

Chapter 10

Paratexts, Printers, and Publishers: Book Production in Social Context



Matteo Valleriani and Christoph Sander

Abstract Paratexts, such as dedication letters or epigrams, in early modern printed books can be used by historians to situate a book’s production in its institutional and social context. We depart from the general assumption that two publishers or printers were in a relation of awareness of each other if they printed and put on the market two different editions that contain at least one identical paratext. In this paper, we analyze the circulation of the paratexts among the 359 editions of the “*Sphaera* corpus.” First, we discuss the available data, the conditions to build a social network, and the latter’s characteristics. Second, we interpret the results—potential relationships among printers and publishers—from a historical point of view and, at the same time, discuss the sorts of potential relationships that this method can disclose. Third, we corroborate the historical results among different approaches, namely by using editions’ fingerprints and by investigating the book production of those printers and publishers tangentially involved in relevant relationships, but who fall outside the “*Sphaera* corpus.” Finally, we identify local communities of printers and publishers and, on a transregional level, printers, and publishers who were observing and influencing each other.

Keywords Paratext · *Tractatus de sphaera* · Johannes de Sacrobosco · Social network · Local market

1 Premise

In the context of the research project *The Sphere: Knowledge System Evolution and the Shared Scientific Identity of Europe* (<https://sphaera.mpiwg-berlin.mpg.de>), we

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investigate processes of evolution of knowledge. Specifically, we focus on basic astronomical knowledge in the period from the thirteenth to the seventeenth century. Our major historical goal is to reconstruct such processes of evolution by means of a large number of historical sources in reference to both their content and the context in which they were produced.

Concerning the early modern period, we have been able to collect a meaningful corpus of printed editions, as described below. Besides the fact that the corpus is sufficiently large and covers a certain subject systematically and completely, we were moreover able not only to apply digital humanities techniques but also to move forward toward a method for analyzing historical data by making use of mathematical means. Within such framework—which we call computational humanities—methods originally developed to analyze the physics of complex systems are applied to questions from the humanities. Therefore, we formalize data as multi-layer networks.

By way of the analysis of some of the data extracted from the textual aspects of the sources, we were able to build a relevant empirical network of five layers. We have also examined its structural and topological characteristics (Valleriani et al. 2019). It is our intention to expand that network by adding new layers, particularly layers that contain information about the relationships between the various actors related to the editions of this corpus. Authors, printers, and publishers are our main focus. Once such layers are in place, we will be able to examine correlations between data on the content of the treatises and data on the social aspects of the production and dissemination of the same books on the market.

Because of the formal and mathematical character of the investigations in the context of computational history, for each aspect we intend to investigate, we must find a systematic approach that is more than a simple accumulation of results from micro case studies. The present study was conceived while looking for ways to systematically detect relationships among printers and publishers involved in the corpus under our scrutiny.

2 The Research Question

Early modern printers, publishers, and booksellers undoubtedly had a strong impact on the development of scientific knowledge in their period, although their contribution to the history of science is rarely acknowledged.¹ When we think about scientific achievements, we often forget about those actors like printers and publishers—rather businessmen than scientists—who nevertheless provided the conditions for the publication of scholarly books. The role of these actors within the larger scientific milieu

¹ “Printers,” “publishers,” and “booksellers” are categories that denote different roles in the context of the production and distribution of printed books in the early modern period, but not necessarily different persons (Maclean 2012, 101–102). In this essay we will mostly focus on the first two categories and define them as “book producers.”

can be investigated from a variety of different perspectives. The most obvious angle might be to approach their influence by looking for connections between publishers and the authors of the books they published. This line of investigation has been followed in scholarship to some extent and has enriched our understanding of how ideas were “sold” in the medium of the early modern printed book.² Scholarship has pointed out the various ways in which publishers, in particular, collaborated with authors and vice versa. A more original and intriguing perspective, however, is related to the way early book producers and sellers cooperated with each other, or, more broadly, were aware of their local and international competitors and adjusted their products accordingly (Hinks and Feely 2017). Here we get to observe the social and economic mechanisms within the business of printing and publishing, subscribing to the assumption that processes of the circulation of knowledge are determinant for the formation and development of scientific thinking. This specific viewpoint is relevant because it allows us to discover how this circulation of knowledge actually worked on a social and material basis. Eventually, it promises insights into the business model(s) that emerged in the aftermath of Gutenberg’s enterprise of the second half of the fifteenth century.

There were many different kinds of relations between printers and publishers, and most of them are well known to scholars of book history: cooperation between publishers based on close family ties, on a wider group of relatives, or (in an extended sense) as the result of inheritance—what we might call family businesses. Against a broader social background transcending the boundaries of a single family, other types of cooperation between publishers/printers existed, too, and extended, for instance, to the lending, borrowing, and purchasing of woodblocks and types. Such forms of cooperation often resulted in the founding of printers’ associations. These were sometimes established ad hoc for the production of particularly demanding individual editorial initiatives (Nuovo 2013) (Chap. 6). In other cases, publishers/printers cooperated in order to sell a particular text (produced in one print run) to a business partner, who might then have assembled it with other textual parts in a new edition, or might have merely replaced or adjusted the title page, leading to so-called reissues. A further form of relationship between book producers could be called “mutual awareness.” This relation implies that two or more book producers did not actively cooperate on a social and economic basis but still knew about their competitors’ businesses, and adjusted their own business accordingly, e.g., by specializing in a different field of publication or by actively competing with it through the practice of reprinting. Mutual awareness, in fact, means that book producers observed what other producers put on the academic book market and might have consequently decided to borrow ideas for the content of their own editions or taken aspects related to the production itself—such as format, visual apparatus, *mise-en-page*, or types. Mutual awareness therefore could turn into mutual imitation to an extent that two editions by different

² Historical research dedicated to individual early modern publishers and printers is very active and has produced innumerable great pieces of literature in the recent years. Concerning our perspective, we would like to mention just two of them as representative: (Lowry 1979; Gerritsen 1991).

book producers could look almost identical (reprint). In this respect, we can speak of relations among book producers, though only on an abstract level.

