation to the Manilius section, by a hitherto unidentified hand that adds the variant readings of the Heidelberg 1590 edition by Joseph Scaliger.

17 Most recently Stiehle 2008, 5.

18 Avienius' work by the same title is of course later in date, but clearly conceived as yet another item in the same *lignée*.

19 Our incunable contains the first ancient Latin poetical texts printed by Aldus since the beginning of his activity in 1494: see *infra* 1.5.

20 On the texts collected by Aldus, see Hübner 2014, 49-50. The short treatise by Leontius Mechanicus on cc. N 1*v*-3*r* has the function of being a mere introduction to Aratus' poem.

1.5 Relationship with Earlier Printed Editions

There is no doubt that the addition of the Greek text of Aratus in the Aldine volume was the most revolutionary addition to modern knowledge of ancient astronomical lore. It was also, perhaps, the greatest *desideratum* of contemporary Renaissance scholars, as is indicated by Vittore Pisani's *praefatio* to the pivotal 1488 de Strata edition of ancient scientific texts (on which see below § 2.3). With regard to Latin texts in the volume, Aldus presents the *Mathesis* of Firmicus Maternus as if it were a real novelty, despite the fact that it is not the *editio princeps* (as we shall see below in § 2.1).

Our incunable therefore, is one of the several instances in which Aldus gives priority to Greek sources over Latin mediations, not in quantitative terms, but in terms of the importance assigned to the respective works.[21] This is by no means an obvious choice in the very year (1499) that has been identified as the moment of Aldus' 'conversion' to Latin texts (no Greek text published until 1502), probably motivated by a series of circumstances: the concomitant, if short-lived, editorial adventure of Zacharias Calliergis, whose *Etymologicum Magnum* (with the decisive help of Markos Mousouros) appeared in July 1499;[22] the need to sell copies, something which the exclusive focus on ancient pagan authors could not guarantee (between 1500 and 1501 very 'popular' texts are issued from the Aldine press, such as Lucretius, St. Catherine, Horace, Juvenal, Persius, Petrarch); the wish to account for the Latin erudition of Italian humanism, most notably through the publication of such a monument of Renaissance philology as Niccolò Perotti's *Cornucopia*.[23]

However, the 1499 incunable offers something that goes well beyond the selection of new texts or a *penchant* for ancient Greek models. The most noteworthy feature of this book is its international dimension, stretching from the book-hunt undertaken by Francesco Negri in Hungary (see below § 2.1) to the enrolment of the Englishman Thomas Linacre, whose translation of the *Sphaera* had been sent to Venice shortly before the date of the incunable's publication and was perceived by many as the founding act of English humanism.[24] It is specifically this new dimension of *respublica literaria* that Aldus highlights in his preface to the edition of Statius in 1502.[25]

21 Dionisotti 1995, 95-96. Id., in *AME*, xxxv: "Era naturale, date le premesse, che alla letteratura classica latina Aldo giungesse per la via greca della filosofia e della scienza". Dionisotti 2003, 9-11. Zorzi 1994, 36.

22 E.g. Fantuzzi 1992; Layton 1994, 21-22 and 318-33; Staikos 1989, 375-400.

23 On this delicate moment in the story of the Aldine press, see Lowry 2000, 150-53; Dionisotti, in *AME* xxxi-xxxv.

24 Todd 1993, 71.

25 *AME*, 63.

1.6 'Technical' Texts and Exegesis

The texts collected in the 1499 incunable of the *Scriptores astronomici* are mostly of technical nature. As such, they certainly number to the 'useful' ancient books (*inter alia* medical and philosophical literature) mentioned by Aldus in his preface to the 1498 Aristophanes.[26] They might have served in a context of higher education,[27] but they certainly adhere to Aldus' cultural programme, which attempted to revamp the Classical heritage not only in its literary aspects, but also as a vehicle of useful knowledge for contemporary science.[28] It is thus not accidental that the text of Aratus – arguably the real premice of the volume – is not presented on its own, but is equipped with a rich apparatus of scholia. This is an almost unique instance in the entire span of Aldus' activity. The only comparable occurrence is the 1498 edition of Aristophanes *cum scholiis*, as the promised scholia to Sophocles (and other poets) announced as a separate book in the 1502 edition of the tragedian, were never to see the light.[29]

For Aristophanes, the ancient scholia were, of course, essential in order to explain the *Witz* of the plays. In the case of Aratus, however, despite the additional technical demands of the *mise en page* and of the overall editorial care, the gain that was obtained from the marginal scholia accompanying the text of the *Phaenomena* was well worth the effort as they contain a remarkable amount of astronomical, grammatical and mythographical information that could be very useful to Italian Hellenists.[30] In fact, Aldus' edition represents the only form in which this remarkable heritage was to be available to scholars prior to Jean Martin's 1974 edition (which, of course, followed entirely new and different editorial methods).[31]

26 *AME*, 24; Wilson 2016, 68-71.

27 E.g. Davies 1995, 26. Others link these texts more specifically to Aldus' activity as a teacher to Alberto Pio de' Carpi: Previdi, Rossi 2015, 23-31 and 58.

28 Hexter 1998, 154.

29 Despite the preparatory work on the scholia to Sophocles carried out by Markos Mousouros and Arsenios Apostolis on ms. Par. gr. 2799. See *AME* xxxviii, 62; Speranzi 2013, 117-20; Ferreri 2014, 399-401; Tessier 2015; Wilson 2016, 104-05.

30 On the scholia to Aratus, see e.g. Kidd 1998, 43-48.

31 Martin 1974.

2 The Sources of the Edition

2.1 Firmicus Maternus

In his initial dedicatory epistle to Guidubaldo da Montefeltro, Aldus Manutius extols the novelty of this edition of Firmicus Maternus: "quod integer et absolutus abusque Getis in Italiam redeat suosque revisat et patriam: nam qui vagabatur prius, valde quam depravatus erat ac mutilus et fere dimidius".[32] The editor of Fimicus' text, the humanist Francesco Negri (here Latinised as *Pescennius Franciscus Niger*: see the Appendix), adds another prefatory letter to Cardinal Ippolito d'Este (cc. *2*r*-*3*v*), in which he celebrates in an almost triumphant tone his discovery of a new manuscript witness that has enabled him to offer a more complete text.[33]

There are three main problems concerning the chronology and provenance of Negri's edition. First, the date of the edition as stated in the colophon of the Firmicus part (June 1499) predates the publication date for the entire incunable in October of that year by four months (see above § 1.1). Second, Negri's prefatory letter to Ippolito d'Este is dated as having been written in Ferrara, on August 29th, 1497; whereas Negri could well have been in Hungary in 1497, he certainly was in Padua in late 1499 (which makes it likely that he could have intervened in person in the last stages of the preparation of the Aldine edition).[34] Third, none of the known extant manuscripts of the *Mathesis* has any chance of being the one allegedly rediscovered by Negri while he was in Hungary.

Tackling the last issue first, philological analysis has shown beyond doubt that the unidentified manuscript brought back from 'Scythia' must be a witness of the 'German' branch of the *recentiores* known as 'Γ'.[35] As mentioned, Negri probably found it in Hungary (or Austria), where he spent a long time between 1489 and 1491 as a professor at Arad and then, again, between late 1494 and late 1497, when he acted as a preceptor to Ippolito d'Este, the (very) young cardinal of Esztergom (Strigonium).[36]

32 *AME*, 329.

33 "Hinc lucidissimum ab orientali horoscopo tuum sidus emersit, Hippolyte faustissime, quod sicut olim lucifer Aeneam, in horas hesperias, Cyllenius Perseum, ad gorgonea litora, Phoebus Cadmum, in haemonios campos, ita me barbaros spoliaturum ad extremam Scytharum fecem devexit, ubi detrusus in carcere gottica feritate Firmicus latitabat. Veni, vidi, et vici, mecumque tam praeclarum comitem tuis radiis tutus in patriam deduxi".

34 This emerges from a letter to Tebaldi dated Nov. 10th, 1499: *AMT*, 67.

35 Rinaldi 2002, 76-84.

36 Mercati 1939, 64-5 no. 3, also quotes a passage of Negri's unpublished *Cosmodystychia*, in which the author recalls his discovery: "Quam [*scil*. Firmici Mathesin] ego tanto labore, astutia et impensa ex media Pannoniae barbarie longo postliminio in Italiam deductam ac suis restituam publicis impressoribus cudendam tradidi in communem Academiae Latinae

Mercati, who wrongly suspected the manuscript in question might be Vat. lat. 2227, pointed out that Negri was already familiar with the *Mathesis* as early as 1494, as witnessed in his letter to Ippolito's secretary, Tebaldo Tebaldi.[37]

The *editio princeps* of Firmicus' work had been published in Venice by Bevilacqua in June 1497.[38] The chronology of the prefaces in the Aldine edition, therefore, suggests one of two scenarios: either Negri kept his edition of Firmicus 'on stand-by' for a number of months (since June 1497 or earlier) until Aldus appeared as an editor ready to print the text despite the fact that it was no longer a *princeps*; or he purposefully backdated his prefatory letter to the Aldine Firmicus so as to make it appear virtually contemporary to the Bevilacqua edition.[39] This dilemma affects the way in which we understand Aldus' reference (and, in similar terms, Negri's as well)[40] to the circulation of a Firmicus "mutilus et fere dimidius". For, if we think that Negri is writing prior to Bevilacqua's edition, this expression can only refer to a vast group of manuscripts (including the most ancient ones) that carried only the first four books of the *Mathesis*.[41] Alternatively, the expression could refer either to the complete manuscripts or (more probably) to the *princeps* itself, which itself did not stop with book 4,[42] but offered a lacunous text of all 8 books, which the newly-discovered manuscript could finally heal.

In fact, the "Firmici instauratio" of which Negri boasts in the catalogue of his philological and literary works[43] has been recognised in recent times as a philologically arbitrary operation of compilation and conflation. According to the editors of the Teubner Firmicus, no less than 20 pages out

utilitatem, cui me hominem natum semper existimavi". Mercati (1939, 108) favours the idea that Negri found the manuscript during his first Hungarian stay in 1489-91. We shall pass in silence regarding the fanciful reconstructions that locate the ms. in Romania (*AME*, 329), Northern Europe (Monat 1992, 31-32; Kroll-Skutsch- Ziegler 1913, xxix-xxxii, where the philological link with branch Γ is documented), or even Constantinople (Hübner 2014, 22 no. 37)!

37 Mercati 1939, 66 no. 1 and 64-65, as well as *62 for the text of this letter, mentioning the constellation of Engonasin.

38 IGI 3975; H *7121bis; BMC V.522. The colophon reads: "Impressum Venetiis per Symonem Papiensem dictum Bivilaqua 1497, die 13 Iunii": see Kroll-Skutsch, Ziegler 1913, xxix-xxx.

39 Mercati 1939, 70.

40 The relevant passages from the prefaces are collected by Kroll, Skutsch, Ziegler 1913, xxx-xxxi.

41 Rinaldi 2002.

42 *Pace AME*, 329.

43 Mercati 1939, 100 no. 3. Aldus himself speaks of an "audacissima instauratio".

of the overall 174 were the fruit of Negri's own additions, some of which directed at ameliorating Firmicus' Latin style so as to make it more 'Ciceronian', but others of which appear intended to fill in the lacunae that affected the whole manuscript tradition.[44] Leaving aside the stylistic issues of Negri's edition, which conjure up a process of thorough 'falsification' of what the late-Roman author actually had written, what appears most striking is the painstaking effort with which Negri completed *suo Marte* the missing parts of the *Mathesis*, above all in books II, V, VII and VIII.[45]

Following an informal suggestion of Aby Warburg, the Teubner editors recognised that Negri did not draw the new passages from his own fantasy. Instead, his supplements derive from existing sources, including texts by the 14th-century scientist Pietro d'Abano and the *Introductorium maius* of the 9th-century Arab scholar Albumasar (or Abu Maʿshar). Both were canonical authors of Medieval astronomical doctrine (the only heritage that was actually at Negri's disposal, given the loss of all ancient Latin works apart from those included in the 1499 incunable), and both were readily available in Negri's times in handy printed editions.[46]

To cite a few examples:

- the characters of the single planets in *Math.* 2 (e.g. the supplements regarding Mars in 2.10 "Mars natura quidem calidus et siccus, iracundus, vehemens…": c. b 7*r* of the Aldine) are taken directly from Albumasar (c. h 3*r* of the 1489 Augsburg edition; see also Boccaccio, *Geneal. deorum gentilium* 9.3).
- the same might be true for the chapters on the conjunction of the planets (the supplements in *Math.* 7.26-30: c. dd 9*r* of the Aldine; we still couldn't find an exact parallel in Albumasar's work).
- also, as Warburg had already acknowledged, the rich information on human characters as influenced by the planets (*Math.* 8.22-29) derives from an autonomous reworking of the captions to Pietro d'Abano's *De imaginibus*.[47]

44 Kroll, Skutsch, Ziegler 1913, xxxi-xxxii. Monat 1992, 32, Rinaldi 2002, 80-81.

45 A similar initiative was undertaken in 1533 by Nicolaus Pruckner in his Basel edition of Firmicus. Hübner 1982, 430-48.

46 Johannes Angelus, *Opus astrolabii plani in tabulis*, Erhard Ratdolt, Augustae Vindelicorum 1488 (IGI 3674; H *1100; GW 1900; BMC II.382). J. Angelus, *Astrolabium planum in tabulis ascendens…*, ed. Johannes Emerich Spirensis, Venetiis 1494 (IGI 3675; H *1101; GW 1901; BMC V.539). On these editions, see Bini 1996, 204-07. As for Albumasar (on whose approach and methods see Federici Vescovini 2008, 236-45) the edition is: Albumasar, *Introductorium maius*, E. Ratdolt, Augustae Vindelicorum 1489 (IGI 264; H *612; GW 840; BMC II.382).

47 See all the details in Kroll, Skutsch, Ziegler 1913, xxxii-xxxiii, who incline to believe that Negri is indebted directly to Pietro, whereas Warburg speculated about a common source.

– above all, it would be interesting to recover the source of the long section on the conjuctions of the planets with the various zodiacal signs, inserted by Negri after *Math.* 5.5 (c. bb 5*v* of the Aldine), as this very peculiar text opens a vast field of research for specialists on the history of medieval astronomy.

It is quite understandable why Pietro d'Abano and Albumasar should feature as the main sources of Negri's supplements. In his unpublished autobiography, Negri listed precisely these *auctoritates* (chiefly Pietro, "ignobilibus et obscuris parentibus natus, in omnium tamen scientiarum disciplina eminentissimus") among the most trustworthy authors in the domain of astronomy.[48] Indeed, it is thanks to Pietro d'Abano's mediation that several important Arabic texts (above all those on the so-called *sphaera barbarica*) reappeared in the Latin West,[49] and that astrology as a science (closely allied to the mathematics of astronomy) regained its place in the medieval and humanistic curriculum.[50] Pietro's belief in the influences of the stars on mankind, as well as his defence of the unity of astronomy and astrology in a Christian world,[51] certainly influenced the tone of Negri's own preface to the Aldine Firmicus of 1499.[52]

It is more difficult to understand why Negri drew upon Engel's 1489 *Astrolabium planum* (see above no. 46) for several of his passages: it is a work made up of several different parts, few of which are original. For example, the second and the third parts are constituted respectively by Pietro d'Abano's *De imaginibus* and by a selection of passages from Firmicus' *Mathesis* (3.2-14; 4.2-16, 19; 5.1-2).[53] To this extent, these passages from the 1489 *Astrolabium planum* represent the real (if very partial) *editio princeps* of Firmicus' text.[54] And Engel juxtaposes in the same book these excerpts from Firmicus to Pietro d'Abano's *De imaginibus*, for which the *Astrolabium* happens to be the only extant witness, equipped with an iconographic apparatus that is very similar to that of Hyginus' *Astronomica*

48 Mercati 1939, 41.

49 Mariani Canova 2002, 216-20 and, above all, Feraboli 1993.

50 Federici Vescovini 1992, 64-75 and 76-104.

51 In the *Differentia prima* of the *Lucidator astrologiae*. Berti 2014; Federici Vescovini 2008, 192-204 e 323-46.

52 See also Aldus' words to Guidubaldo da Montefeltro, quoting a long passage by Firmicus himself (*Math.* 1.6.2-4): *AME*, 27.

53 Haage 1985.

54 Kroll, Skutsch, Ziegler 1913, xxix. Rinaldi 2002, 218-28 on Engel's sources.

(see below § 2.3).[55] As we have seen, the combination of Pietro d'Abano and Firmicus reappears under Negri's intervention in the 1499 Aldine edition of the *Scriptores astronomici*. This fact suggests that the editor might have had some contact with Engel himself, who was active in Ingolstadt, Krems and Vienna during the last 15 years of the 15th century. Most notably, between 1489 and 1491, he had worked as a corrector in the Augsburg press of Erhard Radtolt (see also the *Appendix*).[56]

That the *Astrolabium* (or actually Pietro d'Abano's *De imaginibus*) was well known in the Veneto area even well before 1488, has been demonstrated by the studies on the astronomical frescoes of Padua's Palazzo della Ragione, which was largely re-painted in 1420, following a fire, which had destroyed the original cycle by Giotto. Pietro's work, along with Michael Scot's *Liber introductorius*, played a major role in the new outline of this *Bildprogramm*.[57]

Finally, we should mention the illustrations of Firmicus' text in our 1499 Aldine editon. The few illustrations in this section (none of which appears in the 1497 Bevilacqua edition, which contains only a few blank diagrams) consist of some complicated astronomical schemes in book 2 and the tables of the *geniturae* in book 6. This material seems to be original, although a more thorough investigation of the manuscript tradition might reveal an earlier source.[58] One might even surmise that the preparation of these diagrams was alluded to by the somewhat vague designation "Tabulae astronomicae resolutae" that occurs in the catalogue of Negri's works compiled by the Venetian humanist during the last years of his life.[59]

In his long Latin autobiography, which remains unpublished, Negri discusses the celestial chart of his own birthday, and provides some diagrams of his own *genitura* resembling those in book 6 of the *Mathesis*.[60] Furthermore, the *pinacidion*, or general index, created by Negri and which precedes Firmicus' text in our incunable (cc. *4*r* - *6*v*), is very similar to the index preposed by Negri to his *Cosmodystychia*.[61]

55 On the problematic relationship between the work of Pietro d'Abano and the only source that carries it, namely Engel's *Astrolabium planum*, see Federici Vescovini 1992, 333-37.

56 Worstbrock 2008.

57 Mariani Canova 2002, 213-24 (who also calls into question the *Libro de los paranatellonta* by Alphonsus X the Wise). Mariani Canova 2011, 124-29. Mariani Canova 1998.

58 Chines, Scapecchi, Tinti 2015, 94.

59 Mercati 1939, 99.

60 Mercati 1939, 33-5 (with plates).

61 Mercati 1939, *5-*10 and 108, no. 1.

2.2 Manilius

Manilius' *Astronomica* was first published by Regiomontanus in Nürnberg in 1473, then reprinted several times – most notably in Bologna in 1474 and then in Rome in 1484 (with the important commentary by Lorenzo Bonincontri), as well as in Milan by Dolcinius in 1489.[62] The Aldine edition has not attracted specific scholarly attention, but current research suggests that it derives from a contamination of all four earlier editions.[63] In this respect, it is worth noting that there is neither a preface nor any paratext mentioning the use of a manuscript source in the Aldine edition.

2.3 The *Aratea*

The section of *Aratea* is opened by an *Arati vita e graeco in latinum Aldo Manutio Romano interprete*, to which we shall return in 2.4, when dealing with the transmission of Aratus' Greek text.

There follow two brief excerpts of astronomical content ("Coelum circulis quinque"… "Hic est stellarum ordo"), and then the three poetical versions of Aratus' *Phaenomena* by Germanicus (with abundant exegetical prose alternating with the verse pericopae), Cicero, and Avienius. This is exactly the same order and textual *facies* that appears in the 1488 edition by Antonius de Strata.[64] With regard to the Aratean texts in general, it is the de Strata text that represents the real milestone for the transmission of these works. This book, edited by the great humanist Giorgio Valla, brought together the three works of Avienius (including the *Orbis terrae* and the *Ora maritima*, for which it is a primary witness),[65] Germanicus' and Cicero's *Aratea*, and the *Liber medicinalis* of Serenus Sammonicus.[66] Regarding the Aldine Aratean texts, the derivation from the 1488 de Strata edition is fully demonstrable on the philological niveau for all three au-

62 For Manilius' early editions see Maranini 1994, 163-67 with further bibliography, and Hübner 2014, 49-51.

63 Cramer 1893, 14-15 and (for the collations) 19-27. Also very useful is the register of the readings from book 2 in Garrod 1911, 155-58.

64 IGI 1131; H 2223 = *2224; GW 3131; BMC V.294. The frontispiece reads: *Hic codex Avienii continet epigramma, eiusdem Arati Phaenomena Geographiam carmine heroico et Oras maritimas trimetro iambico, Germanici quoque et Marci Tulli Arati fragmenta et Sereni versus de variis curandis morbis*.

65 See esp. Raschieri 2010, 64-75.

66 On the role of Giorgio Valla in this edition see Gardenal 1981, 95; Raschieri 2010, 70-75 and below § 2.6.

thors.[67] In essence, the Aldine 'editions' have simply been copied *recta via* from the 1488 de Strata volume.