In spite of the fact that several relationships among book producers are well known and have been investigated in historical scholarship, so far there is no commonly acknowledged systematic method to analyze these relationships among the book producers and sellers of the period.

As a matter of fact, our knowledge of these sorts of relationships is almost entirely based on many discrete case studies, a generalization of which might not always be justifiable. In other words, scholarship lacks a concise research approach to investigating the emergence of economic relationships among the players involved in the production and distribution of early modern printed books. In the present work, we would therefore like to present and discuss an approach that might prove useful in identifying what we might call *potential* relationships among book producers. This approach, however, is not based on individual analyses and case studies—in fact, it does not even require comprehensive historical research on single publishers or printing houses. Instead, it is based on large-scale patterns emerging through network analysis. Based on a network constituted from bibliographic metadata of the publication of so-called *Sphaera* treatises—a genre to be introduced in the next section—and the circulation of so-called paratexts within these publications—a literary genre that will be explained in another section in greater detail as well—we hope to argue convincingly for such an approach that can serve as a blueprint or template for other bibliographical corpora and their underlying networks.

3 The Corpus

One condition for the realization of the aforementioned research approach is a well-defined corpus of printed editions. However, the definition of such a corpus can be based on different parameters and characteristics. One possibility would be a corpus based on a specific subject, a specific discipline, or even a specific genre. This would lead to a bibliographical record based on publications with similar content. Yet, due to the late emergence of specializations for printers and publishers who focused on books within one specific genre (Chap. 9) (Pantin 1998), the corpus could also be based on a multiplicity of subjects and genres, and be further defined by geographic limitations. For example, all of the books printed in Leipzig (Chap. 12) could be represented by such a corpus. With constraints placed on provenance, the corpus could be based on the books preserved in one specific library or archive. Our corpus, in any case, is structured around the content of the editions and is thus not based on geographical limitations. It is however limited to a specific time period: from the advent of print in the second half of the fifteenth century until 1650—on the assumption that after this period the rules and output rate of the book market changed considerably.

What follows is based on the “*Sphaera* corpus,” a set of 359 printed editions defined on the basis of a specific subject or content, namely editions that contain,

though in different forms, one specific work: Johannes de Sacrobosco's (1195–1256) *Tractatus de sphaera*.³ This work was originally compiled in the thirteenth century in Paris, where Sacrobosco was appointed as a lecturer in the then recently founded university. The work is a qualitative introduction to geocentric cosmology and was used for teaching in the context of the quadrivial curriculum. The treatise met with tremendous success and became the most widely used textbook for the introduction of astronomy all over Europe up to the second half of the seventeenth century (Gingerich 1988; Valleriani 2017). The 359 editions collected in the corpus are all printed books that contain this particular treatise; the manuscript tradition is disregarded in this context for pragmatic reasons. Although a comprehensive description of the corpus has already been offered in another study (Valleriani 2020), it is perhaps useful to briefly summarize the main aspects of the corpus here.

The two first printed editions are dated 1472, while the last considered here was printed in 1650. As mentioned, the treatises of the corpus have been collected, generally speaking, because they contain Sacrobosco's treatise. They also might contain other texts. We distinguished between five different kinds of books: a) those that exclusively contain the treatise of Sacrobosco (sixteen editions); b) those that contain a commentary on Sacrobosco's text, namely a text printed on the same page in which portions of the original text are also printed (forty-seven editions) (Fig. 1); c) those we call "compilations," which contain Sacrobosco's original text and other texts that are related to the original one or to some of its subjects, so that the entire book can be considered an enlarged commentary (forty-five editions); d) those containing both commentaries of type b) and texts of type c) (125 editions); and e) adaptations of the treatise, namely works on the same general subject and with the same introductory character, following the same compositional order at least in their largest part and make at least a partial use of the same visual material while containing a different, new text instead of Sacrobosco's treatise (125 editions) (Fig. 2).

The great majority of these printed editions were printed in Latin (295 editions), while treatises, either translations or adaptations, were also produced in Italian (twenty-four), French (twelve), English (ten), Spanish (eight), German (seven), and Portuguese (four).

The treatises collected were printed in forty-one different European cities, with one exception of a treatise printed in what is now Mexico City (Chap. 7). Not surprisingly, Venice and Paris are the most relevant production centers from a quantitative point of view (seventy and sixty-nine editions, respectively). Wittenberg, in spite of the fact that its first *Sphaera* edition only appeared in 1531, is in the third position (fifty editions). Leipzig and Antwerp follow after (twenty-one and twenty editions), although the production in Leipzig came to a halt in 1520 and the publication of *Sphaera* editions in Antwerp only started in 1543.

³ The database of the corpus is available through the project website: <https://sphaera.mpiwg-berlin.mpg.de>. Accessed 8 June 2021. For a critical edition and an English translation of Sacrobosco's treatise, see (Thorndike 1949).

PRIMUM

12

facit diē naturalē: cōpositū ex 24. horis: sed mō distiguius diē nālē: i diē artificialē & noctē: & ad argu-
mentū dico q̄ eadē celi p̄s ē i eodē illatū t̄p̄s: mēsurātū primū motū: nō aut mēsurātū motū solis: & ideo
alibus appet i tertia: alibus i pria hora noctis: un̄ apud oēs ē idē t̄ps mēsurātū primū motū: t̄n̄ h̄t idē
mēsurātū motū solis: Adhuc aliq̄ possēt istare: pria & tertia hora noctis sunt q̄ faciūt diuersificari h̄mōi ap-
parētias: s̄ h̄mōi horā sūt d̄ nūcro. 24. horarū mēsuratū primū motū: ergo ēt ex mēsurā primū motū acci-
dit diuersitas: ergo n̄ ē idē ap̄d oēs: & primū argumētū adhuc stat: R̄ndēt q̄ hora pt accipi ul̄ ut ē tale t̄ps:
& tale istas: & sic ē idē ap̄d oēs: & tē i eodē illatū ap̄d oēs appetit: ul̄ al̄t ut hora talē ul̄ talē sc̄ipit denoiatio
nē: uide l̄s q̄ dicat̄ pria uel tertia: & sic i diuersis horis appet: & isto mō uariat̄: q̄a uariat̄ sc̄ipit denoiationē:
q̄a oēs fere in italia sc̄ipit numerare horas ab occasu solis: & q̄a sol aliquibz citius aliquibus tardius occi-
dit: hic ē q̄ idē t̄ps uariis fortit̄ denominationes: & sedm̄ ista horologia cōputauit autor: greci aut̄ & ip̄i
uiginti quattuor horas habebāt: sed incipiebant numerare oriēte sole: hispani aut̄ horologia dimidia h̄nt:
q̄ numerāt. 12. horas: & iterū recurrit ad prinā: & h̄c in meridie & media noctē intū sumunt: & h̄ de
diuersitate cōtingētē in t̄p̄e qd̄ mēsurat̄ p̄ diuersa horologia.

Quod aqua sit rotunda
Vod at̄ aq̄ h̄cat tumorē & accedat ad rotū-
ditatē sic patet. Ponať signū i littore maris:
& exeat nauis a portu: & it̄n̄ elōget̄ q̄ oculus ex̄ns
iuxta pedē malī nō possit uidere signū. St̄ate uero na-
ui oculus eius dē ex̄ntis i sūmitate malī b̄n̄ uidebit si-
gnū illd̄. Sed oculus ex̄ntis iuxta pedē malī melius de-
beret uidere signū: q̄ q̄ ē i sūmitate: cū sit p̄p̄ior signo
sicut patet p̄ lineas ductas ab utroq̄ ad signū: & nul-
la alia huius rei cā ē q̄ motu aq̄. Excludant̄ .n. oīa
alia i p̄ edinēta: sicut nebulę & uapores ascēdētes. Itē



cū aq̄ sit corp̄ hōgeneū totū cū ptib̄ eius dē erit rois:
sed ptes aq̄ (sicut i guttulis & rorib̄ herbarū accidit)
rotūdā nālī appetūt formā: ergo & totū cui sūt ptes

figurā: ut manu capite pedē & h̄mōi: & iō tale cōpositū ex ptibus diuersis: q̄a hōgenea h̄nt i toto & ptibus eandē
denoiatū. In hoc igit̄ cōposita homogenea differūt ab atherogeneis: q̄a hōgenea h̄nt i toto & ptibus eandē
naturā & rōnē. minie uero atherogenea. Sed aq̄ ē corpus homogeneū ut patet: q̄a eadē naturā & p̄pria ac-
cidētia h̄t tota aq̄ ptes eius dē. Sed ptes aq̄ tēdūt naturalr̄ ad figurā rotūdā: ceu dēmostrāt guttā aq̄ ca-
dentis & rores i herbis iuētā: q̄ q̄ nō cōtinent̄ corpe terminato figurā rotūdā figurant̄. Figura igit̄ natu-
ralis totius elemētī aq̄ ad rotūditatē tēdit: qd̄ ē intērtū. An at̄ rōes h̄c dēmostrēt ul̄ pbabilr̄ cōcludāt nolo i
p̄ntiāz discutere. Ptole. at̄ prio almag. cap. iiii. aq̄ rotūditatē expimētō: qd̄ cū pria rōne coiciderē uidef: oñ
dit dicēs. Si sit nauis i mari t̄n̄ a terra elōgata q̄ nullo mō possit uidere terrā & alia q̄ sūt i eaint̄n̄ appro-
p̄iquet q̄ cā sc̄ipiat uidere: pri⁹ uidebunt̄ sūmitates mōtū & cacumia rez̄ altaz̄: deinde q̄to magis dēa nauis
tuis terrā uicinat̄: t̄nto mōtū & hoz̄: uidebit̄ p̄tē maiorē: ac si surgerēt ex aq̄: & q̄n̄ p̄p̄iqua erit: tot⁹ mōs
uidebit̄: quare cū prius apparuerit sūmitates q̄ ptes ifima: arguit̄ aq̄ rotūditas: q̄ ip̄edicat̄ uiderēf ps
ifima mōtis: cacumē uero minime ut patet p̄ figurā textualē. Vege q̄a h̄c rōnes p̄cedūt potius ex q̄bus dā
apparentis: & pbabilibus principiis fidē t̄n̄ facient̄: bus: quom̄ ip̄tinent̄ sit altronomo declarare figuras
eltoz̄: sed p̄ho p̄tinet hoc negotium: nā rotunditas terrā & aq̄: ē quoddā principū in astrologia: principia
autē cū sint notari sc̄ia uisus sunt p̄cipia forti rōne nō pbātur: sed leui iudiciōe & suasioē tm̄: tēte Auer-
ii. & iiii. phy. & prio de celo. Ideo formo rōnē Arist. ii. de celo tex. xxxi. figuram aquę esse rotūdā necessi-
tatem: p̄supponendo primo q̄ aq̄ nata ē fluere ad locū decliuorē nō ip̄edita: un̄ naturalr̄ naturalitate cōi

c iiii

Fig. 1 Composition of a typical early modern scientific commentary for quadrivial teaching. The text of reference is printed with bigger font size, the commentary text is positioned around it, a visual apparatus is added. From (Sacrobosco et al. 1508, 12r). Courtesy of the Library of the Max Planck Institute for the History of Science

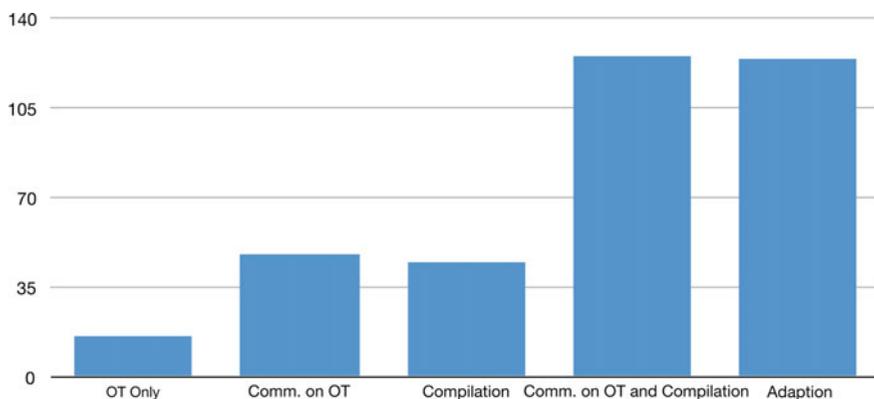


Fig. 2 A typology for the editions constituting the corpus of early modern printed commentaries on the *Sphaera* of Johannes de Sacrobosco: editions that contain the original medieval tract (OT) only; those that contain the original treatise with commentary; those that contain the original treatise and other treatises (compilations); those that contain the original treatise, commentary, and other texts; and adaptations. Authors' plot