Of course, the idea of prefacing the *Phaenomena* by means of a biography and other minor introductory texts was not in itself new,[68] and this specific sequence was not designed by the printers themselves, but was borrowed from a widespread humanistic manuscript tradition, which in turn appears to have descended from a lost Sicilian manuscript, perhaps copied at the time of Michael Scot's activity at the court of king Frederick II.[69] Proof that the Germanicus text in the Aldine edition depends on this particular branch is provided by the title that appears on c. G 1*r*: "Fragmentum Arati Phaenomenon per Germanicum in Latinum conversi cum commento nuper in Sicilia reperto". The most striking feature of this section, however, is the presence of illustrations of the constellations described in Germanicus' *Aratea*: this is, in fact, the second illustrated edition of this work – a feature that one also finds in the 1488 de Strata incunable. In this context, it is worth mentioning that the edition of the Germanicus text published in Bologna in 1474, which also included Manilius (see above § 2.2),[70] was laid out with exactly the same pericopae we find in the 1488 de Strata and the 1499 Aldine editions, with long passages of the *scholia Strozziana* inserted between one pericope and the next. In the 1474 Bologna edition, however, the large spaces left for the illustrations of the various constellations were never filled by woodcuts or by manuscript drawings (at least, no copy of an illustrated version has been discovered to date).[71]

Therefore, the woodcuts accompanying the *Aratea* in both the 1488 de Strata and 1499 Aldine editions derive only indirectly from the manuscript tradition of Germanicus.[72] In fact, they are the same ones that appear in a

67 Calero 1975, 191. Buescu 1941, 84 and 142. Soubiran 1981, 86-87.

68 After all, it is the same principle we find in the *Aratus Latinus*, cf. Maass 1898, 146-50.

69 On the textual history of the "Sicilian" branch of Germanicus' *Aratea*, the contamination with the so-called *scholia Strozziana*, and the frequent association with Hyginus' *Astronomica,* see Orofino 2013, 26-30. Lott 1981. Reeve 1980, 514-17. Some examples of the vast humanistic offspring of this branch can be seen e.g. in Buonocore 1996, 413-14 (Urb. lat. 1358) and 486-88 (Barb. lat. 76). See also Haffner 1997, 105-16.

70 IGI 6126; H 10707; BMC VI.805. *Marci Manlii poetae clarissimi Astronomicon ad Caesarem Augustum*, Bononiae, per Ugonem Rugerium et Doninum Bertochum 1474.

71 Pade, Waage Petersen, Quarta 1990, 106 no. 10. Calero 1975, 190. See the census of the copies in Field 1996. Thiele 1898, 151 (follower by Dekker 2013, 405) argued that the 1474 edition was the starting-point of the humanistic iconographic tradition, but he seems never to have seen an illustrated exemplar.

72 On the various iconographic traditions of these constellations, see Orofino 2013 and Haffner 1997 (whose work does not address early printed editions). A very useful overview of the early printed editions can be found in Bauer 1983, 12. See also Szépé 1992, 155-57.

series of other early printed editions of astronomical texts, starting with Hyginus' 1482 *Astronomica*[73] and continuing as far as the texts of Albumasar and Leopoldus of Austria (both edited by Radtolt in 1489).[74] On this topic, we refer the reader to Kristen Lippincott's paper in this volume. Suffice it to say that the 1499 Aldine edition derives its illustrations (much like the text itself, as we have just seen) from the 1488 de Strata edition,[75] as is demonstrated by the way the images – originally planned for Hyginus' *Astronomica* – are arranged alongside the text of Germanicus' poem identically in both books, and in both cases the volumes suffer shared mistakes that, strangely enough, noone corrected. For example:

- Andromeda appears instead of Cassiopea (Aldine, c. H 2*r*), and Cassiopea is missing;
- instead of Perseus (Aldine, c. H 5*v*), we find a second Engonasin (already occurring at c. G 4*v*), depicted as Heracles with a club and an 'anthropomorphic' shield;[76]
- instead of Orion (Aldine, c. H 10*v*), we find a second Sagittarius (Aldine, c. H 9*r*);
- Sagitta, Capricorn, Canis maior, and Ara are missing.

As was first pointed out by Ulrike Bauer, the illustrations in the 1482 Hyginus edition appear to reflect the iconographical tradition of Michael Scot's *Liber introductorius*.[77] Whereas this history is more fully discussed by Lippincott elsewhere in this volume, it is worth drawing attention once again to the success enjoyed by Michael Scot in late-medieval Padua (and, especially, the great Paduan manuscript of the *Liber Introductorius*, Clm

73 IGI 4959; H *9062; BMC V.286. *Clarissimi viri Iginii Poeticon Astronomicon opus*... Venetiis, Radoldt 1482: see Bini 1996, 182-83. This edition (as pointed out by McKitterick 2003, 76) is not actually the *princeps*, but once again in the rare 1475 Ferrara edition of Hyginus' *Astronomica* by Augustinus Carnerius (IGI 4958; H 9061) blank spaces have been left for manuscript illustrations.

74 Bini 1996, 194-96.

75 Renouard 1825, 20 ("l'Aratus de Venise de 1488"). *AMT*, 67. Szépé 2016, 153 and the penetrating analysis by Szépé 1992, 155-57 (who rightly argues that de Strata's woodblocks derive from Radtolt's through the 1488 edition of Hyginus printed by Thomas de Blaviis: IGI 4961; H *9065 = 9064; BMC V.318) and 68-69.

76 The only similar shield occurs, to my knowledge, in ms. Berol. germ. fol. 244, a manuscript of the revised *Aratus Latinus*. A human head in the skin on Heracles' shoulders, by contrast, appears commonly in Michael Scot's cycle. See Bauer 1983, 106. On the figure of Heracles see also Haffner 1997, 36-37 and 135-36.

77 Bauer 1983, 12, and 105-06 on the main features of the cycle of Michael Scot. See also Orofino 2013, 39-41; Mariani Canova 1998, 34. During his long stay in Sicily, Michael Scot based his work on a Germanicus manuscript with the *Scholia Strozziana*: see Orofino 2013, 39.

10268);[78] and to note some of the very peculiar features of this iconographic tradition (such as the metallic Crown, the reclining Eridanus), which also appear in the fascinating and problematic illustrations of ms. Laur. 89.43.[79] Despite this, however, there remain some features of the de Strata and Aldine illustrations which we still find totally baffling.[80]

As mentioned above, the woodblocks used in the 1499 Aldine edition are basically the same as de Strata's; but there are some differences:

- In the 1488 de Strata incunable, both the Ophiuchus (Aldine, c. G 5*v*)[81] and Cetus (Aldine, c. I 3*v*) are missing. These two illustrations thus seem to have been retrieved directly from the 1482 Hyginus edition, albeit in a slightly modified version.
- In the Aldine edition, the following woodcuts have been entirely recut,[82] although the images (with much the same iconography) have already appeared previously in the 1488 de Strata incunable: Ursa maior et minor (c. G 3*v*), Bootes (c. G 6*v*), Deltoton (c. H 4*v*), Pleiades (c. H 6*r*), Oceanus? (c. I 5*v*).[83] Among these five illustrations that were stylistically renewed and acquired more rounded forms and a neat sense of free movement, at least the Pleiades[84] and Bootes[85] (and perhaps also the mysterious Oceanus) have been attributed by some scholars to the same author of the woodcuts in the *Hypnerotomachia Poliphili*, perhaps Benedetto Bordon (see above § 1.3). In any event, it is likely that the same artist was responsible for the illustrations in

78 Mariani Canova 2001, 394-95; Mariani Canova 2011, 116-18.

79 On the illustrations of this ms., by the hand of the illuminator Gherardo di Giovanni, see Leone 2013.

80 E.g. the man (Oceanus?) appearing instead of the Altar (Aldine, c. I 5*v*: it is clear that the relevant passage, Germ. *Arat.* 393-413, has been reinterpreted because of the erroneous omission of the initial lines 393-95 in many manuscripts, and in the *editio princeps*); the very peculiar shape of the Moon (Aldine, c. I 9*v*) yoking two women rather than two oxen, and carrying in her hand an arrow rather than two torches (on the iconography of the moon, see Haffner 1997, 72 and 169).

81 *AMT*, 67.

82 See Szépé 2016, 153 (in the same volume the description by Pesavento, 225-29), and the more detailed analysis by Szépé 1992, 156-57.

83 Furthermore, Taurus (c. H 1*r*) and Sagittarius (c. H 9 r) have star crowns below their nostrils and their paws respectively, which is not the case in the 1488 de Strata edition.

84 Noted by Essling 1908, 457 no. 1186 (to be read with Pozzi, Ciapponi 1980, I.15). Pozzi, Ciapponi 1980, I, 26-27.

85 Noted by Marcon 1994, 108.

Engel's *Astrolabium* published in Venice in 1494,[86] and perhaps for those of the 1497 Giunta edition of Ovid's *Metamorphoses*.[87]

2.4 Leontius Mechanicus

The two short Greek excerpts on the construction of Aratus' sphere and on the constellation of Ophiuchus (cc. N 1*v* - N 3*r*) are, in fact, two consecutive parts of one and the same work, which according to Jean Martin belongs to a series of exegetical materials on Aratus' poem, collected under the guidance of the Byzantine scholar Demetrius Triclinius in the early 14th century.[88] Be that as it may, the text of this Leontius (of whom nothing is known) has a merely marginal and instrumental function in the wider architecture of the Aldine edition (see above § 1.2). What is perhaps most striking is that, apart from the Aldine edition, this text appears only in one other manuscript, namely Par. gr. 2381, a miscellany of arithmetical, mechanical, and alchemic content, once erroneously connected with the Aldine edition of Aristotle.[89] The Parisinus is by no means a luxury manuscript. Instead, it appears to be the personal property of a learned scholar of the late 14th century, whose identity would be a welcome discovery.[90] Nonetheless, philological analysis shows beyond doubt that it cannot be the direct model of the Aldine edition, and that both the Aldine and the Parisinus must derive from a now-lost, common archetype.[91]

86 See above note 46 and Mariani Canova 2002, 223-24.

87 Toniolo 2016, 96-98.

88 Martin 1974, xxix-xxxiii, esp. xxxi-xxxii on ms. Par. gr. 2381. The edition is in Maass 1898, 561-67.

89 Sicherl 1997, 94. On the manuscript, where our treatise follows immediately upon ps.-Empedocles' lines on the *Sphaera*, see also Costanza 2008.

90 In spite of previous datings to the 16th century, the watermarks all point to the last quarter of the 14th: *Cercle* 3231 Briquet (1360-80); *Balance* 2374 Briquet (ca. 1380); *Chien* type 3597 Briquet (ca. 1400); *Deux clefs* type 3848 Briquet (1370 and later); *Huchet* type 7708 Briquet (1372). F. 64, on which the Leontius piece is copied, has an *Arc* type 786 Briquet (1372, but all the watermarks of this type belong to the 1380s or 1390s). Schreiner 1975, 151-52 observes that the latest events mentioned in the short chronicle on fols 1-3 and in the other chronographical excerpts scattered in the ms. belong to 1392.

91 Maass 1898, 561.

2.5 Aratus

For the edition of the Greek Aratus *cum scholiis* in our incunable, Jean Martin proposed the intervention of the great Cretan scholar Markos Mousouros, perhaps the best-known of Aldus's many collaborators.[92] This hypothesis, however theoretically possible, is not backed by factual elements,[93] nor does Mousouros' hand appear in the manuscript upon which the Aldine edition was certainly based, namely Mutinensis α.T.9.14 (gr. 51).

This codex, datable to around 1465 and preserved today in Modena like many others of the same provenance,[94] stands out *inter alia* for two characteristics. First, it was written by Andronikos Kallistos,[95] one of the most outstanding scribes of Italian humanism and one very prone to conjectural interventions. Second, it carries many annotations by its former owner, the humanist Giorgio Valla. Sometimes these annotations are written between the lines and sometimes between the marginal scholia and the text, or illustrate single words in the scholia. That Valla owned and studied this book is reconfirmed by the fact that he used it to translate some passages from an ancient biography of Aratus in the aforementioned preface to the 1488 de Strata edition (see above § 2.3).[96] This preface, an interesting text in its own right because it argues for the indissoluble union of astronomy and medicine, was written by Vittore Pisani, but it clearly depends on materials assembled by Valla himself.[97] In our 1499 Aldine edition, this short *Vita* of Aratus has been translated by Aldus on c. G 1*r* (immediately before the beginning of the *Aratea*, see above § 2.3) in a very pleasing Latin style.[98] One wonders whether Aldus' choice to re-translate this text – which he certainly knew well

92 Martin 1974, xi.

93 It is not even mentioned in the most recent synthesis on Mousouros and his editorial activity: Ferreri 2014.

94 Martin 1998, I, cxliii-cxliv.

95 Centanni 1984-85, 212; Harlfinger 1974; Orlandi 2014, 170 no. 27. See also the description by Puntoni 1896, 416-17. On Kallistos, see the bibliography quoted by Martinelli Tempesta 2012, 532 no. 67.

96 *Vita* IV, in Martin 1974, 19-21.

97 Raschieri 2010, 71-73; Selter 2009, 10-11 and 15-16, also in comparison with the prefaces of the 1499 Aldine incunable.

98 Aldus avoids *inter alia* Valla's mistake of regarding Theocritus and Lycophron as Aratus' contemporaries on the basis of an incorrect interpretation of *Vita* IV, 19.7-8 Martin. That both Aldus and Valla depend on Kallistos' manuscript is proved beyond doubt by the fact that both translate Kallistos' own addition τοῦτο δὲ καταφανές ἐστι ψεῦδος (20.13 Martin). However, in at least one point Aldus departs from the reading of the Mutinensis: 19.3 Martin Λινδίου Ald. (cum mss. VAP): Λυδίου ὥς φησιν Ἀριστοτέλης Mut.

given the wide popularity of the 1488 de Strata edition – depends on a consciously 'antagonistic' attitude towards Valla (see also below § 2.6 about the issue of Ps.-Proclus' *Sphere*).

The fact that the Mutinensis must have been the model of the Aldine edition becomes even more significant since this text of the Aratus scholia was not superseded until the late 20th century. In both the Mutinensis manuscript and the Aldine edition, we have a unique combination of text and scholia belonging to different branches of the textual tradition.[99] The main difference being that the Aldine edition 'heals' the omissions that one finds in the Mutinensis manuscript, probably by means of the collation (possibly carried out by Mousouros?) of ms. Scorialensis Σ.III.3, a manuscript owned by the other great Cretan scholar George Gregoropoulos.

The only problem is represented by the occurrence of Theon's name as the author of the scholiastic corpus to Aratus.[100] His name does not appear in the Mutinensis manuscript, but it does appear in ms. Par. gr. 2842 (itself an apographon of the Mutinensis, dated to ca. 1475),[101] and it also appears in the later codices of the Triclinian branch. This fact suggests that Aldus had retrieved the name of Theon in some way perhaps from a currently unknown manuscript witness.

The most striking feature of the Mutinensis, however, is its remarkable number of conjectures, and the great liberty with which the scribe revises and updates the text while he is copying it. The modern editor of the Aratus scholia was struck by the care with which this scribe "recensuit, mutavit, perpolivit,... lacunas explevit, mendas ut potuit correxit",[102] but the scholar familiar with the philological practice of Andronikos Kallistos knows that such a *Leistung* is perfectly in keeping with his normal habits.[103]

2.6 Ps.-Proclus

The *Sphaera* ascribed to Proclus is in fact a Byzantine compilation of four non-contiguous passages of the *Isagoge* (or *Elementa astronomiae*), written by the Greek astronomer Geminus. The passages were selected and put together so as to create an elementary description of various parts of

99 Martin 1974, xi-xiii (and 1998, cxliv), who reconstructs the relationship of the Mutinensis with Marc. gr. 476 and Par. gr. 2403. See also Sicherl 1997, 88 no. 257.

100 The identity of this Theon (the grammarian, the astronomer, or neither?) is still debated today. See Martin 1956, 196-204 and Schiano 2002, 135-37, who also discusses manuscript sources and earlier bibliography.

101 Martin 1974, xi.

102 Martin 1974, xiii.

103 Martinelli Tempesta 2012, 533 and no. 71; Günther 1999.

the cosmic sphere, from the axis to the various circles, from the parallels to the colures, from the five zones to the constellations.[104] The attribution to Proclus is obviously false, and it is not clear when and how it originated. There are two manuscript recensions of the text. The earlier of the two branches is represented by a single manuscript, which is also the oldest one preserved, namely Mutin. α.R.7.14 (mid-14th century). We must emphasise here that this Mutinensis, as shown by the handwriting as well as by the watermark,[105] belongs to the 14th century and most probably has an Oriental provenance. It does not, as Robert Todd has argued, belong to the period between 1470-1520, nor should the *Sphaera* as such be considered as the product of a concoction by Western humanists:[106] it is definitely a Byzantine creation. Having said that, it is interesting to note that the Modena manuscript does not carry the name of Proclus, which only appears in the second branch, represented by a dozen of manuscripts copied between the mid-15th and the 16th century.[107]

On the one hand, Todd's philological investigation has shown beyond doubt that the Greek text of the Aldine edition does not derive from the Mutinensis manuscript, but rather from a lost manuscript that belongs to the lower part of the stemma.[108] On the other hand, the Mutinensis manuscript is certainly the source of the partial translation of this work executed in Venice by Giorgio Valla (probably around 1490), and 'pasted into' book 16 of his vast encyclopedic treatise *De expetendis et fugiendis rebus opus*, which was published posthumously by Aldus in 1501.[109] Also, in the Mutinensis manuscript, we find notes in Valla's own hand, and even an appendix containing Valla's short *précis* of chronology. It is difficult to find a reason why Aldus did not decide to use Valla's Mutinensis manuscript for the 1499 edition. It was certainly in Venice at the time, and we know of several other instances in which Valla's library provided the Aldine press with a great number of manuscripts (including the Aratus mentioned above § 2.5). But, for whatever reason, Aldus decided to use a different version for the Greek text, while also making a bold choice to include the Latin translation of the English physician Thomas Linacre (1460-1524),

104 Todd 2008.

105 Watermark: *Peson* type 12403 Briquet, Grenoble 1344 with variants in the same turn of years.

106 Todd 2008, 12.

107 Todd 1993, 57-71.

108 Branch b2 in Todd's stemma, where it flanks mss. Bonon. 2700, Par. gr. 2489, and Vat. Ottob. gr. 339.

109 On this work and its encyclopedic nature, as well as on Valla's translation practice, see Gardenal 1981b, 44-54. That Valla used the Mutinensis was already recognised by Landucci Ruffo 1977, and then by Todd 1993, 59; Todd 2008, 24-26.

who based his own translation on a notably different text from that printed in the Aldine itself.[110]

We must conclude that Valla, despite the fact that he was an expert on astronomy and had just published a *Libellus de argumentis* containing his own translations from Euclides, Proclus, Cleomedes and Aristotle,[111] did not have any role in the preparation of the 1499 incunable.[112] Perhaps this state of affairs reflects Valla's own poor health (he was to die on Jan. 23*r*d, 1500)?[113] Or maybe Linacre's translation, sent from England,[114] only arrived in Venice during the very last stages of the editorial process, when there was no time for further verifications and inquiries about textual issues.[115]

As mentioned above (§ 1.6), one of Aldus's prime motivations behind the 1499 edition was to show that his editorial project had acquired an international dimension. Thomas Linacre had been a student in Padua, Florence and Rome, had already translated scientific texts such as Galen, and had previously contributed to the 1498 Aldine edition of Aristotle. William Grocyn's (1446?-1519) letter to Aldus, which is printed in our incunable immediately after Aldus' dedicatory letter to Alberto Pio di Carpi and before the short epistle of Linacre to Arthur Tudor, notes the debt of the rising English humanistic culture to Italy and to Aldus Manutius in particular.[116] It remains somewhat ironical, however, that Aldus should present the translation of a Greek text that the Italian Giorgio Valla had already rendered in Latin a few years before as a token of the new superiority of British Hellenism over the weary Italian culture.[117]

110 Linacre's text belongs to branch b3 Todd, where it flanks Par. gr. 2317 (end of 16th century) and Laur. Acq. e Doni 172 (second half of the 15th ca.): see Todd 1993, 63. On Linacre's translation, its genesis and its remarkable spreading, see Todd 2008, 26-33.

111 Venice, Simon Bevilacqua 1498: IGI 6792. H *11748. GW M26156. BMC V.523.

112 It is true that the Mutinensis of the *Sphaera* does not refer to Proclus' authorship, but if Aldus and Valla had cooperated the latter would have immediately recognised the text and its correspondence with the one translated by Linacre.

113 As late as 1499, he produced a commentary on Cicero's *Tusculan disputations*. See Gardenal 1981a, 97.

114 Where he had returned – according to Grocyn's letter – before September 1499; but in his dedicatory letter Linacre quotes Germanicus' *Aratea* as they were to appear in the very Aldine incunable, wherefore it is likely that he did have some knowledge of the book that was being edited.

115 This seems to be implied by Aldus' words in his letter to Alberto Pio di Carpi, where he recalls the friendship between Linacre and Alberto Pio himself (*AME*, 28; Wilson 2016, 78-79). See also Todd 1993, 70-71.