Apart from two books in *sextodecimo* format, the dominant formats are folio, quarto, and octavo, though the last is the format that dominates this corpus (thirty-two, 118, and 206 editions, respectively).

The temporal distribution of the production of these treatises, moreover, was not constant, but notably increased around 1550 and maintained this peak until 1585 (Fig. 3).

The fact that these editions were mostly textbooks for use at universities or other educational institutions means that the corpus is not only defined on the basis of a specific scientific subject, but also on the basis of the specific institutional role which played in the context of teaching. In other terms, investigating the relationships among publishers and printers of these editions results in an investigation of their business model(s) in the framework of the academic book market. This also allows us to consider institutional and pedagogical developments of the period as well as the institutions' relationship to the book market. Viewed from this perspective, printing shops and individual publishers appear to be closely connected to the domains of learning and teaching cosmology. This, once more, proves their important role within the dynamic between the book market itself and the market's target customers: students and professors.

The textual content of the treatises has been analyzed through a process of atomization into text parts. A text part is a text portion that clearly has a beginning and an end, and which could be read independently from other text parts published in the same book. Such a text part could, for instance, be an epigram or an entire treatise on the orbits of the planets. We additionally distinguish between text parts that are original texts on one hand and those that are commentaries and translations on the other. Original text parts can be texts of reference, such as Sacrobosco's treatise itself, new texts written by contemporary authors, or older texts which were

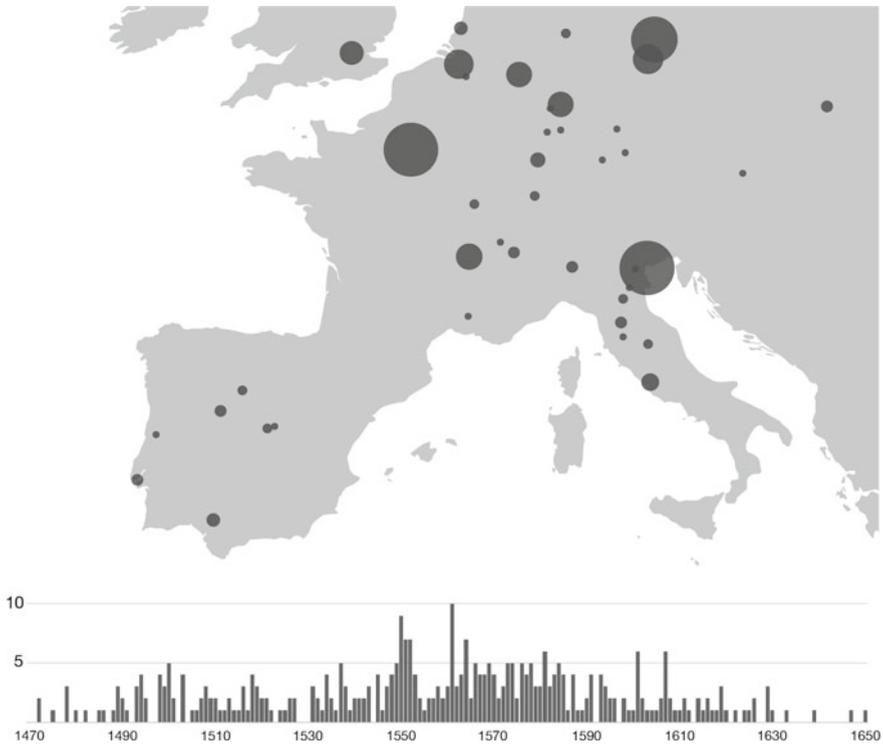


Fig. 3 Geo-temporal distribution of the production of the treatises belonging to the corpus considered here. Authors' plot

published *in the corpus* for the first time. In total, 447 original text parts and 119 commentaries and translations were identified. What is most relevant here is that text parts often reoccurred. It is through the analysis of their reoccurrences that we investigate how knowledge evolved over time.⁴ Previous research (Valleriani 2020) has also sharpened our understanding of the role played by the authors of early modern commentaries within the dynamics of the *Sphaera* corpus, reflecting the low dominance of contemporaries in respect to the total number of credited authors (i.e., authors credited on the title pages of the books).

⁴ The reoccurrence of text parts as a basis for investigating evolution of knowledge is now also used as a method in legal history. In this context, a text part is commonly identified with a paragraph or otherwise well-defined section of the text of a law or a legal corpus. For a pioneering implementation of this method, see (Funk and Mullen 2018). For a more comprehensive description and taxonomy of the text parts in our corpus, see (Valleriani et al. 2019). In the same work, on the basis of complex-network theory analytical tools, we were able to identify families of treatises (epistemic communities) whose contents influenced and shaped the contents of all the other treatises produced in the succeeding periods. The most dominant epistemic communities emerged in 1531 and 1538 and were initiated by Wittenberg's well-known printer Joseph Klug (Chaps. 4 and 5). See also (Zamani et al. 2020).