116 Lowry 2000, 338-43.

117 *AME,* 28 = Wilson 2016, 80: "ex eadem Britannia, unde olim barbarae et indoctae literae ad nos profectae Italiam occuparunt et adhuc arces tenent, Latine et docte loquentes bonas artis accipiamus, ac Britannis adiutoribus fugata barbarie arces nostras recipiamus,

3 Towards a General Assessment

The Aldine edition of the *Scriptores Astronomici* was produced with the declared goal of presenting the astronomical heritage of Greek and Latin antiquity, and of giving it a place in the debate on astronomy and astrology that had been on-going since the late Middle Ages. To be sure, the various parts of the volume are somewhat heterogeneous, and often closely connected with idiosyncratic scholarly figures, such as Francesco Negri (on whom see below the Appendix) or the Englishman Thomas Linacre. The absence of Giorgio Valla from this list of collaborators is particularly surprising, for he would have been the most suitable man to take part in the preparation of such a complex volume, being amongst other things "l'esponente ideale di quella conoscenza approfondita sia di latino che di greco, che Barbaro personificava e Aldo cercava di ricreare".[118]

Nonetheless, the final result does show a fundamental unity, in that it attempts to innovate on the astrological tradition of medieval Veneto, which had particularly flourished in Padua throughout the early 15th century.[119] It also endeavours to multiply and diversify the channels of the transmission of ancient astronomical knowledge, which had relied too narrowly on the *Nachleben* of Germanicus, on the so-called Aratus Latinus, and on handbooks and translations to the expense of the original Greek texts. In the movement 'from Latin to Greek', which intersects the other movement "from astrology to astronomy" (see above § 1), Aldus seems to trace the parabola of a science that does not forget its roots, but rather attempts to revive them in a new world.

In this context, it is particularly striking to note the difference between the ways in which Greek and Latin texts are handled. The former ones (especially Aratus, as the case of Ps.-Proclus is somewhat more complicated for the reasons mentioned above in § 2.6) are published from reliable manuscripts, and further emended in view of the *editio princeps*. Conversely, the Latin texts are easily derived *sur-le-champ* from existing printed editions, and appear as summary works of contamination and collation, produced without any systematic access to (or verification from) manuscript sources.

Firmicus Maternus' *Mathesis* is the only exception to this pattern, but this fact brings with it a whole set of unresolved worries. It appears to

ut eadem hasta sanetur, a qua illatum est, vulnus". We may note in passing that the Greek proverb quoted by Aldus corresponds to an autoschediastic Greek rendering of the Latin motto "senex psittacus ferulam neglegit" (Erasmus, *Adagia*, 161).

118 Lowry 2000, 240. See also Branca 1980, 161-66 (but the reference to the *Astronomici Veteres* on 163 is not to our incunable, but rather to the 1488 de Strata edition).

119 Mariani Canova 2011. It is perhaps not by chance that the city had been the crossroads of the lives of Negri, Linacre, Grassi (and Mousouros). See also the Appendix.

have been handed into the press as a finished product, and might perhaps have been published even against Aldus' own concerns.[120] We know that the editor, Francesco Negri, not only had the 1497 *princeps* at his disposal, but also possessed a different manuscript, with a set of allegedly unique readings (even though it was not quite as good a source as he boasts in his preface). But, with the publication of Negri's text, the renowned respect and philological rigour of the Aldine press appears to have been temporarily abandoned in favour of a wide-ranging rewriting of entire parts of the text that reflect significant contamination with more recent medieval sources. The outcome is a real forgery and has brought heavy consequences to bear on the history of Firmicus' text. To my knowledge, there is no analogous parallel in the vast array of ancient works published under the Aldine dolphin-and-anchor logo. It is well-known that Aldus, in his desire to publish books rather than to allow for a never-ending philological work, used to limit the editors' requests and eventually proceeded to print;[121] but the practice of Negri that is here (consciously or not) assumed by Aldus, belongs to a *modus operandi* that we normally tend to associate with other, less glorious editorial enterprises.[122]

Appendix: Francesco Negri (1452-*post* 1523)

Prosopographical research on the Venetian scholar Franjo Cernoevich, *alias* Francesco Negri (curiously Latinised in our incunable as *Pescennius Franciscus Niger*, the name of a Roman general acclaimed as emperor in 193-194 CE) still relies on the admirable work carried out by Giovanni Mercati and, more recently, the studies by Emilio Menegazzo and Dante Pattini.[123]

The Aldine *Hypnerotomachia Polifili*, produced in 1499 simultaneously with the *Scriptores Astronomici*, was sponsored by the Veronese gentleman Leonardo Grassi, a shadowy figure who attained the grade of apostolic protonotary.[124] It cannot be by mere chance that Francesco Negri, who ed-

120 Dionisotti 2003, 7: "il dubbio resta che essa [*scil.* l'astensione di Aldo dietro le quinte editoriali] conseguisse a un nodo insoluto di insoddisfazione e di riserva critica". But against a similar argument made for the *Polifilo*, see Szépé 1992, 141-42.

121 Lowry 2000, 283-333 and now Tura 2015.

122 Lowry 2000, 288-94 and 304-15. On Italian texts, see Trovato 1991.

123 Mercati 1939, 24-109 (28-32 on his name and Dalmatian origin); Menegazzo 1966; Pattini 2013. Interesting remarks on Negri's grammatical work can be found in Lozano Guillén (1997a) and (1997b). New elements might perhaps emerge from a fresh examination of ms. Ambr. C 12 sup., which contains several texts by Negri or connected with his *entourage*.

124 Lowry 2000, 119. Billanovich 1976.

ited the Firmicus section of the *Scriptores Astronomici*, was an old friend of Grassi's, to whom he had even dedicated an Italian sonnet and a Latin elegy on the event of his election to Rector of Law.[125]

Negri studied in Padua and later became a provost of San Giovanni Decollato in Venice. From 1483 onwards, he functioned as a *clericus vagans* in various regions of Europe. Negri had made important friends during his Paduan years, including Jakob Gerold (later rector of the gymnasium of Knitterfeld in Stiria), who obtained his doctorate in Canonical Law in May 1488, under the rectorate of the same Leonardo Grassi.[126] In that very year, while holding celebrated public orations at the Studio,[127] Negri dedicated his most important work, the *Opusculum scribendi epistulas* or *Modus epistulandi* to Gerold.

Nothing more precise can be gleaned about the contacts between Grassi and Negri, or about the latter's hypothetical participation in the *Polifilo* enterprise. If one considers the role-model played by the Latin writer Apuleius in the *Polifilo*, it is noteworthy that in the catalogue of Negri's works there is mention of an Italian translation of the *Golden Ass*, which no longer exists.[128]

We know from Mercati's studies that Negri could boast a long-standing familiarity with astronomical texts, which was propaedeutical to the mysterious work listed as *Astronomicon Nigri* in his unpublished *Cosmodystychia*,[129] and which certainly had deep roots back to his juvenile years: Negri's earliest known poem is a couple of Latin distichs that appear at the end of the 1478 Venice edition of John of Holywood's *Sphaera* and Gerard of Cremona's *Theorica planetarum*.[130] But perhaps one further detail that appears to be overlooked by scholars should be recalled in this context. From a fragmentary document published by Dennis Rhodes, we know that as early as 1482 and prior to his exile from Venice, Negri was acquainted with the printer Erhard Radtolt.[131] If this contact with Ratdolt, perhaps facilitated by another expert on ancient astronomy, such as Johannes Lucilius Santritter de Hailbronn,[132] continued over the years, then

125 Menegazzo 1966, 445-52. See also Montinaro 2014 (to be used with caution).

126 Menegazzo 1966, 445.

127 Preserved in the ms. Padova, Biblioteca Universitaria 776, and edited by Verrua 1922.

128 Mercati 1939, 99: "Translatio metamorphoseos Apuleianae Ethrusca". Nothing can be found in Acocella 2001. On the role of Apuleius in the *Polifilo* see Fumagalli 1984.

129 Mercati 1939, 99.

130 IGI 5340; H *14108; BMC V.195. Mercati 1939, 46.

131 Rhodes 1985.

132 On him, see Lippincott, this volume. In November 1498 Hailbronn sought a privilege for an *Astrolabium*, that was never be printed (Fulin 1882, no. 87, 135).

Negri might have played a role in the recovery of Radtolt's woodblocks of the constellations (see above § 2.3) from Augsburg to Venice.[133] In turn, this might credit him with a more important role than hitherto assumed (well beyond, that is, the Firmicus section) in the preparatory work leading to the 1499 incunable of the *Scriptores Astronomici*.

Abbreviations

AME = Orlandi, Giovanni; Dionisotti, Carlo (a cura di) (1975). *Aldo Manuzio editore* I-II. Milano: Il Polifilo

AMT = Bigliazzi, Luciana; Dillon Bussi, Angela; Savino, Giancarlo; Scapecchi, Piero (a cura di) (1994). *Aldo Manuzio tipografo 1494-1515*, Firenze: Octavo.

BMC = *Catalogue of books printed in the Fifteenth Century, now in the British Museum* (1908-2007). London: British Library.

GW = *Gesamtkatalog der Wiegendrücke* (1925-). Leipzig; Stuttgart; New York: Hiersmann/Kraus.

H = Hain, Ludwig (1826). *Repertorium bibliographicum*. Stuttgart; Paris: Cotta-Renouard.

IGI = *Indice generale degli incunaboli delle biblioteche d'Italia* (1943-1981). Roma: Libreria dello Stato.

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133 Above § 2.3 we mentioned the possibility of a contact between Negri and Radtolt's Augsburg press, where Johannes Engel was active.

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Cristannus de Prachaticz's Treatises on the Astrolabe

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Abstract In the present contribution our computer methods of collation and statistical treatment of variant readings are summarized and illustrated on the example of the critical edition of the treatises on *Composition* and *Use of the Astrolabe* written by the 15th-century Czech scholar Cristannus de Prachaticz.

Summary 1 Introduction. – 2 The Astrolabe. – 3 Cristannus de Prachaticz (Křišťan z Prachatic). – 4 Spreading of the Manuscripts and Early Prints with Cristannus's Treatises. – 5 Editions in LaTeX and TEI-XML. – 6 Statistics of Variant Readings and Stemma Codicum.

Keywords Computer-assisted Critical Editions. Digital Stemmatology. Treatises on Astrolabe. Cristannus De Prachaticz.

1 Introduction

The relations between medieval manuscripts are often complicated and the tradition that explains the origin of the texts may be misleading. A thorough study of textual tradition and in particular the preparation of critical editions may shed a better light on the genesis and the spreading of the treatises and consequently also on the interaction between the cultural centres where the manuscripts were written, copied or read. Such a work is difficult and laborious but, fortunately, it can be partly facilitated using the currently available computational technique.

An example of a topic which was intensively studied in medieval centres was the theory and practice of the construction and use of the astrolabe. Its description widely circulated in many medieval manuscripts. Treatises on *Composition* and *Use of the Astrolabe* were written by the Master of Prague University Cristannus de Prachaticz in 1407. The aim of our criti-

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cal edition of these treatises (Hadravová, Hadrava 2001) was to ascertain the original form of Cristannus's text and to investigate its relationship to its predecessors and followers. Our study of a great number of treatises on the astrolabe showed that Cristannus's formulation was highly original and successful, so that his treatises were widely spread throughout Europe. They even became the first texts on the astrolabe ever to be printed (Perugia 1477-1479), although they were then wrongly attributed to other authors such as Robertus Anglicus or Prosdocimo de Beldomandi.

For the preparation of the critical edition, which includes nine selected witnesses of the *Composition* (manuscripts, incunabula and early prints) and eighteen witnesses of the *Use of the Astrolabe*, we developed a method enabling a comparison amongst a large number of texts. The variant readings collected in the LaTeX source-file were then analyzed by a software which indicates statistically the relations between individual manuscripts and leads to suggest a *stemma codicum*. Our methods have been described and explained in Czech (Hadravová and Hadrava, 2001-2002). Although several similar methods have been developed since that time, our approach may still be applicable and the experience from its results useful for future work.

In the following we thus briefly summarize the contents of our edition and the circumstances of its preparation, i.e. the theory of astrolabe in Section 2, Cristannus's life and work in Section 3 and the spreading of his treatises on the astrolabe in Section 4. In Section 5 we present our method of collation and typesetting in LaTeX and compare it with the TEI-XML encoding. In Section 6 our statistical treatment of the variant readings is described and compared with some other computational methods in stemmatology.

2 The Astrolabe

The astrolabe is a universal astronomical and geodetic instrument (fig. 1). It was widely used from antiquity up to early modern times for observing the altitudes of celestial or terrestrial objects as well as for solving and demonstrating basic problems of spherical astronomy. Its principle is based on the stereographic projection, i.e. the projection of the sphere from its pole to the plane of equator.[1] The stereographic projection is advantageous for the construction of an astrolabe because its projection of

1 If the equatorial plane is treated as a plane of complex numbers r, the stereographic projection is given by equation $r = e^{i\alpha} \cos \delta / (1+\sin \delta)$, where α is the right ascension and δ is declination.

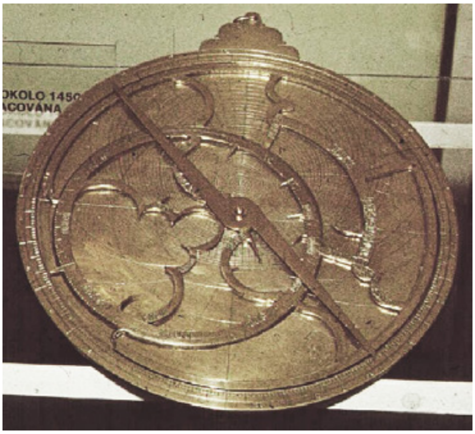


Figure 1. Astrolabe from about 1450. Prague, National Technical Museum, Inv. no. 2287

any circle on the sphere is a circle (or a straight line) in the plane.[2] A net depicting the ecliptic and the positions of selected bright stars rotates in the astrolabe on the background of a grid of horizontal coordinates, thus allowing one to find a correspondence between the sidereal time and the altitude of a star measurable through the alhidade and the angular scale on the instrument – cf., e.g., North (1974).

The astrolabe was described by Ptolemy (2nd century AD) in his Greek-language treatise *Planisphaerium*.[3] Ptolemy's treatise was translated into Arabic and adapted into several versions, which were later translated into Latin and heavily rewritten. More than forty different Latin treatises on astrolabe were used in the Middle Ages (Kunitzsch, 1982), one of the most popular of them being that by Pseudo-Massha'allah (2015).

Study of the astrolabe was a substantial part of the astronomy curriculum at universities in medieval Europe. In 1407, lectures on the astrolabe were read in the Prague university[4] by Cristannus de Prachaticz.

2 It can be seen from the equation $|r\text{-}2s/t|^2=|\sin\varphi\ (1+|s|^2)/t|^2$, where $t=1 - |s|^2 + \cos\varphi\ (1+|s|^2)$, for projection r of the points at angular distance φ from the centre of the circle on sphere which is projected to s. The stereographic projection also preserves angles and hence also shapes (but not sizes) of small figures. This is why it was also used for depiction of constellations and their mutual positions on whole hemispheres.

3 Ptolemy used the name 'astrolabe' for another instrument which he introduced in his *Almagest* for measurement of ecliptical coordinates. It is nowadays called 'armillary astrolabe' to distinguish it from the '(planisphaeric) astrolabe', named from Ptolemy's 'planisphaerium'.

4 Prague university was founded as the first one in the Central Europe by the Emperor Charles IV in 1348.

3 Cristannus de Prachaticz (Křišťan z Prachatic)

Cristannus was born after 1360 in the town of Prachatice in southern Bohemia. In 1388 he became Bachelor and in 1390 Master of Liberal Arts at Prague university, in which he spent rest of his life till his death in 1439. Cristannus was dean of the faculty of Arts in 1403-1404 and rector of the university in 1405, 1412-1413, 1434 and 1437. He dealt with mathematics, medicine, botany as well as theology,[5] but his fame is based nowadays on his astronomical work, within which his treatises on the astrolabe were the most important.

Cristannus was an older fellow, friend and supporter of the reformer Iohannes (Jan) Hus. It was on Cristannus's order that Jan Hus copied John Wycliffe's treatises which inspired Hus's criticism to contemporary Church. In 1415 Cristannus visited Hus in jail at the Council of Constance, where he was also imprisoned and released only thanks to intervention of the Emperor Sigismund. Cristannus was also greeted by Hus in his last letter before he was burned at the stake. Cristannus was one of the first two priests who started to offer the Holy Communion under Both Kinds in his parochial church in Prague, but he was a moderate Utraquist and was forced by radical Hussites to leave Prague for a while in 1420s. This religious and political orientation of Cristannus explains why he was 'persona non grata' for Catholic Europe, and his name disappeared from most copies of his treatises on the astrolabe, with his authorship later being entirely forgotten.[6]

Cristannus wrote two treatises on the astrolabe, namely the *Composition* (inc.: "Quamvis de astrolabii composicione tam modernorum quam veterum dicta habentur pulcherrima") and the *Use of the Astrolabe* (inc.: "Quia plurimi ob nimiam quandoque accurtacionem"). One can find in them some traces of treatises by Pseudo-Massha'allah which influenced also many other Latin texts. However, Cristannus's reprocessing of the topic is substantial and his work can be treated as an original one. His aim was to explain the subject more clearly than it had been done in the

5 Cristannus wrote several Latin treatises, such as *Algorismus prosaycus* and *Computus chirometralis*, *Tabula minucionum sanguinis et lunacionum* and *Collecta per magistrum Cristannum de Prachaticz de sanguinis minucione*, *Herbarius*; in Czech are written his works *Diverse Medicine* and *Medical Books* and others.

6 Cristannus is named as the author e.g. in mss [R], [L], [H], [O] (in the first two also the year 1407 of his lectures is given). A compromise selective approach was chosen by the scribe of ms. [K] saved in Hungarian Kalocsa who wrote: "Expliciunt utilitates astrolabii nove, satis valentes, Magistri Cristanni de Brachadicz, heretici perfidissimi pronunc, licet in composicione sive edicione earundem fuerit Cristianus" i.e. "Here ends a new and quite important treatise on the use of the astrolabe by Master *Cristannus* de Prachaticz, one of the worst heretics of the present day, although in the matter of writing and publishing the treatise he behaved as a Christian (*Cristianus*)" (cf. Hadravová, Hadrava 2001, 281).

other available treatises.[7] Cristannus's focus on didactic explanation was also characteristic for his mathematical treatises and it explains why his treatises on the astrolabe became very popular.[8]

4 Spreading of the Manuscripts and Early Prints with Cristannus's Treatises

The autograph of Cristannus's treatises on the astrolabe is not preserved. The oldest manuscript (our siglum [F] in the list of witnesses below) contains a note in the margin, dating it to 1408. It means that this copy was written immediately after the completion of the text. There are more than 80 known manuscript copies of the *Use of the Astrolabe* and 40 of the *Composition* which were written down to the mid-16th century. Moreover, Cristannus's treatises were also printed several times; we can find their texts in the well-known Perugia incunabulum of 1477-1479 (our siglum [u]), which was followed by other incunabula and early modern prints: Cologne 1478, Venice 1497-1498 (1494?, siglum [v]), Venice 1512, Venice 1521 (siglum [x]), Padua 1549. For our first critical edition of both treatises we have chosen the following nine texts of the *Composition*:

1. [C]: Prague, National Library, III C 2, fols 39*r*-42*v* (15th century)
2. [H]: Heiligenkreuz, Zisterzienserstift Bibliothek, Cod. 302, fols 121*r*-131*v* (1447)
3. [K]: Kalocsa, Fószékesegyházi Könyvtár (i.e. the Cathedral Library), 326, fols 10*r*-19*r* (after 1434)
4. [L]: Wien, Österreichische Nationalbibliothek, Cod. 5145, fols 66*r*a-71*r*b (15th century)
5. [M]: Wien, Österreichische Nationalbibliothek, Cod. 5184, fols 25*r*-36*r* (1482)
6. [O]: Wien, Österreichische Nationalbibliothek, Cod. 5228, fols 1*r*-14*v* (1500)
7. [R]: Rostock, Universitätsbibliothek, ms. math. phys. 4° 1[12], fols 173*v*-186*r* (1426)

7 This can be seen from his introduction to the *Composition*: "Quamvis de astrolabii composicione tam modernorum quam veterum dicta habentur pulcherrima, tamen, quia in eisdem quandoque sub paucis verbis magna latet sentencia, quam non nisi aliqualiter exercitati valent capere, igitur pro collectis tam valentis instrumenti utilitate quibusdam regulis conveniens erit pro complemento cepti operis planis tamen verbis composicionem eius conscribere, ut in unum hec collecta perfectum opus habeatur astrolabii" i.e.: "Although very nice words have been said about the construction of the astrolabe both in the old and in the modern times, nevertheless often in a few words there is hidden a great learning which can be comprehended only by the partly experienced. It will thus be convenient to write down in understandable words its construction as a complement to the started work, so as to collects some rules about the use of such a powerful instrument, and in this way to complete one work on the astrolabe which may be taken as perfect" (Hadravová, Hadrava 2001, 136).