For this specific study, a systematic approach is proposed that seeks *potential* collaborations among authors when a) their texts were published in the same book and b) the authors were alive at the time of publication. Extensive research on the intellectual profiles of the authors of the commentaries revealed that they were all active in the area of university teaching and of the quadrivial disciplinary scheme. By considering “credited authors” (credited on the title pages), a total of 166 persons can be distinguished (among them twenty-two anonymous). Only fifty-eight of them were alive when their texts were published and only eighteen of them were involved in *potential* relationships among one another. Such relationships were identified by searching for pairwise authors who were alive at the time of publication and whose text parts were printed in the same edition so that a potential relationship, via book producer, among them could be established. This (thin) result suggests that the process of transformation of knowledge—as it can be historically reconstructed against the background of this corpus—was not driven by the authors themselves; against the background of the network analysis, the scientific debate was, in other terms, not primarily conducted by the scholars. In this respect, the hypothesis emerged that a leading role, in the case of textbooks, was taken over by the book producers—hence the necessity to investigate their mutual relationships (cooperation, competition, or mere business awareness) in order to understand whether there is a relationship between the transformation of knowledge and the formation of social communities.

4 Methodological Considerations

Book producers may have acted in more than one role within our corpus. For instance, one individual may have been the publisher of one book and the printer of another or even the author of a text. Only three people in the corpus were authors, printers, and publishers, three were both authors and printers, nine were both authors and publishers, seventy were only printers, sixteen were both printers and publishers, 102 were only publishers. Eighteen people were also identified as translators and seventeen with the roles of both translator and author.

The systematic approach we would like to suggest in identifying such potential relationships (of kinship and/or economic nature) among book producers considers paratexts and their circulation.⁵ In linguistics, paratexts are texts that are, in its most generic definition, complementary to one or more main texts. Paratexts often frame the interpretation of main texts.⁶ In our corpus of early modern printed editions, these paratexts are not always clearly distinguishable from main texts, but as a rough guide, we treat texts as paratexts if they introduce or conclude longer texts, and particularly—and more importantly for the argument of this paper—if they relate to

⁵ A similar line of research concerning paratexts is followed by (Brown et al. 2017).

⁶ For studies concerning the paratext as a genre and its function, see (Genette 2001; Töpfer 2007; Wagner 2008; Enenkel 2015; Smith and Wilson 2014; Batchelor 2018; Tweed and Scott 2018).

or qualify a social relation between, for example, the author of a text and another person, such as a colleague.⁷ Typical examples of paratexts in our corpus include dedication letters and epigrams or other forms of poetry that are not primarily a means of communicating a cosmological idea. Thanks to a taxonomic analysis conducted by Irina Tautschnig, we are able to identify 251 different paratexts in the corpus, which are in turn a sub-group of the 447 original text parts mentioned above. These paratext text parts are organized according to a specific taxonomy: Poetry (ninety-seven), Dedication letter (ninety-one), Letter to the reader or preface (forty-three), and others (twenty).

The undergirding assumption of our approach is that paratexts are a good means by which to make qualified assumptions about potential social and economic relations, including simply “mutual awareness,” between book producers. This genre of texts often established or rather represented, social relations, and as such, the occurrence of many paratexts is strongly tied to the concrete geographical and temporal context of a given edition—a context highly dependent on the work of the book producers.⁸ It goes without saying that not all paratexts fulfill this criterion, yet, at a large scale, the 251 different paratexts are a promising basis for our analysis, and in many examples, it seems highly probable that the book producer deliberately chose which paratexts should accompany his edition.

However, it is not the single occurrence of a paratext that interests us, but rather its reoccurrence—its circulation within the corpus. Here, the assumption is that when a book producer B republished a paratext originating from the specific temporal and local context of a previous edition published by book producer A, producers A and B shared a social or economic context or were at least aware of each other’s business, and thus were in a potential relationship with each other. Why is that? While main texts—such as a treatise on cosmology—widely circulated and could be the basis for many printing businesses completely unrelated to one another, a paratext frames this main text in a way that not only reflects a common interpretational framework but more importantly seems to suggest a more deliberate choice of B to follow the editorial agenda of A. Moreover, most paratexts were composed at the time of publication. Paratexts also mostly, in a strict sense, were not published alone, but were bound to one particular editorial project. By republishing a specific paratext, the previous printing project that embedded it is echoed in a way that renders some sort of relation between the book producers more plausible, as it requires at least an awareness of the edition that published the respective paratext before. Moreover, paratexts such as dedication letters are often testament to high authority and would probably not

⁷ Paratexts such as titlepages, tables of contents, indices, and imprints or colophons are not considered here.

⁸ “Die Paratexte der Drucke sind der Ort, an dem sich diese Transformationen des Produktions-, Distributions- und Rezeptionsprozesses am deutlichsten niederschlagen. In ihnen finden sich explizite Selbstaussagen der Produzenten, also der Drucker oder der Herausgeber des Buchs. Paratexte dienen daneben der Verwaltung des Buchs im Distributionsprozeß, indem sie seinen Inhalt identifizieren, aber auch der Rezeptionssteuerung, indem sie diesen Inhalt qualifizieren und die Attraktivität des Produkts betonen oder steigern.” From (Wagner 2008, 135).

have been republished without previous agreement—a process that would necessarily involve the book producers as well. The very nature of the relations deduced from the reoccurrences of paratexts, however, needs to be investigated in a second step and will not be dealt with here, as this would require detailed historical research on the respective actors.

Technically speaking, we define the circulation of a paratext when this text is reprinted and republished at a later moment by a different printer and/or publisher. Specifically, we suggest identifying paratexts as mentioned and then grouping the editions by function of the reoccurrences of one particular paratext. If at this point the book producers responsible for the publication at hand were alive, we can deduce that they were mutual aware of each other or even in direct contact.

Our approach is defined more precisely by four conditions.⁹ First of all, we distinguish whether the author of a paratext was alive at the time of publication or not, and we analyze the data according to both cases. For brevity's sake, we call the two resulting networks of book producers the “alive-network” and the “non-alive-network.” These two perspectives allow us to take into consideration the real and strict social context on one hand (when the author was alive) and the role of the paratext in the design and conception of the new edition on the other hand. Certainly, there is considerable overlap between both networks, but the nuances do change considerably and will be sketched in a later section. In general, the author being alive means that we are dealing with a contemporary paratext; the non-alive-network would be built from paratexts that may come from much earlier times, and which therefore might have completely lost the social, local, or temporal context from which they originated by the time we encounter them.¹⁰ This means, in the latter case, that the paratexts tend to become a main text. We have clearly identified cases in which some dedication letters, as time passes, became introductory texts, almost completely losing their interpersonal function.

The notorious dedicatory letter by Philipp Melanchthon (1497–1560) to Simon Grynaeus (1493–1541) is a good example, as the letter continued to be very important even after the Reformer's death. Rather than being printed as a letter, however, it was often simply used as an introduction to Christian astrology, even omitting mention of its author's or addressee's names altogether.¹¹ Here, we also faced a content-related

⁹ To guarantee the reproducibility of our historical analysis, the dataset extracted from the database as well as the scripts that embed the following conditions and that are used to create the networks described and analyzed in the following sections are freely available at: <https://gitlab.gwdg.de/MPIWG/Department-I/sphaera/sphaera-paratexts-data-prep>. Accessed 8 June 2021.

¹⁰ “Die Widmungsvorrede ist also schon früh mehr als eine persönliche Adressierung an einen individuellen Förderer, die sich zugleich an breite Leserkreise richtet, sondern löst sich vom ursprünglichen Entstehungskontext der Ausgabe, wird also nicht mehr mit einer spezifischen Ausgabe, sondern mit der in ihr erstmals vorgelegten Redaktion des Werkes selbst assoziiert.” From (Wagner 2008, 152).

¹¹ Melanchthon's letter to Grynaeus was published and republished all over Europe and also beyond the prohibition in the Catholic countries. Often, we still find exemplars of texts in which the folios have been relocated, or the name of Melanchthon deleted or, later, the text published as if it were by an anonymous author. This text has been the object of numerous studies. We mention here (Pantin 1987; Lalla 2003; Reich and Knobloch 2004).

limit to our approach. The circulation of this text was, at least after a while, clearly due not to specific relationships among book producers but to the wish to publish a strong and authoritative text in defense of the study of astrology.¹²

The second condition, already mentioned, is that the book producers involved have been alive at the time of both publications linked by a common paratext. The time between both editions is called the “link age,” which will be discussed below. One particular problem emerges in concomitance with this condition, namely the problem that birth and death dates of printers and publishers are not always known or not known with the necessary precision. In all uncertain cases, the active times of the book producers were specified—that is, the time period between the first and the last known edition produced by the respective actor. This is treated as equal to his career as an active book producer. However, even though these dates might bring some uncertainty into the equation, pushing both dates of birth and death by five years (i.e., extending the period by ten years) did not affect the results.

A further condition is that the link age must be at least one year. This means that we did not take into consideration the circulation of paratexts from one edition to the next when this process occurred within the same year. The simple reason for that is that it would require individual research to determine which edition preceded the other if both appeared in the very same year, as our network is oriented chronologically.

The fourth and last condition is what we call the “shortest temporal distance.” If for instance a paratext was published once by publisher A and then many times by a second publisher B, we only consider the instance of nearest temporal proximity. We, therefore, prioritize the first republication of a paratext by a second book producer because we consider the time of the first republication to be the moment when the potential relationship was established.

Following these conditions, we created a network connecting all the editions with one another if, and only if, they both contain at least one identical paratext—what we called the circulation of a paratext above. If two editions share two or more paratexts, then the network contains the same number of links among each pair of editions as the number of paratexts they share.

5 The Network

The alive-network has 359 relations between the editions, while the non-alive-network has 622. This is to be expected—dropping a restrictive condition will increase the amount of links in a network. When ignoring the circulation of more than one paratext for each book, namely by deleting multiple links between the

¹² The approach delineated here may also be valid for disclosing social and economic relations as well as intellectual affinity. A systematic and formal taxonomy of paratexts that allows one to make such a distinction does not seem possible; the requirement therefore emerges of adding close-reading analyses of the detected paratexts in a second step in order to ultimately discover further relevant characteristics.

same couple of editions, the numbers decrease to 242 (alive) and 354 (non-alive) respectively.

Of the total 251 paratexts, only a small portion was republished in different editions of the treatises. In the alive-network this amounts to only fifty-six different paratexts, in the non-alive to seventy. This means that only fourteen paratexts were republished by different book producers after the death of the paratext's original author. It also means that the majority of paratexts were not republished, testifying to a possible singular and non-reproducible social context of the editions that contain them.

The five paratexts that circulated most according to these conditions are:

1. the dedicatory letter by Philipp Melanchthon to Simon Grynaeus (8,6% for the alive-network and 26,2% for the non-alive-network);
2. the epigram *De triplici ortu* by Philipp Melanchthon (9,1% for the alive-network and 14,4% for the non-alive-network);¹³
3. the dedicatory letter by Élie Vinet (1509–1587) to Johannes Tacitus (?) (5,8% for the alive-network and 11,4% for the non-alive-network);¹⁴
4. the carmen by Donato Villalta (1510–1560) dedicated to Pierius Valerianus (1477–1560) (0,14% for the alive-network and 9,6% for the non-alive-network);¹⁵
5. the dedicatory letter by Christophorus Clavius (1538–1612) to the reader (5,4% for the alive-network and 7,4% for the non-alive-network).

The ten paratexts that circulated most are responsible for 38% of the links between editions in the alive-network and for 80% in the non-alive-network. This huge difference in percentage again points to the different status of a paratext in relation to the restrictive alive-condition. We could say emphatically that the older a paratext was, the more likely it was to be republished and thereby extracted from its original context. It also should be noted that paratexts one to four were very often published in the same editions; paratexts one and two were virtually always published in the same editions; paratexts three and four were virtually always published in the same editions and in the most editions that also included paratexts one and two. This means most links in the network are based on paratexts of one “tradition” or editorial context.

¹³ The short poem of four verses—*De triplici ortu*—is taken to be a paratext although it does not appear at the beginning in most of the editions, but after the end of Sacrobosco's treatise. We count it as a paratext since it is supposed to conclude the treatise in a poetic manner, comparable to a doxology in religious texts. This paratext is closely related to the first paratext by Melanchthon, as they are virtually always published together (mutilated copies or other highly specific reasons explain the very few cases in which these text parts are not co-published).