8 For a more detailed description of Cristannus's life and work see Hadravová, Hadrava 2008 and 2001, 13-43.

8. [u] (incunabulum): *Roberti Anglici, viri astrologia prestantissimi, De astrolabio canones incipiunt*. Perugia, Petrus Petri, Johannes Conradi et Friedrich Ebert, 1477-1479 (ISTC ir00203000; copy: Milano, Biblioteca Trivulziana, Triv. Inc. C 127, 52-82)
9. [Y]: Florence, Biblioteca Laurenziana, ms. Laur. Ashb. 134 (208-140), 256a-283b (1419?)

and eighteen witnesses of the *Use of the Astrolabe*:

10. [A]: Oxford, Bodleian Library, MS. Canon. Misc. 436, fols 50*r*a-57*v*b (1468?)
11. [E]: Prague, National Library, V E 4b, fols 70*r*-85*r* (1479)
12. [F]: Prague, National Library, XIII F 25, fols 49*r*-68*r* (1407-1408)
13. [G]: Prague, National Library, IV G 10, fols 1*r*-19*r* (end of the 15th century)
14. [J]: Cracow, Biblioteka Jagiellońska, 3224, 459-537 (538-550 Additamenta), (1st half of the 16th century)
15. [K]: Kalocsa, Fószékesegyházi Könyvtár, 326, fols 52*r*-66*r* (after 1434)
16. [L]: Wien, Österreichische Nationalbibliothek, Cod. 5145, fols 58*r*a-66*r*a (15th century)
17. [M]: Wien, Österreichische Nationalbibliothek, Cod. 5184, fols 37*r*-49*v* (1482)
18. [N]: Wien, Österreichische Nationalbibliothek, Cod. 5210, fols 108*r*-132*r* (15th century)
19. [O]: Wien, Österreichische Nationalbibliothek, Cod. 5228, fols 15*r*-30*v* (1502)
20. [R]: Rostock, Universitätsbibliothek, ms. math. phys. 4° 1^{12}, fols 159*r*-173*r* (1426)
21. [S]: Berlin, Staatsbibliothek, Preussischer Kulturbesitz, ms. lat. oct. 438, fols 280*r*-291*v* (15th century)
22. [T]: Paris, Bibliothèque Nationale, Lat. 7282, fols 55*v*a-62*r*a (1468)
23. [u] (incunabulum): *Roberti Anglici, viri astrologia prestantissimi, De astrolabio canones incipiunt*. Perugia, Petrus Petri, Johannes Conradi et Friedrich Ebert, 1477-1479 (ISTC ir00203000; copy: Milano, Biblioteca Trivulziana, Triv. Inc. C 127, 1-51)
24. [v] (incunabulum): *Astrolabii quo primi mobilis motus deprehenduntur canones*. Venetiis, Paganinus de Paganinis, around 1497-1498 (1494?) (ISTC ia01171000; copy: Nelahozeves, Lobkowicz collection /formerly Prague NL/, Roudnice VII Ad 63)
25. [x] (early print): *Astrolabii quo primi mobilis motus deprehenduntur canones*. Venetiis, Petrus Liechtenstein, 1521. 4-0 (copy: Cracow BJ, Inc. 2696b)
26. [Y]: Florence, Biblioteca Laurenziana, ms. Laur. Ashb. 134 (208-140), 217a-255a (1419?)
27. [Z]: Genève, Bibliothèque Publique et Universitaire, 80, fols 1*r*-15*v* (15th century).

These manuscripts represent different versions of the text and their groups. Linguistic analysis of the textual variants has helped us to establish links between them, and the directions of their spreading from Prague. The details of this analysis exceed the aims and possibilities of the present contribution and they can be found in the edition (Hadravová, Hadrava 2001, 97-98 and 100-106). Before we deal with the statistical treatment, which confirmed the philological conclusions, we shall mention here only briefly some additional arguments.

In some manuscripts the place, year and name of the scribe are explicitly indicated.[9] An indirect evidence about the history of some copies can be gathered from Chapters 12 and 49 of the *Use of the Astrolabe*, where Cristannus mentions the time measured from the sunset by astronomical clocks "here in Bohemia" or "in Prague". Scribes abroad usually augmented these indications or directly replaced them by their own location (even if in their countries this 'old Czech time' was not used). We can thus find that the treatises were copied in the following regions and towns: *civitates Stagnales*, *partes Rheni*, *partes Alemanie*, *Saxonia*, *Cracovia*, *Polonia*, *Wienna*, *Ungaria*, *Italia*, *Roma*… Some of the manuscripts also contain tables of geographic coordinates of important cities. These tables help to trace back templates of the manuscripts because the scribes used to add the name of their own place on the last line (Hadravová, Hadrava 2001, 110-119).

The Italian branch of manuscript copies was a template for the aforementioned first incunabulum of the treatise on the astrolabe. Its editor, Ulyxes Lanciarinus Fanensis, pointed out in his foreword that this text is the best for students owing to its clarity, and he identifies it as "the newest rules by a foremost astrologer Robertus Anglicus". This name was used either for Robert of Chester,[10] who lived in the 12th century in England and Spain where he participated together with Hermann of Carinthia in the translation of Arabic texts, or for another Robert the Englishman, who commented in the 13th century Sacrobosco's treatise *De sphaera*. Regardless of the fact that Cristannus's text was really significantly more advanced than the texts from times of both these Roberts, neither of them had a reason to refer to *horologia in Italia…, in partibus Rheni et circa civitates Stagnales* and *in Praga*, which is what we can read in Lanciarinus's edition as well as in the subsequent prints. Antonio Favaro (1879) attributed the authorship of the Venetian print of 1521 to Prosdocimo de Beldomandi[11] because of its similarity to ms. Florence, Biblioteca Laurenziana, Ashb. 134 (our ms. [Y]), allegedly written by Prosdocimo in 1419, and because of a note penned in the outprint of the Jagellonian Library by Piotr Myszkowski – a scholar in Padua in 1530. However, Favaro and his followers did not investigate the other manuscripts with the text and their relations, nor did they try to explain the appearance of "Praga" (corrupted to "Parga" in ms. [Y]) in the text. The database "In Principio" (ver-

9 For instance ms. [R] was copied in Rostock 1426 by Conradus de Geysmaria, ms. [H] in 1447 by brother Ewald, professor in Heidelberg, ms. [E] by Master Iacob of Prague university.

10 Robert of Chester is named in ms. Wien, ÖNB 5311, fols 33*r*a-35*r*a, as a translator of another text on astrolabe classified by Kunitzsch (1982, 489-91) as a type RC.

11 Prosdocimo de Beldomandi (Padua, born between 1370-80, died 1428) is renowned especially through his treatise *Contrapunctus* (cf. e.g. Favaro 1879).

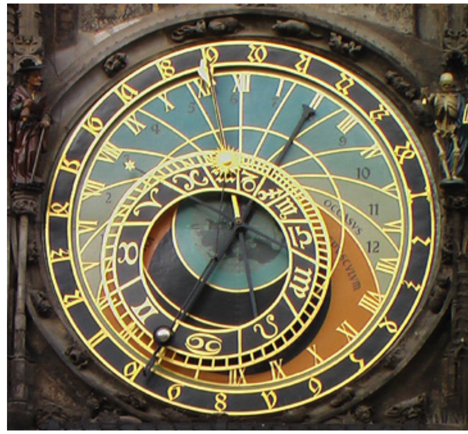


Figure 2. Astrolabic dial (with stereographic projection from the northern pole) of the Prague Astronomical Clock constructed by clockmaker Nicolaus of Kadaň

sion 2000) lists the text of *Composition* in ms. Madrid, El Escorial, Mon. de S. Lorenzo I II 7, fol. 163, which it attributes to the Alfonsinian scholar Aegidius de Tebaldis (Hadravová, Hadrava 2001, 96). Our study of this manuscript made already after the publication of the edition revealed that this copy is closest to the ms. [Y] and hence to the Italian branch of manuscripts and prints of Cristannus's *Composition*.

It is worth noting that Cristannus's text was also a basis for the treatises on the astrolabe written by the Viennese astronomer Iohannes von Gmunden in the 1420s or 1430s. Our comparative edition based on two manuscripts carrying his text (Hadravová, Hadrava 2001, 323-373) reveals that Iohannes von Gmunden included almost the whole of Cristannus's text in his treatise, but he added and further developed some parts, e.g. on terrestrial measurements.

5 Editions in LaTeX and TEI-XML

Our edition of Cristannus's treatises on the astrolabe was published in 2001, but we started to prepare it already in early 1990s. Regarding the relatively large number of witnesses to be included and the consequent size of the critical apparatus,[12] it became advantageous to prepare the edition as camera-ready, and the best option with the then available computers and software was to write it in LaTeX. The implementation of LaTeX distributed by CSTUG (i.e. Czech and Slovak TeX Users Group) included a handy and versatile editor program (CSED) allowing to deal with Czech diacritics. This

12 The *Composition* contains 1568 and the *Use of the Astrolabe* 3192 variant readings.

programme of editing is similar to KEDIT, and it proved to be useful for our method of collation of the individual texts – cf. figure 3; CSED allowed us to work with very long (potentially infinite) lines, of which the displayed part can be arbitrarily chosen using the cursor. We thus put a transcription of each manuscript or its greater part into a single line opened by its siglum, and we put these lines in a chosen sequence one below the other in one and the same window. By inserting spaces we shifted manually the rest of each line to the right so that the equivalent parts of the text formed a column in which the different variants were well visible. We then wrote the chosen reading into the resulting file of the critical edition created in another window at the bottom,[13] and we also indicated its variants in LaTeX-footnotes.

In the above described procedure we generated a LaTeX source-file which in fact anticipated the syntax developed later[14] by the Text Encoding Initiative (TEI) for encoding the critical editions (cf. the on-line document TEI P5). The similarity of both styles of encoding of the critical edition can be seen in the following example of the text:

> Quamvis de astrolabii[1] composicione tam modernorum quam veterum dicta[2] habentur[3] pulcherrima[4]
>
> [1] astrolabii composicione α : composicione astrolabii **C** [2] dicta α : dictis **M** [3] habentur α : habeantur **Ou** [4] pulcherrima α : plurima **M**

taken from our edition of the Cristannus's *Composition of the astrolabe.* In LaTeX it has the form:

```
Quamvis de astrolabii\footnote{ astrolabii composicione
{\bf {\qa}KLMO}: composicione astrolabii {\bf C}}
composicione tam modernorum quam veterum dicta\footnote
{ dicta {\bf {\qa}CKLO}: dictis {\bf M}}
habentur\footnote{ habentur {\bf {\qa}CKLM}: habeantur {\bf Ou}}
pulcherrima\footnote{ pulcherrima {\bf {\qa}CKLO}: plurima
{\bf M}}
```

which can be transcribed into XML in the TEI convention as:

```
Quamvis de <app><lem wit="#H #K #L #M #O #R
#u #Y">astrolabii composicione</lem> <rdg
wit="#C">composicione
```

13 Actually, we modified only the text of the basic manuscript copied initially into this window, because its text turned out to be often the best one.

14 The first version of TEI was released by the end of the year 2007, i.e. more than a decade after our approach was first developed.

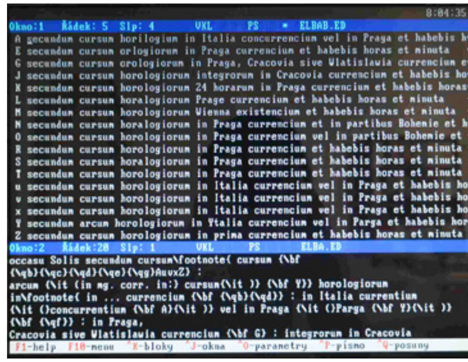


Figure 3. A screenshot of CSED with the edition of Cristannus's Use of the astrolabe (chapter 49) during its preparation

```
astrolabii</rdg></app>
tam modernorum quam veterum <app><lem wit="#C #H #K #L #O
#R #u #Y">dicta</lem> <rdg wit="#M">dictis</rdg></app>
<app><lem wit="#C #H #K #L #M #R #Y">habentur</lem>
<rdg wit="#O #u">habeantur</rdg></app>
<app><lem wit="#C #H #K #L #O #R #u #Y">pulcherrima</lem>
<rdg wit="#M">plurima</rdg></app>
```

The main difference between these two methods of encoding is that the preferred text is to be written in LaTeX both in the base text as well as in the apparatus footnote (where it can be abbreviated to the first and the last word of longer passages), while in TEI it is denoted as a 'lemma' inserted from the apparatus into the base text (cf. TEI P5, Chapter 12.1.2). For the rest, these styles can be converted from one to the other practically by a straightforward interchange of the brackets with keywords in LaTeX to the corresponding XML elements in TEI.[15]

The equivalence of both methods in their logical structure is a natural consequence of the nature of the task of the critical edition. It also results from this equivalence, that analogous procedures of preparation of the editions as well as further processing of the texts like the statistical treatment described in the next Section can be used for both methods.

15 In our example the keyword \qa stands for α, which is an abbreviation of the group of manuscripts HRuY, which often share identical variant readings.

6 Statistics of Variant Readings and Stemma Codicum

The critical apparatus yields evidence about the relationship between the manuscript texts, and it is thus self-suggesting that a mathematical treatment of variant readings may be helpful in the determination of a *stemma codicum*. This possibility has been studied a long time before computers started to be used for the typesetting of the editions (e.g. by Quentin 1926, Greg 1927), but it became much more easily applicable on electronically encoded texts. Plenty of statistical methods have been designed for stemmatology or modified from similar methods in other disciplines (cf. e.g. Baret, Macé and Robinson 2006, Roos and Heikkilä 2009) like the determination of phylogenetic trees in evolutionary biology (cf. e.g. Felsenstein 2004). Hereby, we shall summarize our own statistical method of 'binary correlations', developed and applied to examine the textual tradition of Cristannus's treatises on the astrolabe as documented by the aforementioned LaTeX-edition, and we shall compare it with the results yielded for the same data by some of the recent methods.

Let us define the binary correlation of two particular witnesses as their agreement in a variant reading. The rigid syntax used in the LaTeX-encoding of the critical apparatus enabled us to debug a Fortran code which distinguishes in the source-file of the edition each group of witnesses with an identical reading. It is thus possible to count how many times each pair of witnesses appears in the same group. For n witnesses we thus get $n(n\text{-}1)/2$ independent counts of the binary correlations. In the following table we give as an example the values of correlations in Cristannus's *Composition* (cf. Hadravová, Hadrava, 99; for the more extended table for the *Use of the Astrolabe* see 107-108).

	H	R	u	Y	M	L	O	C	K
H		1129	1112	1086	1019	1015	773	740	467
R	1129		960	956	925	903	718	681	440
u	1112	960		1288	883	883	764	662	422
Y	1086	956	1288		870	882	770	660	415
M	1019	925	883	870		819	647	608	390
L	1015	903	883	882	819		666	614	388
O	773	718	764	770	647	666		491	358
C	740	681	662	660	608	614	491		387
K	467	440	422	415	390	388	358	387	

A higher number of correlations indicates a closer similarity between the two witnesses and thus also their possible dependence.

It would be possible to draw up a tree in the sense of the graph theory,[16] maximizing the sum of weights of the edges given by the values of the binary correlations. Such a solution would be analogous to the 'minimal evolution tree' in biology, because a high correlation of two witnesses means a low ('evolutionary') change between them, so that the distance between two witnesses, which is minimized in phylogenetics, is the difference between the total number of witnesses and the correlation of this pair of witnesses. The mathematical problem of selecting the optimal tree has been solved by Jarník (1930).[17] We can see in figure 4, depicting such an optimal tree for Cristannus's *Composition* and *Use of the Astrolabe*, that this method confirms our choice of the basic manuscripts [H] and [F], respectively. However, such a straightforward algorithmic solution ignores the possibly useful information represented, e.g., by the dating of individual witnesses or other facts. It may thus lead to paradoxical conclusions such as a younger manuscript joining distinct families of older manuscripts. In fact, we can find such a violation of causality (chronology) between the witnesses [u] and [Y] in Cristannus's *Composition*, and between witnesses [J] and [G], [u] and [A] and [x] and [v] of the *Use of the Astrolabe*.

It is necessary in such cases to assume the existence of some hypothetic common template of the two families which was later faithfully copied into the preserved witness. The existence of common (unpreserved) templates is assumed in phylogenetics where the binary trees are searched for. It means that every branch splits into two edges only at each additional hypothetical vertex. The structure of the tree and the weights of its edges must be reconstructed so as to give the distances between the real vertices (the witnesses) as a sum of all edges on the path joining them. This mathematical problem generally does not have an exact solution,[18] however, the solution can be approximated by various methods which may involve

16 The tree is an undirected graph consisting of the vertices (represented by the individual witnesses) joined with edges (i.e. lines between the witnesses), such that there is exactly one path connecting any two vertices. A real *stemma* need not be a simple tree if some witness is influenced by more than one template and hence the resulting graph is cyclic (i.e. it contains a closed path). There can be found n^{n-2} different unrooted trees between n vertices.

17 Jarník's algorithm chooses in the first step the optimal edge (i.e. with the smallest distance and highest correlation) and then in subsequent steps always the optimal edge which joins any of the already connected vertices with some of the remaining vertices. This algorithm was later several times rediscovered e.g. by Robert Prim in 1957.

18 For n given tips (the preserved witnesses) there must be added in such a tree n-1 hypothetical vertices (one root and n-2 bifurcations) connected with altogether 2n-2 edges. The total number n (n -1)/2 of distances is thus for n>3 higher than the degree of freedom of the solution given by the number of weights of the edges (the difference between the edges from the root does not influence the distances between the tips). Such a rooted bifurcation tree can be constructed in $(2n-3)!/2^{n-2}/(n-2)!$ topologically different ways.

additional conditions such as optimizing the sum of all edges (i.e. minimizing the number of evolutionary changes). One of these methods is the so called Neighbour-joining (cf. Felsenstein 2004, 167). This method gives in our case of Cristannus's treatises the structure of the trees shown in figures 5 and 6.

We can see from these diagrams that the method of Neighbour-joining really indicates closer relations between witnesses precisely where we expect them, e.g. between the oldest manuscripts [F], [R], [H] or within the Italian branch including [Y] and the early prints. However, it appears very unlikely that the manuscript [F] of the *Use of the Astrolabe* should have been preceded, within one year, by six generations of templates from which most of the variants should have developed. Similarly, the basic manuscript [H] and its close relative [R] of the *Composition* should be preceded by four generations, but while they have diversified from [Y] in the third generation only, in the *Use of the Astrolabe* this diversification should have taken place already in the first generation. These problems are a consequence of the fact that the assumptions of these algorithmic methods are – compared to evolutionary biology – much less acceptable for the textual tradition of manuscripts and, on the other hand, the additional information available for manuscripts is ignored in them.

The approach we chose in the edition of Cristannus's treatises was thus different. Since there is no preserved autograph, we can suppose that the witness with a high number of correlations to all others is the closest to it. If we plot the positions of all witnesses into a graph in which the time of their origin is running down on the ordinate and the binary correlation with the basic witness divided by the total number of variant readings containing this witness decreases to the right on the abscissa, then the causally connected witnesses indicated by their high binary correlation should lead right down from the template to its copy (unless the copy corrects obvious mistakes of the template). A practical example from our edition can be seen in figure 7; this graph does not pretend to give a final *stemma*, but it suggests possible relations between the witnesses, which should be verified or disproved by a more detailed philological analysis.

It should be kept in mind that the numerical values obtained by our method described above, or by any other statistical treatment of the critical apparatus, are dependent on the editor's choice concerning which variants are worth to be included. To get some promising result, the treatment should be as homogeneous as possible already in the stage of collation of the witnesses. Some normalization may be needed in the case of extended omissions. However, even in an ideal case the statistics can be only a supporting criterion. In an analogy with the sentence "astra inclinant, non necessitant", we could state that statistics can indicate or suggest the *stemma* but cannot to determine or prove it.