¹⁴ Élie Vinet's dedicatory letter is very closely related to the previous two paratexts by Melanchthon. Although this paratext was published in thirty-three editions, Melanchthon's dedication letter was not printed in only eight of them (or was removed due to censorship in the inspected copies).

¹⁵ Donato Villalta's *carmen* is closely related to the paratext by Élie Vinet (no. 3), as they are always published together.

Table 1 List of the ten book producers with the most potential relationships

Alive-network			Non-alive-network		
Person	Links	Percentage (%)	Person	Links	Percentage (%)
Cavellat, Guillaume	20	4,44	Seitz, Peter I.	22	3,28
Richard, Jean	17	3,78	Krafft the Elder, Johann	20	2,99
Krafft the Elder, Johann	14	3,11	Cavellat, Guillaume	20	2,99
Seitz, Peter I.	14	3,11	Richard, Jean	19	2,84
Kreutzer, Veit	13	2,89	Heirs of Arnold Birckmann	18	2,69
Klug, Joseph	12	2,67	Kreutzer, Veit	17	2,54
Bindoni I., Francesco	11	2,44	Cholinus, Maternus	17	2,54
Crispin, Samuel	10	2,22	Richard, Thomas	15	2,24
Gabiano, Jean de	10	2,22	Bindoni I., Francesco	15	2,24
Ciotti, Giovanni Battista	10	2,22	Barbier, Symphorien	15	2,24

Looking at the temporal aspects of the results, the circulation of paratexts started as early as 1478 and ended in 1619 in the alive network, and in 1629 in the non-alive-network. The average age of the links is of five and seven years, respectively, while the oldest links are thirty-one and forty-one years.

Coming finally to the potential relationships, we find that 102 book producers are involved in the circulation of paratexts in the alive-network and 118 in the non-alive-network. Their relations, if they are considered reciprocal, amount to 450 and 670. However, because of the need to order them chronologically, the network must be correspondingly oriented.¹⁶ This in turn means that reciprocal relationships are represented by oriented links; therefore, they amount to 225 and 335 (i.e., the relations A-B and B-A are counted as one relation, not as two).¹⁷

Considering again only the absolute numbers, the ten book producers with the most potential relationships cover 29% and 26% (alive-network and non-alive-network) of the total amount of potential relationships detected (Table 1). Additionally, 7% and 5% of the book producers (in both cases exactly thirty-three persons) display only one potential relationship.

To take an example from a paratext, we can consider Jacques Lefèvre d'Étaples's (1450–1536) dedicatory letter to Carolus Borra (Charles Bourré) (d. 1498). In this

¹⁶ Reciprocity here is an important feature, although the graph is directed chronologically. Yet, it must be assumed semantically that any cooperation is by definition reciprocal.

¹⁷ Re-editions by the hand of the same printers and/or publisher have been excluded.

letter, d'Étaples formulates grandiloquent praise on behalf of the entire “academia” of Charles Bourré for his engagement in the teaching of mathematics.

This letter was printed and published first in 1494 in Paris by Wolfgang Hopyl (fl. 1489–1523) (Sacrobosco 1494). It was then reprinted and republished five years later in Venice by Simone Bevilacqua (1450–1518) (Sacrobosco et al. 1499b) and reissued by the same in the same year (Sacrobosco et al. 1499a). One year later it was republished by Hopyl again (Sacrobosco et al. 1500); then in 1507 by Henri d'Estienne I (1460–1520) in Paris (Sacrobosco et al. 1507); then by Giuntino Giunta (1477–1521) in Venice in 1508, but printed by the brothers Giovanni and Bernardino Rosso (fl. 1506–1512) (Sacrobosco et al. 1508); then in 1511 by Henri Estienne I again (Sacrobosco et al. 1511); then in 1521 by Simon de Colines (1480–1546) in Paris (Sacrobosco et al. 1521); then in 1531 by Lucantonio Giunta (1457–1538) in Venice (Sacrobosco et al. 1531); and finally in 1534 by Simon de Colines in Paris (Sacrobosco et al. 1534).

By applying the condition of the shortest temporal distance, these nine editions and one reissue (all containing the mentioned paratext by d'Étaples) result in a total of 17 potential relationships. It cannot be precisely identified from which edition a succeeding edition borrowed the text, or which book producer might have been in contact with which other book producers. Ordered according to the dates of publication of the editions from which the links originate toward other editions, the potential relationships, within the frame of the alive-network, are seen in Table 2.

6 Interpretation

Drawing definite conclusions from the data with regard to the social, economic, or intellectual relationships between book producers is hardly possible at this moment. Yet, some patterns and tendencies emerge that shall be sketched in what follows. In order to do so, we will mainly look at the geographical attributes of the network—i.e., the question of how centers of book production (cities) relate to one another. It turns out that the network indicates both transregional and local links between editions (and thereby between their producers) that were printed in cities of different regions, as well as those printed within one and the same city. A first step thus will be to draw a more precise picture of this situation, balanced against further data of the corpus. A second step will validate the data against other methods to trace possible relationships between editions, namely by analyzing the similarity of book layouts and typesetting based on fingerprints,¹⁸ and by looking beyond the *Sphaera* corpus. Here we ask whether two book producers involved in a potential relationship

¹⁸ The fingerprint of an edition is a unique identifier consisting of letters printed on specific pages of the respective edition. These fingerprints not only allow a more precise identification of a specific edition than a traditional bibliographical record, but also enable the detection of very similar prints or reissues of one print run. For the method of extraction of fingerprints in the *Sphaera* corpus, see (Beyer 2019). The fingerprints of the editions constituting the *Sphaera* corpus are available through the database mentioned above.