Figure 4. Optimal trees joining the witnesses of Cristannus's Composition (up) and Use (bottom)

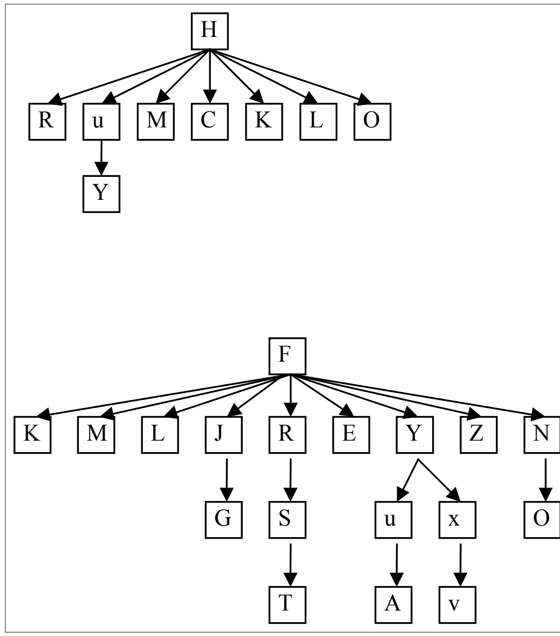


Figure 5. Neighbour-joining tree for Cristannus's Composition of the Astrolabe

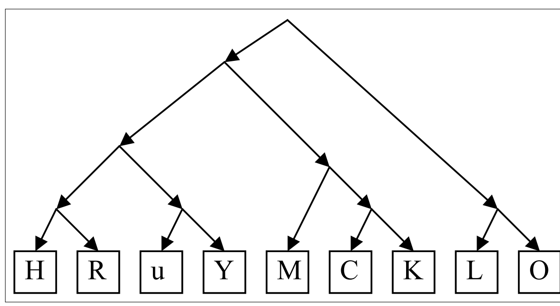
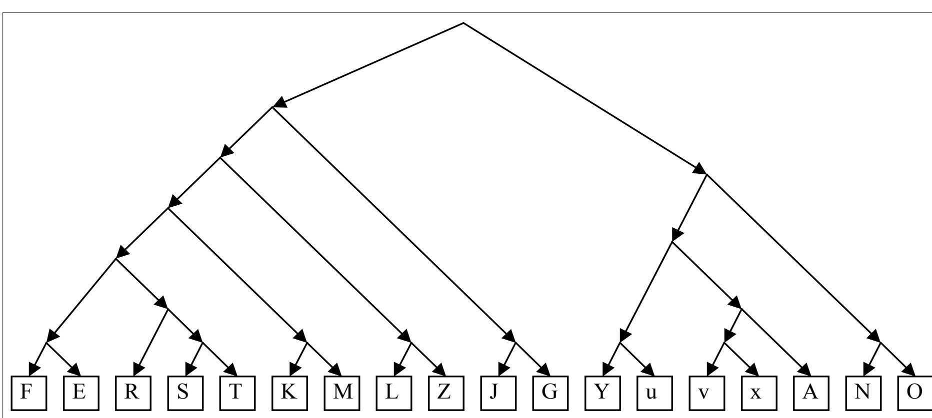
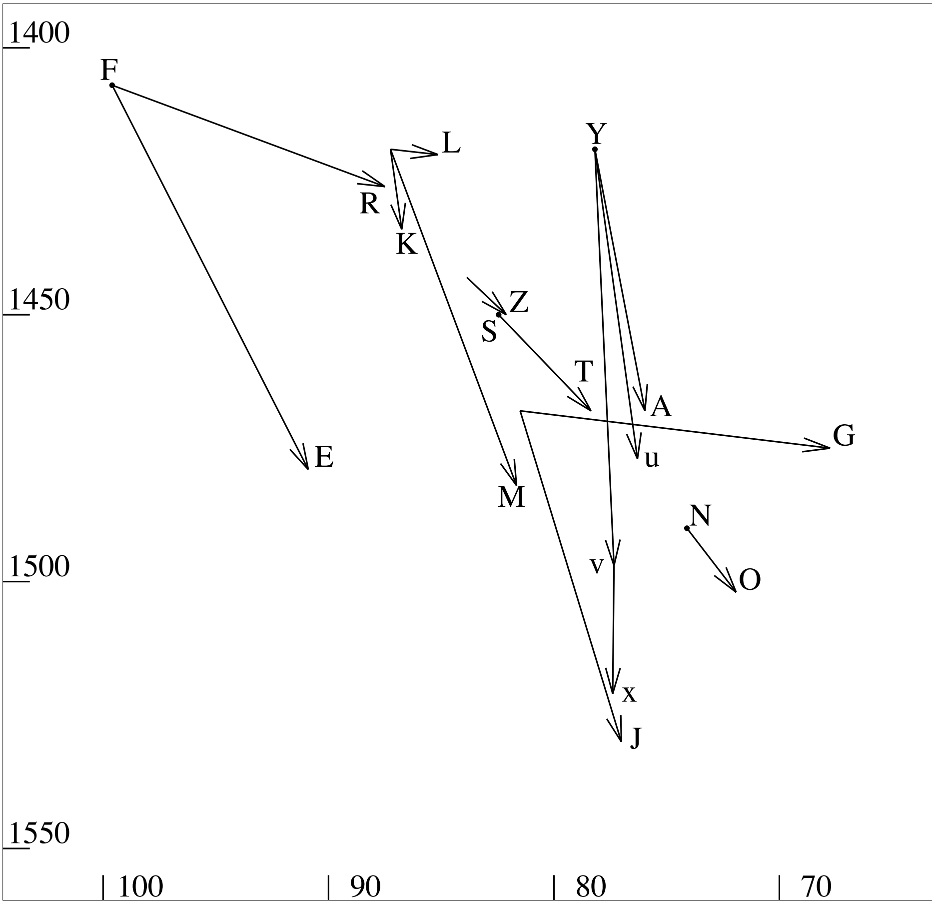


Figure 6. Neighbour-joining tree for Cristannus's Use of the Astrolabe





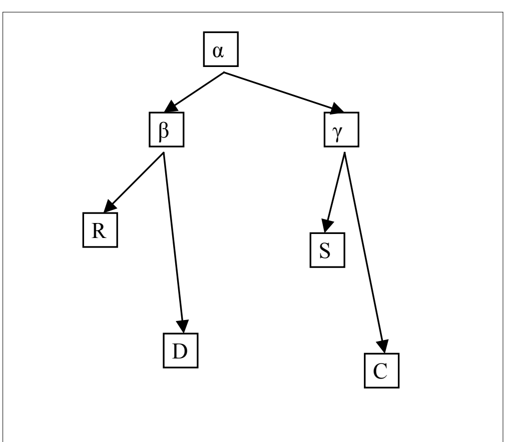


Figure 7. Graph of statistically found relations between witnesses of Cristannus's Use of the Astrolabe

Figure 8. Neighbour-joining tree for a subset of four witnesses

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Appendix

An interesting simple example of limitations of the standard algorithmic methods in stemmatology can be seen in the case of another text (Hadravová 2017). The four oldest preserved manuscripts of this text are [R] from the 12th century, [S] from the break of the 12th and 13th century, [D] from the break of the 14th and 15th century and [C] from 1401. The manuscripts differ in terms of the number of of individual chapters in which the text is organized. These four witnesses contain altogether 231 chapters out of the total number 275 found also in other younger manuscripts. If we count the correlations in presence of the chapters we find values for individual pairs: $c_{SC} = 270$, $c_{RD} = 260$, $c_{SD} = 253$, $c_{DC} = 252$, $c_{RS} = 242$ and $c_{RC} = 241$. Their complements to the total number 275 give distances of these vertices $d_{SC} = 5$, $d_{RD} = 15$, $d_{SD} = 22$, $d_{DC} = 23$, $d_{RS} = 33$ and $d_{RC} = 34$. A straightforward solution by Neighbour-joining algorithm yields the tree shown in figure 8, which is consistent with the dating of the manuscripts (depicted by the vertical displacement of the individual items in fig. 8). This solution also gives the distances from the hypothetical vertices $d_{\beta R} = 13$, $d_{\beta D} = 2$, $d_{\beta\gamma} = 18$, $d_{\gamma S} = 2$ and $d_{\gamma C} = 3$ which precisely reproduce all distances between the tips (e.g. $d_{RS} = d_{\beta R} + d_{\beta\gamma} + d_{\gamma S} = 13 + 18 + 2 = 33$). However, if we inspect in detail how many and which chapters are present in each witness, we find that [D] contains 230 chapters from which 15 are missing in [R] (which has 215 chapters), namely the chapters 170-174, 224, 228-229, 245-248 and 270. It means that the true $d_{\beta R} = 15$ instead of 13 and $d_{\beta D} = 0$ instead of 2. The only chapter, which is missing in [D] (and also in [R]) but is contained in [S] and [C], is chapter 225. It thus follows from the assumption of 'minimal evolution' that [β] contained the same 230 chapters as [D], from which 15 were lost by [R], [α] contained 231 chapters (i.e. also no. 225 lost by [β]). We can find that [S] contains 210 chapters including nos. 49, 107 and 205 which are missing in [C]. Vice versa, [C] contains amongst its 209 chapters also nos. 34 and 259 missing in [S]. Consequently, [γ] should have 212 chapters, i.e. it lost 19 chapters from [α] which we can identify as nos. 170–176, 224, 228-229, 245-248 and 270. This means that the true distances (number of changes in copies) are $d_{\alpha\beta} = 1$ and $d_{\alpha\gamma} = 19$, which cannot be determined by the Neighbour-joining and which give together distance $d_{\beta\gamma} = 20$ instead of 18. The failure of the method of Neighbour-joining is a consequence of the violation of the assumption that the distances between the tips are always the sum of the positive lengths of the edges (branches) on the path joining them. In our case $d_{R\gamma} \neq d_{\alpha\gamma} + d_{\alpha\beta} + d_{\beta R}$, because in the first and the third branch the same chapter 224 was omited and the result of these two independent but identical changes decreases instead of increasing the distance of [R] from the family [S] + [D] developed from [γ]. Although such a coincidence is more likely for omissions (which can take place also on a detailed level of variant readings) similar independent identical evolution cannot be excluded also in other cases and this limits the reliability not only of Neighbour-joining but of all algorithmic methods.

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Gli *auctores* nella *Cosmographiae introductio* (1507) di M. Waldseemüller e M. Ringmann

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Abstract The treatise *Cosmographiae introductio*, published in 1507, contains several quotations from classical authors (Vergil, Ovid, Boethius, Theodosius, Dionysius Periegetes etc.), who are always presented as *auctoritates* for both the geographical description and the scientific context. This paper analyses various cases of these citations and particularly the use of the *auctores*, and it concludes by explaining the dialogue between ancient and modern elements in this Renaissance work.

Keywords Authorities. Cosmography. Renaissance. Ancient and Modern. Classics.

1 Contesto

Tra la fine del secolo XV e gli inizi del XVI nella cittadina lorenese di Saint Dié[1] (situata a un centinaio di chilometri da Strasburgo e sull'itinerario che collegava Parigi a Heidelberg, a Friburgo e ad altre città) si formò un'associazione letteraria e scientifica chiamata *Gymnasium Vosagense*.[2] Era composta dai canonici dell'antico monastero di S. Deodato, da cui il nome alla cittadina dove si trovava una piccola tipografia.

Il *patronus* dell'associazione fu Renato II duca di Lorena (1473-1508),[3] sovrano illuminato e colto, che nutrì un particolare interesse per gli *studia humanitatis*, in particolare la geografia.

Il *Gymnasium*, sovrinteso dal canonico Gauthier Ludd,[4] era composto da:
- Nicholas Ludd (suo nipote),

1 Vedi anche: Ronsin 2006, 111-89; Schwartz 2007, 31-35; Pelletier 2000, 19-21.

2 Vedi anche Schwartz 2007, 35-49.

3 Sul personaggio vedi ora: Say, Schneider 2010.

4 Saint Dié 1448-527; vedi Ronsin 2006, 249-50.

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– Jean Basin[5] (latinista),
– Matthias Ringmann[6] (grecista e poeta),
– Martin Waldseemüller[7] (cartografo).

Questo cenacolo erudito si impegnò nella pubblicazione di alcuni testi:

a. *De artificiali perspectiva*: un trattato di prospettiva, che fu il primo libro edito dal *Gymnasium Vosagense* nel 1505[8] a cura di Jean Pèlerin (detto *Viator*);[9] vi viene esposta la nuova scienza della rappresentazione:

   > laquelle consiste en dimensions arismetrales et doctrine desdits maistres, si comme autres secrez de l'art pictorale (dont les Italz tiennent la palme).[10]

   Con questo testo si diffusero nei paesi nordici le teorie del Rinascimento italiano;[11] esso fu infatti il primo volume a stampa di tale argomento, fatta eccezione per il capitoletto (IV) *De perspectiva*, contenuto nel *De sculptura* di Pomponio Gaurico.[12]

b. *Cosmographiae introductio* (1507): un 'trattatello' introduttivo alla *Geographia* di Tolomeo, a cura di Matthias Ringmann, Martin Waldseemüller e Jean Basin.

5 Sendacourt 1470, Saint Dié 1523; vedi Ronsin 2006, 248.

6 Heichhoffen 1482, Sélestat 1511; vedi Ronsin 2006, 119-22, 129-32, 142-50 e 250; Schwartz 2007, 39-43.

7 Radolfzell, Württemberg ca. 1470-Saint-Dié ca. 1522; vedi Wolff 1992, 111-26; Meurer 2007, 1201-07; Van Duzer, Larger 2011, 217-19; per la sua concezione cartografica: Van Duzer 2012, 8-20.

8 *De artificiali perspectiva*, Tulli 1505; riguardo a questo testo: Ivins 1938.

9 Vihiers, Maine-et-Loire 1440-Toul 1524; vedi Ronsin 2006, 250; Clanché 1928; Brion-Guerry 1962 (con testo latino, traduzione francese e commento).

10 «La quale consiste nelle proporzioni e nella dottrina degli esperti, così come negli altri segreti dell'arte pittorica della quale gli Italiani tengono la palma». Questo periodo è presente solo nella prima edizione del 1505, nelle successive è misteriosamente scomparso, forse a causa di un ripensamento dell'autore.

11 Per un'ampia visione sullo sviluppo della prospettiva vedi almeno: Damish 1987, Sinisgalli 2001.

12 Si veda il testo latino con trad. italiana in Cutolo 1999, 203-21; si legga anche Divenuto 1999; Brockhaus 1885, 32-58.

c. *Instructio manuductionem praestans* (1511),[13] corredata dalla mappa *Itineraria Europae*, ugualmente a cura degli stessi Ringmann e Waldseemüller.
d. *Geographia* (o meglio: Guida alla rappresentazione grafica della Terra) di Claudio Tolomeo (1513):[14] traduzione latina, revisionata su un manoscritto greco, aggiornata e arricchita di informazioni demoetnoantropologiche; ad essa lavorarono M. Ringmann (fino alla morte [1511]) e M. Waldseemüller; ma, a seguito di vicissitudini finanziarie, il progetto fu completato da due giuristi (Jacob Aëszler e Georg Übelin), che si attribuirono tutti gli onori dell'impresa.
   L'opera (8 libri) è costituita da:
   - sezione teorica:[15]
     - lib. I (suddiviso in 24 capitoli)
     - lib. II. 1 (prefazione alla sezione topografica)
     - lib. VII:
       - 5 (didascalia sommaria della mappa dell'*oikoumene*)
       - 6 (erroneamente segnato VII; descrizione della sfera circolare)
       - 7 (Epilogo)
     - lib. VIII. 1-2 (segue parte del 3 con il completamento del lib. VIII riguardo all'Europa)
   - sezione topografica
     - libb. II-VIII (eccetto i paragrafi sopra indicati), che contengono una serie di 8100 toponimi (in cui per la prima volta la forma greca è abbinata a quella latina), con le loro coordinate (latitudine e longitudine) espresse in numeri arabi.

   In precedenza, nell'estate del 1508, Matthias Ringmann effettuò un secondo viaggio, promosso e sovvenzionato da Aëszler e Übelin e in tale occasione ottenne da Gianfrancesco Pico della Mirandola, nipote del famoso umanista, di poter portare un codice greco a Saint Dié, per utilizzarlo nell'allestimento della nuova edizione di Tolomeo (come si desume dalla lettera di Gianbattista Pico della Mirandola).[16]
   In realtà già nel 1505 Ringmann aveva visitato l'Italia e proprio

13 *Instructio manuductionem praestans in Cartam itinerariam*, Argentorati, Ex officina impressoria I. Gruninger 1511; online: `http://bildsuche.digitale-sammlungen.de/index.html?c=viewer&lv=1&bandnummer=bsb00006232&pimage=00006232&suchbegriff=&l=en`.

14 *Claudii Ptolemei viri Alexandrini [...] opus novissima traductione e Graecorum archetypis castigatissime pressum [...]*, Strassburg, Johann Schott 1513; riprod. Skelton 1966, sul significato e importanza di tale edizione, si vedano in partic. le pagine v-xx. Per una panoramica vedi: Gautier Dalché 2007, Gautier Dalché 2009. Per un quadro complessivo sulla fortuna di Tolomeo: Longo 1994-95, Jones 2010.

15 Su questa sezione del testo tolemaico vedi: Berggren, Jones 2000.

16 Skelton 1966, vi-xii.

durante tale soggiorno aveva avuto modo di vedere un manoscritto greco di Tolomeo.

La *Cosmographiae introductio* (1507) mostra alcuni riferimenti a tale progetto editoriale:

- il titolo stesso (che dalla traduzione di Jacopo Angeli era invalso tra gli Umanisti per indicare la *Geographia* di Tolomeo) rivela immediatamente di essere una preparazione al testo tolemaico
- la prefazione della stessa (1507) rinvia esplicitamente a questo codice greco (c. Aii *r* ediz. I):

> Hinc effectum est ut nobis (qui librariam officinam apud Lotharingie Vosagum in oppido cui vocabulum est Sancto Deodato nuper ereximus) Ptholomaei libros post exemplar Graecum recognoscentibus, necnon quatuor Americi Vespucij navigationum lustrationes adijcientibus totius orbis typum tam in solido quam plano (velut praeviam quandam ysagogen) pro communi studiosorum utilitate paraverimus.[17]

Ringmann ritorna a citare tale glorioso progetto anche nella epistola prefatoria della sua *Grammatica figurata*[18] del 1509, dove si legge:

> Inter quae placebit (ni fallor) maxime Claudij Ptolemaei Geographia e graeco originali diligentissime castigata variarumque rerum additione ornatissima.[19]

17 «Da ciò è scaturita questa idea in noi, che abbiamo aperto da poco una casa editrice sui Vosgi in Lotaringia, nella cittadella chiamata Saint-Dié, ovvero di allestire, esaminando i libri di Tolomeo derivati da un esemplare greco e aggiungendo anche le descrizioni dei quattro viaggi di Amerigo Vespucci, la carta dell'intero universo sia in superficie piana che in proiezione sferica (quasi come una introduzione preliminare) per la comune utilità degli studiosi».

18 *Grammatica figurata. Octo partes orationis secundum Donati editionem* [...], Deodate 1509, 2; sull'importanza di quest'opera nel contesto storico-culturale vedi Marino 1996, 92-93.

19 «Tra le quali imprese, se non erro, soprattutto piacerà la Geografia di Claudio Tolomeo corretta con sommo studio dall'originale greco e assai arricchita con l'aggiunta di vari elementi».

2 La *Cosmographiae introductio* (1507)

La *Cosmographiae introductio*[20] è un volumetto, in lingua latina, di 105 pagine ed è così costituito:

- la *Cosmographiae introductio* vera e propria (cc. Ai *r* - bii *v* = 42 pp.)
- le *Quatuor Americi Vesputii navigationes* (cc. biii *r* - fvi *r* = 63 pp.): traduzione latina de *La lettera di A. Vespucci delle isole nuovamente trovate in quattro suoi viaggi* o *Lettera al Soderini.*[21]

Era corredato da:

- una mappa (il primo mappamondo a stampa) costituita da dodici xilografie di notevoli dimensioni (cm 59 × 44 ca.);[22] essa raffigurava oltre ai tre continenti (Europa, Asia, Africa) anche il quarto (il nuovo Mondo) che viene qui denominato 'America' nella sola parte meridionale.[23] Non sarà inutile ricordare che proprio il trattatello contiene la spiegazione del geonimo (c. av *v*):

> Nunc vero et hae partes sunt latius lustratae, et alia quarta pars per Americum Vesputium (ut in sequentibus audietur) inventa est, quam non video cur quis iure vetet ab Americo inventore sagacis ingenij viro Amerigen quasi Americi terram, sive Americam dicendam: cum et Europa et Asia a mulieribus sua sortita sint nomina. Eius situm et gentis mores ex bis binis Americi navigationibus quae sequuntur liquide intelligi datur.[24]

20 La prima e unica traduzione italiana esistente con note esplicative: Baldi, Maggini, Marrani 2015. Mentre si hanno due versioni inglesi: Fischer, von Wieser 1907; Hessler 2008.

21 Sull'opera si veda almeno: Formisano 1991 (segue il testo vespucciano alle pagine 170-89); in generale si veda anche Luzzana Caraci 1996, 2, 473-82.

22 Di tale mappa conosciamo solo un esemplare che, in epoca ignota, giunse in possesso della famiglia del principe Waldberg-Wolfegg (nel castello di Wolfegg nel Württemberg) dove è rimasto sconosciuto al mondo fino al 1901 quando il sacerdote gesuita J. Fischer lo scoprì e ne rese nota l'importanza al mondo intero (1903). Immediatamente gli USA espressero molto interesse nei confronti di tale mappa ma sono occorsi molti decenni (1992) prima di giungere alla possibilità di acquistarla: quando cioè il principe Johannes Waldberg-Wolfegg ha dichiarato che la mappa era in vendita e finalmente nel 2001 venne acquistata dal governo americano per dieci milioni di dollari e dal 2003 si trova presso il Thomas Jefferson Building della Library of Congress a Washington DC (G3200 1507.W3). Vedi anche: Hébert 2003; Harris 1985; Brotton 2013, 146-85. Una riproduzione digitale della mappa: `https://www.loc.gov/resource/g3200.ct000725` e una versione interattiva sul sito: `http://mostre.museogalileo.it/waldseemuller/`.

23 Nella vasta bibliografia vedi: Jantz 1976; Luzzana Caraci 1992, 623; Luzzana Caraci 2007; Gillardot 2007; Schwartz 2007, 28-31, 43-52, 126-28; Humboldt 2009, 1, 311-21.

24 «Ora in realtà anche queste parti sono state più estesamente esaminate, e Amerigo Vespucci (come poi si udirà) ha scoperto un'altra quarta parte, che non vedo perché qualcuno vieti a buon diritto che debba esser detta, dal suo scopritore Amerigo, uomo di acuto ingegno, Amerige, cioè terra di Americo, o America, quando sia l'Europa sia l'Asia hanno

– un globo a spicchi, creato per essere ritagliato e incollato su un supporto ligneo.[25]

In previsione di pubblicare l'*opus magnum*, cioè la *Geographia* di Tolomeo (1513), come abbiamo sopra esposto, gli studiosi ritennero quindi opportuno pubblicare una breve trattazione di quelle nozioni indispensabili alla comprensione del testo tolemaico.

Al fine di conseguire una conoscenza più puntuale del contenuto del trattatello è utile leggere l'indice degli argomenti, che si trova subito dopo la breve prefazione della *Cosmographiae introductio* (c. Aii *v*):

> TRACTANDORUM ORDO
>
> Cum Cosmographiae noticia sine praevia quadam astronomiae cognitione et ipsa etiam astronomia sine Geometriae principijs plene haberi[26] nequeat, dicemus primo in hac succincta introductione paucula de Geometriae inchoamentis ad spherae materialis intelligentiam servientibus.
>
> – 2. Deinde[27] quid sphera, axis, poli etc.
> – 3. De coeli circulis.
> – 4. Quandam[28] ipsius spherae secundum graduum rationes Theoricam ponemus.
> – 5. De quinque Zonis caelestibus earundemque et graduum coeli ad terram applicatione.
> – 6. De parallelis.
> – 7. De climatibus orbis.
> – 8. De ventis cum eorum et aliarum rerum figura universali.
> – 9. Nono capite quaedam de divisione terrae, de finibus maris, de insulis et locorum ab invicem distantia dicentur.[29]

ricevuto in sorte il loro nome da donne. Si può ben comprendere la sua posizione e i costumi della popolazione dai quattro viaggi di Amerigo che seguono».

25 In generale si veda Dekker 2007.

26 Ho corretto: *habere* ediz.

27 Ho corretto: *Deiude* ediz.

28 Ho corretto: *Quaudam* ediz.

29 «INDICE DEGLI ARGOMENTI
Poiché non è possibile avere solide nozioni di cosmografia senza una qualche conoscenza di astronomia e anche della stessa astronomia senza i principi di geometria, esporremo in primo luogo, in questo compendio introduttivo:
[1]. alcuni dei rudimenti di geometria utili per comprendere la sfera;
2. poi cosa siano la sfera, l'asse, i poli ecc.;
3. i circoli del cielo;
4. porremo poi la teoria della stessa sfera secondo i rapporti dei gradi;
5. le cinque zone celesti e la relazione di quelle e dei gradi del cielo nei confronti della Terra;

Si tratta dunque di una introduzione metodologica, con aggiornamenti (per es. la quarta parte del mondo) alla *Geographia* di Tolomeo, testo che avrebbe visto la luce solo nel 1513.

Il trattatello fu arricchito dalla grande mappa con cui costituisce un 'dittico' di estrema importanza poiché le affermazioni teoriche esposte nel testo vengono concretizzate nella realizzazione della mappa, che implica una lettura a livello semiologico delle figure, delle tabelle e della mappa stessa. Il cosmo infatti viene descritto sia in un testo, sia in immagini che risultano non solo corredo iconografico, ma costituiscono esse stesse una fonte di nozioni e di informazioni.

Non dimentichiamo inoltre che questa introduzione contiene le relazioni delle recenti scoperte (le *Quatuor A. Vespucii navigationes*) e la loro resa grafica nell'allestimento della grande mappa.

Il trattatello assurge pertanto a una sintesi agevole e aggiornata del sapere nozionistico cosmografico ed è un ulteriore passaggio nella realizzazione del mosaico complessivo che raffigurerà in maniera verosimile tutta la terra conosciuta. Questo testo costituisce poi il risultato di un continuo gioco di giustapposizione tra antico e moderno, tra conoscenze antiche e aggiornamenti, tra citazioni di opere classiche e di autori contemporanei.

3 *Auctores* antichi e contemporanei

La *Cosmographiae introductio* vera e propria, pur essendo un testo estremamente tecnico, presenta citazioni provenienti non solo da autori di trattati scientifici (ad es. Tolomeo) ma anche e soprattutto di opere letterarie, in prosa (ad es. Cesare)[30] e in poesia (ad es. Virgilio).[31]

Il modo in cui vengono citati i vari passi è:
- diretto: i testi poetici (ad eccezione di un brano in prosa di Pomponio Mela)
- indiretto: i testi in prosa, per lo più rielaborazioni latine di originali greci (ad es. Tolomeo)
- mediato: (Omero tramite Orazio, Teodosio tramite Sacrobosco)

La scelta, verosimilmente programmatica, di omettere le citazioni in scrittura greca credo che derivi dalla volontà di fornire al testo la mas-

6. i paralleli;
7. i climi della Terra;
8. i venti con l'immagine globale di loro e di altri elementi;
9. nel nono capitolo saranno esposte alcune notizie sulla divisione della Terra, i confini del mare, le isole e la distanza dei luoghi tra loro».

30 Cap. 3, c. Av *v* dove si fa riferimento a un passo del *De bello gallico*, VI, 28.

31 Ad es.: Cap. 2, c. A iiii *v*, cf. più avanti in questo lavoro.

sima fruibilità e che non sia imputabile a problemi tecnici di stampa o alla scarsa reperibilità di esemplari (manoscritti o a stampa) in lingua originale.

Al fine di favorire la massima comprensione dei singoli passi, qui esaminati e proposti nello stesso ordine in cui sono utilizzati nella *Cosmographiae introductio*, forniamo di ognuno il frammento testuale originale (unitamente a una mia traduzione italiana, posta in nota) e contestualizzato all'interno del capitolo nel quale esso si trova.

La Prefazione si apre con queste parole (c. Ai *v*):

> Si multas adiisse regiones et populorum ultimos vidisse non solum voluptarium sed etiam in vita conducibile est (quod in Platone, Apollonio Thyaneo atque alijs multis philosophis qui indagandarum rerum causa remotissimas[32] oras petiverunt clarum evadit); quis, o Caesar invictissime, regionum atque urbium situs et externorum hominum?[33]

Nel mondo antico non solo i filosofi, ma anche intellettuali, legislatori, eroi e altri ancora compivano viaggi con l'intento di scoprire il mondo; le mete erano: Egitto, Asia minore, Grecia, Roma, India. Il viaggio implicava un duplice spostamento, non solo spaziale ma anche temporale, poiché essi erano costantemente sulle tracce di quel passato dal quale era scaturito il presente.

I Greci avevano perfetta cognizione della rilevanza del valore del viaggio e Platone fu il primo[34] ad elevarlo a fulcro della sua dottrina filosofica tanto da descrivere il viaggio dell'anima nell'iperuranio, l'unico modo mediante il quale si giunge al possesso della vera conoscenza dell'anima (mito di Er).[35] Platone viaggiò nel mondo conosciuto (bacino del Mediterraneo) alla ricerca di una ideale unione tra politica e filosofia, al fine di poter vedere la concretizzazione dell'idea di bene e di giustizia nel comportamento dei governanti.[36]

32 Ho corretto: *remontissimas* ediz.

33 «Se visitare molte regioni e vedere i più lontani tra i popoli non è solo piacevole ma anche vantaggioso all'esistenza (come risulta evidente da Platone, Apollonio di Tiana e da molti altri filosofi che si diressero verso i confini più remoti al solo scopo di indagare la realtà), chi [vedrà], o invincibile Cesare, i siti delle regioni e delle città e degli uomini stranieri?».

34 Non tenendo in considerazione Pitagora del quale non sappiamo molto di preciso e storicamente documentato, ma che, a quanto pare, ha appreso la sua celebre sapienza dagli Egizi (geometria), dai Caldei (astronomia) e dai Fenici (aritmetica).

35 *Respublica* X (614a-621d); vedi anche: Thayer 1988, Schils 1993.

36 Fonti per le notizie biografiche e in particolare per i viaggi: la *Lettera VII* di Platone stesso; Diogene Laerzio, *Vita dei filosofi*, III, 18-24; Olimpiodoro, *Vita di Platone*; Ateneo, *Deipnosofisti* 504b-509e; Apuleio, *Platone e la sua dottrina*, I-IV; Plutarco, *Vita di Dionigi* 12-21.

Apollonio di Tiana (I d.C.) compì lunghi e incredibili viaggi in Asia Minore e in India e incarna l'ideale del filosofo che intraprende il viaggio della conoscenza, seguendo l'esperienza paradigmatica di Pitagora e Platone.[37]

Da tutto ciò si deduce che il dono più prezioso della geografia, del visitare luoghi o delle loro descrizioni, è l'arricchimento che tale studio arreca all'esistenza individuale, al fine di comprendere e valutare quanto viene osservato.

3.1

Il cap. 2 (*La sfera*, *l'asse*, *i poli*) fornisce le nozioni basilari per lo studio della cosmografia e si apre con la descrizione della sfera.[38] Per fare ciò Waldseemüller e Ringmann utilizzano subito la definizione che l'antico astronomo Teodosio di Bitinia (160 ca.-100 a.C.) aveva formulato nel II secolo a.C., nel suo famoso trattato S*phaerica*[39] che si apre appunto con la descrizione dell'oggetto su cui è costruita l'intera opera.[40]

Così si legge nel testo cosmografico (c. Aiiii *r*):

> Sphera (ut eam Theodosius in libro de spheris definit) est solida et corporea figura una quidem convexa superficie contenta, in cuius medio punctus est a quo omnes rectae ad circumferentiam eductae ad invicem sunt aequales.[41]

37 Le nostre conoscenze si fondano, come è noto, sulla sua biografia, romanzata, redatta da Filostrato, *Vita di Apollonio*; ma vedi anche Elsner 1997 (con bibliografia precedente).

38 Per un'ampia panoramica sull'importanza di questa figura geometrica vedi Totaro, Valente 2012.

39 Sulla struttura dell'opera: Thomas 2014. Sulla trasmissione del testo vedi: Lorch 1996. Il testo greco di Teodosio è circolato fino alla metà del '500 solo su manoscritti (in numero abbastanza esiguo) e l'*editio princeps* si ebbe nel 1558: Θεοδοσίου Τριπολίτου Σφαιρικῶν βιβλία γ'. *Theodosii Tripolitae Sphaericorum libri tres, numquam antehac graece excusi. Iidem latine redditi per Ioannem Penam Regium Mathematicum*, Parisiis, Apud Andream Wechelum, 1558. Nel 1529 era però apparsa l'edizione latina *Theodosii De sphaericis libri tres, a Ioanne Vogelin [...] restituiti [...]*, Viennae. In officina I. Singrenii, 1529, disponibile anche online: `http://reader.digitale-sammlungen.de/de/fs1/object/display/bsb10981297_00005.html`.

40 Per un quadro sulla sfera celeste vedi Obrist 2004, 119-46, sulla sfera terrestre: 147-69; Freguglia 1999, 59-87.

41 «Dunque la sfera (come la definisce Teodosio nel trattato *Sulla sfera*) è una figura solida e corporea, contenuta in una superficie convessa, nel cui centro c'è un punto dal quale tutte le linee tracciate verso la circonferenza sono uguali tra loro».

Se lo confrontiamo con il testo di Teodosio (I. 1):

> σφαῖρά ἐστι σχῆμα στερεόν, ὑπὸ μιᾶς ἐπιφανείας περιεχόμενον, πρὸς ἣν ἀφ’ἑνὸς σημείου τῶν ἐντὸς τοῦ σχήματος κειμένων πᾶσαι αἱ προσπίπτουσαι εὐθεῖαι ἴσαι ἀλλήλαις εἰσίν.[42]

vediamo che Teodosio non è la fonte utilizzata, ma esso è stato mediato dalla *Sphaera mundi* di John Halifax of Holywood (Sacrobosco) (1190-1256),[43] trattato famosissimo e capillarmente diffuso, dove nel Lib. I. 1 si afferma:

> Sphaera etiam a Theodosio sic describitur. Sphaera est solidum quoddam una superficie contentum in cuius medio punctus est, a quo omnes lineae ductae ad circumferentiam sunt aequales.[44]

Questo testo è pertanto la fonte a cui hanno attinto i nostri cosmografi.

3.2

Dopo aver chiarito il concetto di sfera viene affrontata la nozione di asse (c. Aiiii *r*):

> Axis spherae est linea per centrum spherae transiens ex utraque parte suas extremitates ad spherae circumferentiam applicans, circa quam sphera, sicut rota circa axem carri (qui stipes teres est), intorquetur et convertitur estque ipsius circuli diametrus.[45]

42 «La sfera è una figura solida racchiusa da un’unica superficie: tutte le rette che partendo da un unico punto (il centro) e restando interne alla figura, giungono fino ad essa, sono tra loro uguali».

43 Sul personaggio e l’opera vedi almeno Hamel 2014.

44 «Anche Teodosio descrive la sfera così: la sfera è un solido contenuto all’interno di un’unica superficie nel mezzo del quale c’è un punto da cui tutte le linee, tirate fino alla circonferenza, sono uguali tra loro».

45 «L’asse [cioè il diametro] della sfera è una retta che passa per il centro della sfera ed entrambi gli estremi terminano sulla superficie della sfera; così come una ruota intorno all’asse del carro (che è un palo ben tornito), la sfera si avvolge e si gira intorno all’asse; l’asse è anche il diametro del medesimo cerchio».

La prima parte di tale definizione è nuovamente tratta, in modo tacito, dalla *Sphaera mundi* (I, 1):

> Linea vero recta transiens per centrum sphaerae applicans extremitates suas ad circumferentiam ex utraque parte dicitur axis sphaerae.[46]

che a sua volta deriva da Teodosio [I. 3]:

> διάμετρος δὲ τῆς σφαίρας ἐστὶν εὐθεῖά τις διὰ τοῦ κέντρου ἠγμένη, καὶ περατουμένη ἐφ᾽ἑκάτερα τὰ μέρη ὑπὸ τῆς ἐπιφανείας τῆς σφαίρας, περὶ ἣν μένουσαν εὐθεῖαν ἡ σφαῖρα στρέφεται.[47]

Un rapido confronto permette di capire che il nostro testo è una parafrasi della definizione di Sacrobosco, con l'aggiunta di una similitudine rurale (al solo scopo esemplificativo).

3.3

Seguono poi (c. Aiiii *r*) due versi di Manilio (*Astronomica*, I. 279 e 281):

> Aera per gelidum tenuis deducitur axis
> sydereus medium[48] circa quem volvitur orbis.[49]

Essi fanno parte di una sezione più ampia (vv. 275-93) dove viene descritto l'asse terrestre e proprio la lettura più estesa del testo maniliano permette di comprendere maggiormente la descrizione astronomica della *Cosmographia*, ma pone al contempo qualche interrogativo riguardo alla selezione operata dai nostri autori di questi due soli versi (279 e 281) eliminando il v. 280 che, in realtà, era quanto mai opportuno in tale contesto.[50]

46 «Ma la linea retta che passa per il centro della sfera e termina le sue estremità sulla circonferenza da una parte e dall'altra, si chiama asse o perno attorno al quale la sfera gira».

47 «Il diametro della sfera è una retta che passa per il centro ed entrambi i suoi estremi terminano sulla superficie della sfera, e intorno al diametro, che sta fermo, ruota la sfera».

48 'Medium' in Manilio è posto dopo 'circa'.

49 «Il sottile asse si estende attraverso il gelido aere, / la sfera stellata si muove intorno a questo, che è al centro dell'universo».

50 Sul libro I e la descrizione dell'universo vedi almeno Volk 2009, 14-57; sulla ricezione umanistica dell'opera maniliana cf. Hübner 1980.

3.4

Dopo la citazione di Manilio si incontra la definizione dei poli (c. Aiiii *r*):

> Poli (qui et cardines et vertices dicuntur) sunt puncta coeli axem terminantia ita fixa ut numquam moveantur sed perpetuo eodem loco maneant.[51]

dove, per la parte iniziale, gli autori ricorrono tacitamente sempre a Sacrobosco (I, 1):

> Duo quidem puncta axem terminantia dicuntur poli mundi.[52]

che riprende la definizione teodosiana [I. 4]:

> πόλοι δὲ τῆς σφαίρας εἰσὶ τὰ πέρατα τοῦ ἄξονος.[53]

3.5

Sempre nel Cap. 2 incontriamo (c. Aiiii *v*) due versi virgiliani come esemplificazione dei due poli principali (boreale e australe) (*Georgiche*, I. 242-43):

> Hic vertex nobis semper sublimis, at illum
> sub pedibus Stix atra videt manesque profundi;[54]

sarà utile ricordare che i due versi sono menzionati ben due volte in Sacrobosco: II, 2 (*Sul circolo equinoziale*); III, 5 (*La quantità dei giorni e delle notti di quelli sotto l'Equinoziale*).

51 «I poli (che sono detti anche cardini o vertici) sono punti che terminano l'asse del cielo, così fissi che mai si muovono ma rimangono eternamente nello stesso luogo».

52 «I due punti che delimitano l'asse si chiamano poli».

53 «I poli della sfera sono le estremità dell'asse».

54 «Questo polo incombe sempre su di noi ma l'altro / lo vedono sotto i loro piedi il lugubre Stige e i morti sotterra».

3.6

A questi versi di Virgilio vengono giustapposti (c. Aiiii *v*) due esametri del contemporaneo Battista Spagnoli (latinizz. Mantuanus)[55] (*Parthenice Mariana* I. 22-23):

> Tu nobis Elice, nobis Cynosura, per altum
> Te duce vela damus, etc. [portus habitura secundos].[56]

Essi fanno parte dell'invocazione iniziale (vv. 1-28)[57] dove il poeta invoca non le Pieridi bensì la Vergine Maria, Regina del cielo e a questo proposito non deve stupire l'epiteto (*Cynosura*) Orsa minore rivolto a Maria poiché essa è già invocata come *Stella maris* ed entrambi gli appellativi sono riconducibili al concetto di 'luce che guida…'.

3.7

Nel cap. 4 (*Teoria della sfera secondo il calcolo dei gradi*) vengono esposti i cinque circoli principali, dei quali il maggiore è l'Equatore. Gli autori antichi sono soliti denominare gli spazi tra un circolo e l'altro con il termine 'zone', così nel testo cosmografico si legge (c. Bi *r*):

> Quinque tenent coelum zonae quarum una corusco
> semper sole rubens et torrida semper ab igni est
> quam circum extremae dextra laevaque trahuntur
> cerulea glacie concretae atque imbribus atris.
> Has inter mediamque duae mortalibus aegris
> munere concessae divum et via secta per ambas
> obliquus qua se signorum verteret ordo.[58]

55 (Mantova 1448-1516), poeta e religioso; sul personaggio vedi almeno: Pescasio 1994, Marrone 2013, 19-33.

56 «Tu per noi come Elice o Cynosura, con te / come condottiero, spieghiamo le vele per giungere a porti propizi».

57 Sull'opera vedi Bolisani 1957, 7-21; Coroleu 2014, 24-37.

58 «Cinque zone segnano il cielo delle quali una / rosseggia sempre al fulgido sole e sempre arsa dal fuoco / intorno alla quale le estremità si estendono / a destra e a sinistra, compatte per il ceruleo ghiaccio e per le nere tempeste. / Tra queste e quella mediana, due zone / sono state concesse per dono divino ai miseri mortali / e tra le due fu tracciata una via lungo la quale / ruota obliquamente l'ordine dei segni».

Si tratta di alcuni versi virgiliani (*Georg.* I, 233-239); essi fanno parte della sezione *Le zone e le relative attività* (vv. 231-256) che, come è noto, si fondano su un passo dell'*Hermes* di Eratostene (fr. 16 Powell).[59] Ricordiamo che i primi due versi (233-34) vengono citati, ancora una volta, da Sacrobosco II, 7 (*Sulle cinque zone*).

3.8

Viene poi affrontata la distanza delle cinque zone tra loro, fornendo la posizione dei circoli maggiori e minori e si afferma (c. Bii *r*-*v*):

> Nos quoque ea de re tractantes spacii iniquitate sic exclusi ut ratio minutorum non vel vix possit observari et si observaretur etiam tedium cum errore gigneret, a plenis[60] graduum annotationibus circulorum positionem sumemus. Nam non multum distat inter 51 min. et plenum gradum qui sexaginta minuta continet, sicuti supradiximus atque in libro De sphera et aliubi ab harum rerum studiosis examussim declaratur. Itaque in figura quam pro talium intelligentia hoc loco subiungemus ipsi bini tropici Cancri scilicet et Capricorni atque maxime solis declinationes ab aequinoctiali 24 gradibus distabunt.[61]

Esso risulta verosimilmente la rielaborazione di un passo della *Sphaera mundi* di Sacrobosco (II, 6 *De quatuor circulis minoribus*):[62]

> Cum igitur maxima Solis declinatio secundum Ptolomaeum sit 23 graduum et 51 minutorum et totidem graduum sit arcus qui est inter circulum arcticum et polum mundi arcticum, si ista duo simul iuncta quae fere faciunt 48 gradus subtrahuntur a 90 residuum erunt 42 gradus quantus est arcus coluri qui est inter primum punctum Cancri

59 Powell 1970, 62-63.

60 Ho corretto: *plaenis* ediz.

61 «Anche noi, trattando tale argomento, impediti dalla mancanza di spazio così da escludere di osservare del tutto o in parte il computo dei minuti, che se fosse osservato genererebbe noia olte che errore, da tutte le annotazioni dei gradi, trarremo la posizione dei circoli. Non esiste molta differenza tra 51 minuti d'arco e un grado pieno (che contiene 60 minuti d'arco), come abbiamo sopra esposto, e nel libro *Sulla sfera* e altrove è dichiarato, con esaustività, da studiosi di questa materia. Così nella figura, che in questa sede aggiungiamo per la comprensione di tali argomenti, gli stessi due Tropici del Cancro e del Capricorno e soprattutto le inclinazioni del Sole disteranno dal circolo equinoziale 24° [invece che 23° e 51′]...».

62 Testo tratto da Ioannes de Sacrobosco, *Tractatus de sphaera*, Venetiis, Adam de Rottweil, 1478 ca., c. 12*v*, consultabile anche online: `http://www.ghtc.usp.br/server/Sacrobosco-1478.htm`.

> et circulum arcticum. Et sic patet quod ille arcus fere duplus est ad maximam Solis declinationem.[63]

In questo passo si esplicita maggiormente un'indicazione presentata da Sacrobosco già in II, 4; l'approssimazione di calcolo, qui utilizzata per evitare di imbattersi in problemi eccessivi durante la rappresentazione grafica, era diffusa prima di Tolomeo, come si legge proprio nell'annotazione al testo di Sacrobosco (II, 4 *De duobus coluris*) tradotto[64] da Piervincenzo Danti:[65]

> Prima di Tolomeo la declinazione dello Zodiaco era tenuta 24 gradi perché gli Astronomi di quei tempi che dividevano la Sfera in 30 gradi o parti, dicevano che lo spazio tra un tropico e l'altro era 4 parti, che sono 48 di maniera che la massima declinazione era di gradi 24.
> Prima di Tolomeo era 24°
> Al tempo di Tolomeo era 23°51′20″
> Al tempo di Albategno che fu negli anni del Signore 880 e dopo Tolomeo anni 750 era 23°25′0″
> Al tempo di Arzael dopo Albategno anni 190 fu 23°34′0″
> Al tempo d'Almeone Almansore, che fu dopo
> Arzael anni 70 era 23°33′30″
> Ai nostri tempi che siamo nel anno 1497 è quasi 23°29′0″.

63 «Essendo la massima declinazione del sole, secondo Tolomeo, 23° e 51 minuti di arco e altrettanti gradi e minuti è l'arco che si trova fra il circolo Artico e il polo artico del mondo, se sommiamo l'uno e l'altro fanno quasi 48°, e se li sottraiamo a 90 restano 42°: di tale ampiezza è l'arco del Coluro preso tra il primo punto del Cancro e il circolo Artico: così è evidente che questo pezzo di arco è quasi la metà più grande della massima declinazione del Sole».

64 *La Sfera di Giovanni di Sacrobosco tradotta da Pier Vincenzo Dante de Rinaldi, con le annotazioni del medesimo [...]*, In Perugia 1574, Nella stamperia di Gio. Berardino Rastelli [CNCE 37861], 26; consultabile anche online: `http://teca.bncf.firenze.sbn.it/ImageViewer/servlet/ImageViewer?idr=BNCF0003260823#page/1/mode/2up`.

65 Matematico e letterato (metà sec. XV-1512), vedi anche Fiore 1986a. Egli tradusse il testo di Sacrobosco, dedicandolo al suo maestro Alfano Alfani: il manoscritto (mai ritrovato) venne pubblicato, postumo, dal più famoso nipote Egnazio Danti a Firenze 1571 e a Perugia 1574. Sul nipote vedi almeno Fiore 1986b e Sciarra, in questo volume..

3.9

Nel cap. 7 (*Sui climi*) prosegue l'esame delle varie zone e riguardo al clima australe (c. aiii *r*) si cita il geografo Pomponio Mela, *Corografia* I. 4:

> Zonae habitabiles paria agunt anni tempora, verum non pariter. Antichthones alteram, nos alteram incolimus. Illius situs ob ardorem intercedentis plagae incognitus: huius dicendus est.[66]

Si tratta di un passo del libro I, i cui §§ 1-2 costituiscono la prefazione (con esposizione dell'argomento dell'opera e delle varie sezioni), i §§ 3-8 affrontano l'universo e le parti della terra.

Il frammento testuale citato si colloca in questa seconda sezione e la sua comprensione è facilitata dalla lettura del testo che precede:

> Huius medio terra sublimis cingitur undique mari, eademque[67] in duo latera, quae hemisphaeria nominant, ab oriente divisa ad occasum, zonis quinque distinguitur. Mediam aestus infestat frigus ultimas; reliquae habitabiles.[68]

Così risulta chiaro che i criteri per distinguere le zone terrestri non sono astronomici bensì climatici e da tale affermazione si desume che per Pomponio solo le zone temperate sono abitabili.[69]

Non sarà inutile sottolineare che antica è l'idea dell'esistenza di popoli che vivono agli antipodi (cf. Hipp. *De regim*. II, 38; Arist. *Meteor.* 362 b 30-36; Cic. *Tusc.* I, 68), e che nella concezione pitagorica il termine ἀντίχθων indica la terra dalla parte opposta alla nostra (cf. Arist. *de cael.* II, 13, 2).[70]

66 «Le zone abitabili hanno uguali stagioni ma in realtà non in tempi uguali. Gli Antictoni ne abitano una, noi l'altra. La posizione di quella zona, per il calore della fascia interposta, non è nota; di questa zona invece dobbiamo affrontare la trattazione».

67 Lezione in correzione del ms. Città del Vaticano, Biblioteca Apostolica Vaticana, lat. 4929; edizioni: *eodemque*.

68 «In mezzo a questo universo si trova la straordinaria terra cinta ovunque dal mare la quale è divisa in due lati (da est verso ovest) che si chiamano emisferi, ed è ripartita in cinque zone: quella centrale è la più calda, le estreme quelle più fredde; le altre sono abitabili».

69 Sulla fascia intermedia vedi anche Plinius *Naturalis Historia*, II, 172.

70 In generale su tale concetto vedi Moretti 1994a, Moretti 1994b.

3.10

Nel cap. 8 dopo quattro citazioni classiche (due virgiliane e due ovidiane),[71] si ricorre nuovamente alla giustapposizione di alcuni versi di un altro poeta contemporaneo, Johannes Hänlein (latiniz. Gallinarius),[72] noto soltanto per il *Tractatus super Salve regina* (1503)[73] che però non risulta contenere i versi qui citati (c. aiiii *r*):

> Eurus et Eoo flat Subsolanus ab ortu
> flatibus occasum Zephirusque Favonius implent
> Auster in extremis Lybiae et Nothus aestuat oris,
> sudificus Boreas Aquiloque minatur ab axe.[74]

Riguardo ai venti in realtà si sarebbero potuti citare altri autori antichi, decisamente più noti, come:[75]

- Aristotele, *Sulla metereologia* 363a 21 - 365a 13
- Seneca, *Questioni naturali* V, 16-17
- Plinio, *Storia naturale* II, 119-130 e XVIII, 335-336
- Aulo Gellio, *Notti attiche* II, 22
- Vitruvio, *Sull'architettura* I, 6

Altri versi seguono i quattro di Gallinarius ed essi sembrano ascrivibili allo stesso (c. aiiii *v*):

> quoque loco prodit gelidus furit Auster et arctis
> cogit aquas vinclis at dum per torrida flatu
> sydera transierit nostras captandus in oras
> commeat, et Boreae sevissima tela retorquet.
> At contra Boreas nobis gravis orbe sub imo
> fit ratione pari moderatis levior alis.

71 Ov. *Met.* I, 61-66; Verg. *Georg.* I, 44; Ov. *Met.* I, 264; Verg. *Aen.* III, 285.

72 (Heidelberg 1475-1516 ?), sul personaggio vedi Franck 1878; per una panoramica sul contesto cf. Spitz 1963, 41-60, 267-93.

73 *Tractatus super Salve regina, materia pro ambone valde utilis, per modum sermonum collecta a venerabili patre domino Johanne Henlin, sacre theologie lectore, ordinis predicatorum Noriburgo concionatorem*, Noriburgo 1502; consultabile online: `http://daten.digitale-sammlungen.de/~db/bsb00002688/images/index.html?id=00002688&fip=62.94.138.130&no=4&seite=5`.

74 «Euro e Subsolano soffiano dalla nascita in Oriente, / Zefiro e Favonio con i soffi portano a compimento il tramonto / Austro e Noto infuriano negli estremi lidi della Libia, / il secco Borea e Aquilone minacciano dall'asse».

75 Senza considerare le opere giunteci frammentarie come Teofrasto, *Fragm.* 5 *De ventis*.

> Caetera mox varios qua cursus flamina mittunt
> immutant propriae naturam sedis eundo.[76]

3.11

Il lungo (cc. aiiii v - bi v = 11 pp.) cap. 9 (*Alcuni elementi di cosmografia*), dopo una estesa carrellata geografica (ben 116 versi della *Periegesi* di Prisciano), presenta, nella parte finale, la questione dell'elevazione del polo e, affrontando la distanza dall'Equatore verso Nord, parla (fondandosi su Tolomeo [I. 3]) delle miglia che non sono identiche tra tutti i popoli (c. aviii *v*):

> Verum tamen non sunt, secundum Ptholomaei sententiam, milliaria a circulo aequinoctiali ad Arcton ubique gentium aequales.[77]

Questo testo può essere confrontato con l'edizione latina (1513) della *Geographia* di Tolomeo, menzionata in principio, che proprio in questi anni Ringmann e Waldseemüller stavano portando avanti:

> [titolo] Quomodo ex stadiorum dimensione cuiuscunque rectae distantiae, licet non sit sub eodem meridiano, mensura ambitus terrae sit percipienda et contra.
>
> Perque autem hoc reliquum est ut et omnium caeterarum distantiarum dimensio (licet rectae omnino non sint, neque ab eodem meridiano aut parallelo) percipiatur elevatione poli et inclinatione distantiae ad meridianum diligenter servata; contra enim per rationem circumferentiae ad maximum circulum stadiorum numerus facile haberi potest a cognita circulatione totius terrae.[78]

76 76 «In qualunque luogo si propaga il gelido Austro, esso infuria / e costringe le acque in anguste catene, e finché non abbia / attraversato le zone torride per essere accolto nelle nostre coste, / passa e sospinge indietro i tremendi dardi di Borea. / Al contrario Borea, devastante per noi, sotto la parte più bassa del cosmo / diventa parimenti più debole, mitigando le ali. / Gli altri venti, poi, percorrono varie strade / e nel procedere mutano la natura della loro sede».

77 «In realtà tuttavia, secondo il parere di Tolomeo, le miglia dal circolo equinoziale verso l'Orsa non sono uguali in tutti i luoghi».

78 «[titolo] In che modo dal numero delle miglia di qualunque diretta distanza, anche ove non sia sotto lo stesso meridiano, si debba desumere la misura del circuito terrestre, e viceversa.

Perciò resta dunque che la misurazione di tutte le altre distanze (sebbene non siano del tutto in linea retta, né lungo lo stesso meridiano o parallelo), venga percepita in base all'elevazione del polo e all'inclinazione della distanza rispetto al meridiano; al contrario

Leggiamo anche il testo greco di Tolomeo:

> Διὰ δὲ τούτου λοιπὸν καὶ τοὺς τῶν ἄλλων χωρὶς ἀναμετρήσεως, κἂν μὴ ὦσι δι' ὅλων ἰθυτενεῖς μηδ' ὑπὸ τὸν αὐτὸν μεσημβρινὸν ἢ παράλληλον, τὸ δ' ὡς ἐπίπαν τῆς προσνεύσεως ἴδιον ἐπιμελῶς ᾖ εἰλημμένον καὶ τὰ τῶν περάτων ἐξάρματα. Διὰ γὰρ τοῦ λόγου πάλιν τῆς ὑποτεινούσης τὴν διάστασιν περιφερείας πρὸς τὸν μέγιστον κύκλον καὶ τὸ τῶν σταδίων πλῆθος ἀπὸ κατειλημμένου τῆς ὅλης περιμέτρου προχείρως ἔνεστιν ἐπιλογίζεσθαι.

Comprendiamo quindi che il testo del 1507 risulta un riferimento tolemaico molto 'libero' ma esso conserva tutta la sua forza scientifica permettendoci di percepire la dinamica compositiva e soprattutto la notevole autorevolezza che la menzione di un autore antico conferisce ancora ad una affermazione.

Mentre la citazione esplicita di un passo (sia esso in poesia o in prosa) mette il lettore in grado di confrontare immediatamente le affermazioni dell'autore con le parole dell'*auctor* antico, quando il riferimento non è esplicitato l'autore gioca fortemente sulla fiducia del lettore, il quale incontrando la menzione di un *auctor* crede alla sua *auctoritas* che imprime al testo moderno una forza decisamente ragguardevole, che difficilmente potrebbe acquisire in modo diverso.

3.12

Verso la fine dello stesso cap. 9, dopo aver esposto le nozioni cosmografiche viene spiegato il metodo seguito nella realizzazione della mappa (c. bi *r*):

> Haec pro inductione ad Cosmographiam dicta sufficiant si te modo ammonuerimus prius nos in depingendis tabulis typi generalis non omni modo sequutos esse Ptholomaeum, praesertim circa novas terras ubi in cartis marinis aliter animadvertimus aequatorem constitui quam Ptholomaeus fecerit.[79]
>
> Et proinde non debent nos statim culpare qui illud ipsum notaverint. Consulto enim fecimus[80] quod hic Ptholomeum alibi cartas marinas sequuti sumus.[81]

infatti in base al rapporto della circonferenza rispetto al cerchio maggiore il numero delle miglia si può facilmente ottenere dalla circonferenza nota di tutta la terra».

79 Ho corretto: *faecerit* ediz.

80 Ho corretto: *foecimus* ediz.

81 «Quanto detto sarà sufficiente come introduzione alla cosmografia, a patto che ti avvertiamo che noi nella rappresentazione della carta generale non abbiamo seguito in

Per giustificare poi eventuali lacune Waldseemüller e Ringmann utilizzano l'ultima esplicita menzione di Tolomeo (*Geogr*. I. 5):

> Cum et ipse Ptholomaeus quinto capite primi libri non omnes continentis partes ob suę magnitudinis excessum ad ipsius pervenisse noticiam dicat et aliquas quemadmodum se habeant ob peregrinantium negligentiam sibi minus diligenter traditas, alias esse quas aliter atque aliter se habere contingat ob corruptiones et mutationes in quibus pro parte corruisse cognitae sunt.[82]

Si tratta di una citazione indiretta del testo tolemaico che è fedele al testo originale come possiamo dedurre dalla lettura dell'edizione del 1513:

> [titolo] Quod recentioribus historiis credendum magis sit, ob mutationes quae diversis temporibus in orbe contigunt
>
> Initium nostre descriptionis his prelibatis sic aeque haberi poterit. Sed cum loca omnia quae aut ob infinitam eorum magnitudinem aut quia non semper eodem modo sese habent, non omnino satis explorata sunt et diuturnius tempus eorum noticiam semper certiorem faciat, circaque Geographiam hoc animadvertendum videtur.
>
> Cum concessum sit ex traditionibus vario in tempore editis, non unas nostri continentis partes ob excessum sue magnitudinis nondum ad nostram pervenisse noticiam. Aliquas vero non quemadmodum sese habent ob peragrantium negligentiam nobis minus diligenter traditas. Alias autem esse quae nunc aliter quam hactenus sese habent, sive ob corruptiones sive ob mutationes in quibus pro parte corruisse cognitae sunt.
>
> Necesse nobis sit intendere, librando tamen in expositione illorum quae nunc tractantur et in selectione eorum quae hactenus tradita fuerint, quid sit quidve non sit credendum.

Come sempre risulta utile la lettura del testo greco:

> [Titolo] Ὅτι ταῖς ἐγγυτέραις τῶν ἱστοριῶν προσεκτέον διὰ τὰς ἐν τῇ γῇ κατὰ χρόνους μεταβολάς.

modo pedissequo Tolomeo, soprattutto riguardo alle nuove terre dove nelle carte nautiche vediamo che l'Equatore è posto altrove rispetto a quanto stabilì Tolomeo. Onde non ci devono subito incolpare coloro che hanno notato proprio questo aspetto; intenzionalmente infatti abbiamo fatto così, seguendo ora Tolomeo e ora le carte nautiche».

82 «Lo stesso Tolomeo, nel cap. 5 del libro 1, dice di non aver avuto informazione di tutte le parti del continente per la sua eccessiva grandezza e di aver descritto alcune in modo più approssimativo per la negligenza dei viaggiatori, e inoltre che ve ne sono altre che possono essere alquanto difformi per via delle alterazioni e dei mutamenti in cui si sa che sono in parte incorse».

> Ἡ μὲν οὖν ἐπιβολὴ τῆς καταγραφῆς τοιαύτης ἂν εἰκότως ἔχοιτο προθέσεως· ἐπειδὴ δὲ ἐν ἅπασι τοῖς μὴ παντελῶς κατειλημμένοις τόποις ἢ διὰ μεγέθους ὑπερβολὴν ἢ διὰ τὸ μὴ ἀεὶ ὡσαύτως ἔχειν ὁ πλείων ἀεὶ χρόνος ἱστορίαν ἐμποιεῖ καθάπαξ ἀκριβεστέραν, τοιοῦτον δέ ἐστι καὶ τὸ κατὰ τὴν γεωγραφίαν (ὡμολόγηται γὰρ δι’ αὐτῶν τῶν κατὰ χρόνους παραδόσεων, πολλὰ μὲν μέρη τῆς συνεχοῦς γῆς τῆς καθ’ ἡμᾶς οἰκουμένης μηδέπω διὰ τὸ τοῦ μεγέθους δυσέφικτον εἰς γνῶσιν ἐληλυθέναι, τὰ δὲ μὴ ὡς ἔχει λόγου τετυχηκέναι παρὰ τὸ τῶν ἐκλαβόντων τὰς ἱστορίας ἀνεπίστατον, ἔνια δὲ καὶ αὐτὰ νῦν ἄλλως ἔχειν ἢ πρότερον διὰ τὰς ἐν τοῖς κατὰ μέρος ἐπιγινομένας φθορὰς ἢ μεταβολάς)· ἀναγκαῖόν ἐστι κἀνταῦθα ταῖς ὑστάταις τῶν καθ’ ἡμᾶς παραδόσεων ὡς ἐπίπαν προσέχειν, παραφυλάσσοντας ἐπί τε τῆς τῶν ἱστορουμένων ἐκθέσεως καὶ τῆς τῶν προϊστορηθέντων διακρίσεως τό τε ἀξιόπιστον καὶ τὸ μή.[83]

In questo caso il riferimento, pur indiretto, è meno approssimativo rispetto alla menzione tolemaica precedente (vedi qui nr. 11), come possiamo facilmente comprendere dal confronto sia con la versione latina che con il testo originale. Ricordiamo che questo cap. 5 introduce e giustifica le numerose annotazioni e correzioni (capp. 6-20) che Tolomeo appone al trattato *Correzione della rappresentazione grafica della terra* del suo contemporaneo Marino di Tiro (I-II d.C.).[84]

83 «Necessità di prestare attenzione alle relazioni più recenti per i mutamenti avvenuti sulla terra durante il corso del tempo.

Il progetto infatti di tale descrizione potrebbe attenersi a tale proposito: poiché in tutti i luoghi non totalmente conosciuti vuoi per l’eccessiva grandezza vuoi perché non restano sempre allo stesso modo, il tempo più lungo rende l’informazione sempre inequivocabilmente più esatta, lo stesso vale anche per la geografia (si conviene infatti nelle trattazioni diacroniche che molte aree del continente abitato da noi, difficili da raggiungere per la loro vastità, sono sinora sfuggite alla conoscenza, altre non hanno potuto trovare descrizioni per la trascuratezza degli estensori delle narrazioni, altre ancora sono oggi diverse rispetto a prima per i disastri o per i cambiamenti avvenuti periodicamente in quei luoghi): è necessario allora da parte nostra prestare attenzione soprattutto alle ultime trattazioni, distinguendo, nell’esposizione delle informazioni che raccogliamo e nel vaglio delle narrazioni preesistenti, ciò che è fededegno e ciò che non lo è».

84 Dilke 1987, Riley 1995, 232-36.

4 Autori contemporanei

Al novero degli *auctores* abbiamo aggiunto due autori contemporanei:

- Battista Spagnoli (latinizzato: Mantuanus) (nr. 6)
- Johannes Hänlein (latinizz. Gallinarius) (nr. 10).

Essi sono gli unici due autori non antichi che sono utilizzati qui alla stessa stregua dei loro più gloriosi predecessori. Gli argomenti affrontati nelle loro citazioni potevano essere estrapolati anche da opere antiche, ma l'aver volontariamente scelto proprio questi due autori è indiscutibilmente significativo e degno della nostra attenzione perché tale *modus operandi* è costante in questa impresa cosmo-geografica. La scelta dei due contemporanei potrebbe essere stata dettata da conoscenze personali; resta il fatto che il lettore non percepisce la cesura tra citazione antica e moderna perché permane sempre l'armonia anche dal punto di vista stilistico, trattandosi in particolar modo di testi poetici.

Come i versi dei due letterati contemporanei sono giustapposti a quelli di *auctores* antichi (Virgilio e Ovidio) così la lettera di Vespucci viene posta accanto al testo scientifico: un accostamento che può sembrare molto audace, ma in realtà è il frutto di una visione umanistica molto ampia, che travalica i limiti cronologici e legge e valuta i testi prescindendo dall'altezza cronologica dei loro autori.

In questo volumetto la sezione più estesa, e indiscutibilmente più innovativa, è proprio la lunga *Lettera al Soderini*, che ripercorre le varie tappe dei quattro viaggi (I-II al servizio della Spagna e III-IV al servizio del Portogallo) compiuti da Amerigo Vespucci tra il 1497 e il 1504. Essa costituisce pertanto un eccezionale documento (in forma epistolare) per le notizie che conserva riguardo ai viaggi compiuti; vi si descrive infatti soprattutto la parte meridionale delle nuove terre che Vespucci ha solcato e visitato, e tutto ciò trova un riscontro nella grande mappa allegata.[85]

Aver tradotto in latino la lettera vespucciana (pubblicata in volgare nel 1505 ca.) significava, come è evidente, attribuire ad essa una scientificità che fino a quel momento non possedeva. In questo modo gli eruditi vosagensi si dotarono di uno strumento che mise in grado il *Gymnasium* di realizzare, a livello teorico e grafico, un quadro nuovo e più ampio dell'*oikoumene*,[86] legittimato dalle stesse indicazioni di Tolomeo.

Vespucci era già autore di una descrizione del Nuovo Mondo intitolata *Mundus novus*, che nell'arco di due o tre anni ebbe dodici edizioni in latino oltre a varie traduzioni in tedesco e olandese (divenendo ben presto un

85 Cf. De Ponti 2005.

86 Vedi anche Mangani 2005.

bestseller).[87] Lo stesso Ringmann aveva collaborato ad una delle traduzioni, pubblicando a Strasburgo nel 1505 il *De ora antarctica per regem Portugalliae pridem inventa*.

Essa possiede alcune importanti peculiarità:

- titolo diverso (non *Mundus novus* bensì *De ora antarctica*)
- lettera dedicatoria di Ringmann a Jacobus Brunes (1 agosto 1505)
- elogio poetico delle recenti scoperte geografiche.[88]

Il titolo *Mundus novus* è veramente icastico e risulta il *leit-motiv* dell'operetta. Nella parte introduttiva si pone chiaramente la contrapposizione tra conoscenza antica e quella moderna. Gli Antichi ritenevano che a sud dell'equatore non esistessero terre emerse, ma solo mari; ora però la flotta del re del Portogallo aveva scoperto una nuova terra confutando palesemente le affermazioni antiche; così nella parte centrale, cioè la sezione etnografica (cui segue la descrizione del polo antartico e del movimento delle stelle), non si risparmiano critiche agli stessi Antichi.

A questo punto non sarà inutile leggere le parole di un umanista e fisico del secolo XVI: Jean Fernel (1497-1558), che nella prefazione del suo *De abditis rerum causis*[89] afferma:[90]

87 Una sintesi efficace in Aboal Amaro 1962, 99-111; Luzzana Caraci 1996, 2, 357-58; King 2014, 297-305.

88 Il testo venne poi reimpiegato come nota al lettore anteposta alla *Lettera al Soderini* nel volumetto della *Cosmographiae introductio*.

Rura papirifero qua florent pinguia Syro / et faciunt Lunę magna fluenta lacus / A dextris montes sunt Ius Danchis quoque Mascha / illorum Aethiopes inferiora tenent / Aphrica consurgit quibus e regionibus aura / Afflans cum Libico fervida regna Notho / Ex alia populo Vulturnus parte calenti / Indica veloci per freta calle venit. / Subiacet hic ęquo noctis Taprobana circo / Bassaque Prasodo cernitur ipsa salo; / Aethiopes extra terra est Bassamque marinam / non nota e tabulis o Ptholomęe tuis. / Cornigeri Zenith tropici cui cernitur hirci / atque comes multę funditor ipsus aquę. / Dextrorsum immenso tellus iacet ęquore cincta / tellus quam recolit nuda caterva virum / hanc quem clara suum iactat Lusitania regem / invenit missa per vada classe maris. / Sed quid plura? situm gentis moresque repertę / Americi parva mole libellus habet. / Candide syncero voluas hunc pectore lector / et lege non nasum rhinocerontis habens.

Dove i campi, resi ubertosi dal Siro ricco di papiri, verdeggiano / e i grandi fiumi della Luna producono laghi, / a destra ci sono i monti Ius, Danchis, Mascha / alla base di questi ci sono gli Etiopi. / Sorge da quelle regioni l'Africo, il vento / che soffia con il libico Noto verso i caldi regni, / dall'altra parte il Volturno spira sul popolo accaldato / attraverso il mare Indiano con rapido passo. / Qui sotto l'Equatore si trova Taprobane / mentre la stessa Bassa si distingue nel mar Prasode; / oltre gli Etiopi e Bassa, sul mare, c'è una terra / ignota alle tue mappe, o Tolomeo. / Da essa si distingue lo Zenit del tropico del Capricorno / e il suo compagno, che versa molta acqua. / A destra giace una terra circondata da un mare immenso, / terra che è abitata da una massa di uomini nudi. / Questa fu scoperta da colui che la famosa Lusitania si gloria di avere come re, / lui che aveva inviato una flotta per le onde del mare. / Ma che cos'altro in più? La posizione e i costumi dei popoli scoperti / presenta il piccolo libretto di Amerigo. / Oh candido lettore, sfoglia questo libro con animo puro / e leggi non con naso di rinoceronte!

89 Sul personaggio e l'opera Forrester 2005, 3-102.

90 Forrester 2005, 108 e 110 (con trad. inglese a fronte, 109 e 111).

> Quis ignorat non tam novarum rerum desiderio quam navigandi peritia, classe perlustratum Oceanum? repertas Insulas? intimos Indiae recessus apertos? maximam continentis ad occiduum partem, quam inde novum orbem appellant, priscis ignotam, nostris magno suo commodo cognitam fuisse?
> Haec, ut cuncta astronomica Platoni, Aristoteli, vetustioribusque philosophis non satis perspecta, Ptolemaeus dein plurimum auxit et illustravit, qui tamen si nunc redeat, Geographiam non agnoscat, adeo novus orbis inductus videtur huius seculi navigatione. Ad quam nos non dico adiumentum attulimus, certe excogitavimus horarum aequinoctialium observatione, qua ratione quacunque sis orbis regione, illius eam possis internoscere, quam Geographi appellant longitudinem. Quod quidem de fontibus antiquorum non hausimus, sed de nostris rivulis primi (ni fallor) protulimus. Te quocunque vertas cogitatione, intelliges non decoxisse posteros, sed erecto ad contemplationem intentoque animo haereditatem veterum artium ampliasse et induxisse novas.[91]

Particolarmente rilevanti sono, a mio parere, le ultime due frasi che costituiscono un'ottima sintesi del pensiero dell'epoca:

> Questo non lo abbiamo certamente tratto dalle fonti antiche ma per primi (se non erro) l'abbiamo offerto dai nostri ruscelletti. Ovunque tu ponga attenzione, vedrai che coloro che sono venuti dopo non hanno cucinato dal nulla, ma con l'animo totalmente rivolto agli studi hanno ampliato l'eredità delle arti degli antichi e ne hanno introdotte di nuove.

Nella *Cosmographiae introductio*, che come si è detto è una introduzione alla *Geographia* di Tolomeo, esigue sono le citazioni del geografo antico,

91 «Chi non sa che l'Oceano è stato scandagliato dalla flotta, non tanto per il desiderio di novità quanto per capacità nautiche? che sono state scoperte isole? che i più remoti angoli dell'India sono stati resi noti? che la parte più estesa del continente verso Occidente, la quale poi viene chiamata Nuovo mondo, ignoto agli antichi, è stata svelata ai nostri contemporanei con loro grande giovamento?

Queste cose, come tutte le conoscenze astronomiche non erano state abbastanza indagate da Platone, Aristotele e dai filosofi più antichi; Tolomeo poi moltissimo aggiunse e chiarì, lui che se tornasse in vita oggi, non riconoscerebbe la geografia, nuovo a tal punto sembra l'aspetto del mondo grazie alla navigazione di questo secolo. Ad essa non dico che noi abbiamo apportato giovamento, ma certamente abbiamo indagato in profondità tramite l'osservazione delle ore equinoziali, in che modo, in qualunque regione del mondo uno si trovi, possa riconoscerne quella che i geografi chiamano longitudine,.

Questo non lo abbiamo certamente tratto dalle fonti antiche ma per primi (se non erro) l'abbiamo offerto dai nostri ruscelletti. Ovunque tu ponga attenzione, vedrai che coloro che sono venuti dopo non hanno cucinato dal nulla, ma con l'animo totalmente rivolto agli studi hanno ampliato l'eredità delle arti degli antichi e ne hanno introdotte di nuove».

ma sicuramente la seconda (I. 5; vedi *supra* nr. 12) è particolarmente acuta e pertinente e viene utilizzata in modo perfettamente analogo: come Tolomeo corregge e aggiorna Marino di Tiro, così gli autori rinascimentali aggiornano Tolomeo e questo loro *modus operandi* riceve un'autorevole giustificazione. Un valido commento è costituito dalle parole di Lelio Bonsi (1532-post 1569)[92] nella terza delle sue *Cinque lezzioni:*[93]

> Claudio Tolomeo, a cui (per lo essere egli stato Principe così degli Astrologi come de' Geometri) pare che debbia non solamente la terra, ma eziandio il cielo, lasciò scritto non meno ingenuamente, che con giudizio, nel cap. 5 del primo libro della sua Cosmografia, che quanto al sito et habitazione del mondo si doveva credere sempre a più giovani, o volemo dire moderni, cioè a coloro, i quali di tempo in tempo venivano, volendo mostrare che ciò più colla lunghezza del tempo e colla sperienza stessa, che con altro apparare e sapere si poteva. La cui sentenza quanto fusse non meno vera, che prudente si può di qui agevolmente conoscere; tutti così gl'Astrologi, come i Cosmografi, quanto maggior tempo dopo lui furono, tanto più così nelle cose della terra, come in quelle del cielo alla verità s' accostarono e massimamente nelle habitazione del mondo, come dimostrarano apertamente l'oppenione così varie, come false, prima dell'antichi e poi de' più moderni di mano in mano.

5 *Auctores | Auctoritates*

È noto che nessun autore medievale poteva presentare qualcosa di sensazionale senza il supporto delle *auctoritates*, che rendevano ogni affermazione fededegna e credibile. L'umile e dimessa intenzione di innovare si associava infatti, nel Medioevo, al costante e paziente sforzo di mostrare che quanto si era, con estrema fatica, compreso o scoperto, in realtà era già stato capito e descritto da qualche autore antico.

Durante il Rinascimento il mondo classico è percepito come periodo indiscutibilmente superiore rispetto al Medioevo. Gli Antichi venivano collocati fuori del tempo e dei 'corsi e ricorsi' della storia, incarnavano cioè il fulgido ideale di perfezione che nessuno e niente poteva scalfire.

Servirsi dei classici era percepito come ricorrere all'ideale più elevato di conoscenza e di esplicazione di essa poiché l'uomo, nell'età classica, era ancora libero dal giogo religioso pertanto era come tornare alle origini,

92 Vedi anche Ballistreri 1970.

93 *Cinque lezzioni di m. Lelio Bonsi lette da lui publicamente nella Accademia Fiorentina aggiuntovi un breve trattato della cometa e nella fine un sermone sopra l'eucarestia da doversi recitare il giovedì santo del medesimo autore*, In Fiorenza, Appresso i Giunti, 1560, c. 50*r-v* [CNCE 7028].

dopo aver eluso il grigio periodo dell'età di mezzo (il Medioevo appunto). L'uso degli Antichi riconduceva quindi ad una visione primordiale, incontaminata; si tornava all'antico per avere uno strumento efficace al fine di combattere il vecchio (cioè le dottrine medievali).

Anche nel caso specifico, qui presentato, risulta dunque importante esaminare gli *auctores* antichi, soprattutto quelli di ambito scientifico, in un ampio arco cronologico poiché nelle alterne vicende della loro trasmissione testuale e nel loro impiego e reimpiego, possiamo percepire la loro grandezza e il loro eccezionale carico rivoluzionario.

Nella *Cosmographiae introductio* gli *auctores* antichi si possono suddividere in due grandi gruppi:

- letterari
- tecnico-scientifici

La differenza fra loro è particolarmente evidente poiché quelli letterari (come Virgilio, Ovidio e altri) assurgono indiscutibilmente ad *auctoritates*[94] e non subiscono modifiche (non è infatti necessario), mentre quelli scientifici, come abbiamo già detto, costituiscono il fondamento delle varie discipline, e sono uno stimolo ineludibile perché quelle stesse scienze, nel corso del tempo, non continuano a conservare una veridicità assoluta e inconfutabile in quanto le generazioni successive, mediante l'osservazione della realtà, hanno compiuto progressi tali da essere in grado di aggiornare le conoscenze antiche.

L'esempio più eclatante resta sempre la *Geographia* di Tolomeo che dopo essere stata un *desideratum* da parte dei primi umanisti, tradotta dal greco in latino al fine di risultare facilmente consultabile, ben presto iniziò a manifestare i suoi limiti, come era prevedibile trattandosi di un testo del I secolo d.C. e tenendo conto che in tredici secoli (soprattutto negli ultimi quattro) le conoscenze erano cambiate. L'elemento rivoluzionario di questo testo risiede nel progresso che Tolomeo compì nel risolvere un problema matematico, cioè la proiezione della sfericità della superficie terrestre sul piano; pertanto, nonostante i suoi limiti, la riscoperta di tale testo avrebbe condotto anche alla più grande scoperta: quella del quarto grande continente che impose ai cartografi una riflessione tecnica e scientifica al fine di giungere alla rappresentazione in piano di tutte le terre note.[95]

L'edizione della *Geographia* del 1513, varie volte menzionata, presenta la versione latina del testo antico e l'aggiornamento separato alla fine del volume, allo scopo di evidenziare chiaramente la concrezione da cui scaturisce l'opera moderna; nell'epoca di rinascita, quella per antonomasia (sec.

94 Un'ampia panoramica in: D'Angelo, Ziolkowski 2014.

95 È noto che lo studio e le dimostrazioni di Euclide costituirono il fondamento per lo sviluppo dell'astronomia sferica ma Tolomeo divenne il paradigma perché la *Geographia* non è una semplice descrizione della terra ma fornisce pure gli elementi per la sua rappresentazione su carta.

XV-XVI),[96] gli autori antichi venivano anche aggiornati, ma erano rispettati nella loro integrità testuale e nel loro contenuto scientifico. Era mutato l'occhio con cui si guardavano e leggevano i testi e non si intendeva più annullare il testo antico per crearne uno nuovo, bensì far rivivere l'antico con i dovuti aggiornamenti che dimostravano il contributo dei moderni alla scienza antica che aveva già acquisito una gran parte di conoscenza del mondo reale.

In sintesi possiamo quindi affermare che l'*auctoritas* poggia le sue basi sulla sopravvivenza dei testi mentre l'*antiquitas* fonda la sua esistenza sulla rinascita o riscoperta di testi che appartengono ad un mondo passato; l'*auctoritas* infatti si individua attraverso la continuità, l'*antiquitas* invece implica la distanza.

6 Conclusioni

Abbiamo sopra esposto i casi più salienti di citazioni, ma al fine di avere un quadro meno parziale si fornisce qui sotto l'elenco degli autori e la quantità di versi o righi citati (indicando se la citazione è diretta [d], indiretta [i] o mediata [m]):

- Boezio vv. 5[97] [d]
- Cesare r. 1[98] [i]
- Giovenale v. 1[99] [d]
- John Halifax of Holywood rr. 3[100] [i]
- Manilio vv. 2[101] [d]
- Omero attraverso Orazio vv. 2[102] [m]
- Ovidio vv. 14[103] [d]
- Pomponio Mela rr. 2[104] [d]

96 Si annoverano infatti almeno altri tre rinascimenti precedenti: 1. di trasmissione dei testi (sec. VI d.C.); 2. islamico (sec. VIII); 3. tecnologico (sec. XIII); un'efficace sintesi in Russo 1997, 285-98.

97 *De consolatione philosophiae* II. VI, 9-13.

98 *De bello gallico* VI, 28.

99 *Saturae* X, 168.

100 *Sphaera mundi* II, 6.

101 *Astronomicon* I, 279 e 281.

102 *Odyssea* I, 1-3 mediante *Ars Poetica* 141-42.

103 *Metamorphoseon* I, 45-51, 61-66, 264,

104 *De Chorographia* I, 4.

- Prisciano vv. 116[105] [d]
- Teodosio attraverso John of Holywood rr. 4[106] [m]
- Tolomeo rr. 5[107] [i]
- Virgilio vv. 19[108] [d]

Come vediamo, Prisciano è l'autore più estesamente menzionato: si tratta di ben 116 versi che si pongono come un affresco poetico all'interno di un contesto che, per la sua tecnicità e aridità toponomastica, poteva risultare letterariamente poco gradevole.

Il semplice esame delle citazioni ha pertanto contribuito all'accrescimento delle nostre conoscenze non soltanto riguardo ai singoli *auctores* e al loro uso in un testo tanto particolare di epoca rinascimentale, ma ha migliorato pure la visione complessiva di quest'opera, illuminata dalla varietà degli *auctores* che coprono un arco cronologico di oltre diciassette secoli, dal II a.C. (Teodosio) al XVI d.C. (Mantuanus e Gallinarius).

Questa interconnessione tra le varie tessere antiche e moderne rende il testo particolarmente interessante e sollecita anche qualche riflessione poiché esso mostra di essere il frutto di una rielaborazione degli Antichi visti certamente come capisaldi della conoscenza, ma anche suscettibili di errori e non per questo denigrati o negletti, ma semplicemente accolti così come sono, senza pretendere che siano perfetti o biasimandoli per i loro limiti.

Si tratta di un dialogo tra l'antico e il moderno, dove ogni epoca contribuisce, con quello che possiede, allo sviluppo culturale senza adorare l'antico come fosse un contesto di assoluta perfezione, senza demonizzare il moderno che, in quanto recente, è ritenuto sistematicamente negativo e di pessima qualità.

Alcune 'edizioni' (come ad es. quelle curate da Niccolò Germano ed Enrico Martelli)[109] della *Geographia* di Tolomeo sono concepite come una nuova versione aggiornata dell'opera tolemaica; ma in esse manca ancora un criterio filologico dal momento che tutto era agglomerato insieme, l'antico col moderno, come un mosaico allestito con tessere antiche frammiste a quelle di recente fattura, al fine di creare una nuova opera che nella realtà supera largamente la banale somma delle due tipologie di tessere.

Una concezione tipica del secolo XV. Con l'avvento della nuova filologia

105 *Periegesis* 37-42, 45-48, 50-51, 54-64, 72-159, 609-13.

106 *Sphaerica* I, 1, 3-4 mediante *Sphaera mundi* I, 1.

107 *Geographia* I, 3 e 5.

108 *Georgica* I, 30, 44, 54-59, 233-39, 242-43; II, 109; *Aeneis* III, 285.

109 Sui due personaggi: Böninger 2006, 313-48; sulle loro edizioni vedi almeno: Gentile 1992, 207-15; Gautier Dalché 2009, 219-31.

(di cui Poliziano[110] è stato certamente un esimio esponente[111] anche in riferimento a testi matematici)[112] muta il punto di vista e l'atteggiamento verso i testi che non costituiscono più una dispensa da cui attingere vari ingredienti per realizzare la ricetta di una nuova torta bensì uno scaffale a muro, una 'biblioteca interna', di cui una mirabile raffigurazione si trova nello studiolo di Esdra[113] nella Bibbia Amiatina,[114] e come in essa sono contenuti i volumi delle Sacre Scritture che permettono di raggiungere la Rivelazione, così quei libri conservano la bibbia laica e rendono possibile l'accesso alla vera dottrina scientifica.

La *Cosmographiae introductio* realizzata nel 1507 costituisce quindi un caso emblematico, particolarmente importante e di immediata evidenza, della combinazione, non solo teorica ma anche pratica, di materiale antico e moderno.

Se infatti lo studio del volumetto permette di comprendere la rielaborazione teorica dei testi antichi con gli aggiornamenti forniti dal testo di Vespucci, nella grande mappa abbiamo anche la possibilità di visualizzare immediatamente la resa grafica di quanto il testo teorico espone.

L'analisi di questo duplice prodotto intellettuale fornisce a noi la possibilità di afferrare pienamente la rilevanza degli studi teorici perché vediamo la struttura, la grammatica, la sintassi di forme alle quali solitamente si presta un'attenzione solo esteriore.

Una teoria, come è noto, può essere meravigliosa ma per essere scientifica deve continuare ad essere valida nella sua applicazione concreta e qui noi possiamo toccare con mano la materializzazione di quanto esposto nel trattatello.

Si è prima accennato al dialogo tra l'antico e il moderno e direi che di esso possediamo una icastica sintesi iconografica proprio nella grande mappa del 1507, in particolare nei due medaglioni apposti sulla sommità centrale della raffigurazione dell'*oikoumene* che contengono:

- Claudio Tolomeo con accanto il vecchio mondo in miniatura (sx)
- Amerigo Vespucci che guarda il nuovo mondo in miniatura (dx);[115]

i due sono come le valve di un dittico, affrontate, speculari che quando si congiungono formano una perfetta unità. Tutto ciò possedeva, come ab-

110 Angelo Ambrogini (1454-94), sul personaggio cf. Bigi 1960, Daneloni 2013 con estesa e aggiornata bibliografia.

111 Sul suo metodo vedi Branca 1974, Mariani Zini 1996, Baldi 2014, 41-42.

112 Si legga almeno Rose 1975, 10 e 35.

113 Sulla duplice forma (Esdra o Ezra) attestata nel codice Amiatino vedi Marsden 1995, 120 no. 95.

114 Firenze, Biblioteca Medicea Laurenziana, Amiat. 1, f. 2*r*, anticamente segnato '4*r*' e 'Vr'.

115 Vedi anche Camerota 2005, 333-46.

biamo visto, un notevole valore per l'epoca ma, come spesso accade, esso continua ad avere importanza non solo storica ma anche attuale poiché ci ricorda, e frequentemente infatti lo dimentichiamo, che gli antichi, pur con le loro imperfezioni, costituiscono una parte sostanziale della nostra cultura e della nostra civiltà.

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The observation of the stars has never just been a matter of 'science', but has constantly interacted with other domains, such as philosophy, literature, medicine, religion, history and magic. Consequently, the history of astronomical writings involves very diverse skills and, therefore, calls for a cooperation between scholars. The present book represents such a shared attempt to investigate ancient, medieval and Renaissance astronomical texts, with a special focus on their transmission in manuscripts and prints, the relationship between texts and images, and the *Nachleben* of the Greco-Latin tradition in later Western culture.

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