Table 2 Potential relationships resulting from the circulation of Jacques Lefèvre d'Étaples's dedicatory letter to Carolus Borra

Source year	Target year	Source publishers	Target publishers	Source printers	Target printers
1494	1499	Hopyl, Wolfgang	Bevilacqua, Simone	Hopyl, Wolfgang	Bevilacqua, Simone
1494	1499	Hopyl, Wolfgang	Bevilacqua, Simone	Hopyl, Wolfgang	Bevilacqua, Simone
1499	1508	Bevilacqua, Simone	Giunta, Giuntino	Bevilacqua, Simone	Giovanni & Bernardino Rosso (brothers)
1499	1508	Bevilacqua, Simone	Giunta, Giuntino	Bevilacqua, Simone	Giovanni & Bernardino Rosso (brothers)
1499	1507	Bevilacqua, Simone	Estienne I., Henri	Bevilacqua, Simone	Estienne I., Henri
1499	1507	Bevilacqua, Simone	Estienne I., Henri	Bevilacqua, Simone	Estienne I., Henri
1499	1500	Bevilacqua, Simone	Hopyl, Wolfgang	Bevilacqua, Simone	Hopyl, Wolfgang
1499	1500	Bevilacqua, Simone	Hopyl, Wolfgang	Bevilacqua, Simone	Hopyl, Wolfgang
1500	1531	Hopyl, Wolfgang	Giunta, Lucantonio	Hopyl, Wolfgang	Giunta, Lucantonio
1500	1521	Hopyl, Wolfgang	Colines, Simon de	Hopyl, Wolfgang	Colines, Simon de
1500	1508	Hopyl, Wolfgang	Giunta, Giuntino	Hopyl, Wolfgang	Giovanni & Bernardino Rosso (brothers)
1500	1507	Hopyl, Wolfgang	Estienne I., Henri	Hopyl, Wolfgang	Estienne I., Henri
1507	1508	Estienne I., Henri	Giunta, Giuntino	Estienne I., Henri	Giovanni & Bernardino Rosso (brothers)
1508	1521	Giunta, Giuntino	Colines, Simon de	Giovanni & Bernardino Rosso (brothers)	Colines, Simon de
1508	1511	Giunta, Giuntino	Estienne I., Henri	Giovanni & Bernardino Rosso (brothers)	Estienne I., Henri
1521	1531	Colines, Simon de	Giunta, Lucantonio	Colines, Simon de	Giunta, Lucantonio
1531	1534	Giunta, Lucantonio	Colines, Simon de	Giunta, Lucantonio	Colines, Simon de

also published/printed any non-*Sphaera* editions that display the same content. We take this to be a further indication of some sort of relation between the two book producers. Both complementary approaches (“fingerprints” and “similar editions”) are taken to be spot-test validations of the data generated in the network on which our analysis is focused.

6.1 *Geographical Distribution*

As mentioned above, Paris, Venice, and Wittenberg are the places where most *Sphaera* editions were published. It is thus no wonder that in the present network (including data from both alive and non-alive networks) these three cities are most prominent with regard to the reoccurrences of paratexts.

Moreover, and probably in tight connection with this geographical observation, it must be taken into account that most links are based on a relatively small set of paratexts, mostly connected to the authors Melanchthon, Vinet, and Clavius. But these two presuppositions, however, do not necessarily warp the data and therefore present a problem for drawing valid conclusions. It rather qualifies the nature of the relationships between the book producers: those predominant paratexts, as has been underlined in a previous section, do not necessarily indicate the social and local context like other paratexts do. They rather suggest a broader awareness of the book producers toward certain intellectual trends in the cosmology (and wider academic) book market. The *Sphaera* editions introduced by Melanchthon's letter (editions often containing Vinet's dedication letter as well), and editions of Clavius's commentary were clearly disruptive developments in the publication of *Sphaera* editions and mark the emergence of new trends, materialized in the vast reprinting and republishing of these editions.

Bearing all of this in mind, interpreting the geographical distribution of the paratext-based links between *Sphaera* editions is greatly facilitated. A look at Table 3 immediately evidences the fact that most links between two *Sphaera* editions are created within one city, or more precisely, *within* those three cities that produced most of the *Sphaera* editions: Paris, Venice, and Wittenberg (marked by \rightleftharpoons preceding the city's name).

This data, on one hand, seems to suggest a rather local culture of relationships between book producers. This conclusion will be corroborated in the next section. On the other hand, the number of links among the three major centers of the production of *Sphaera* editions (and of editions in general) is not strikingly low. Does this indicate a more transregional aspect of the network and therefore contradict the apparent local nature of relationships? "Yes and no" might be the most precise answer. The transregional aspect follows from the immense number of reoccurrences of the prominent paratexts mentioned above. For very few links we can allege that book producers actively cooperated on a social, economic, or even contract-based level. We must keep in mind that those links, moreover, are links between editions, not between people. Although we, and we think with justification, regard links between editions to indicate potential relationships between their producers, those links are often links between one edition (A) and a plethora of other editions (B, C, D, etc.) featuring the same paratext on whose basis the links are established. It is, viewed from the perspective of economic history, rather unlikely that the producer of A was in a social relationship with all producers of B, C, D, etc. More likely, it would appear—and this is indeed what the sample tests sketched in the next section confirm—that

Table 3 Geographical distribution of the paratext-based links between *Sphaera* editions

Alive-network			Non-alive-network		
City/cities	Links	Percentage (%)	City/cities	Links	Percentage (%)
↔Venice	37	7,57	↔Venice	43	6,92
↔Paris	28	5,73	↔Wittenberg	42	6,76
↔Wittenberg	26	5,32	↔Paris	33	5,31
Venice → Wittenberg	22	4,50	Wittenberg → Antwerp	27	4,35
Venice → Paris	14	2,86	Antwerp → Wittenberg	24	3,86
Wittenberg → Venice	14	2,86	Venice → Wittenberg	22	3,54
Paris → Venice	13	2,66	Paris → Venice	20	3,22
Wittenberg → Paris	12	2,45	Venice → Paris	18	2,90
Paris → Antwerp	12	2,45	Wittenberg → Paris	17	2,74
↔Lyon	12	2,45	↔Antwerp	16	2,58
Cologne → Lyon	12	2,45	Paris → Wittenberg	14	2,25
Lyon → Venice	11	2,25	Wittenberg → Venice	14	2,25
Antwerp → Venice	11	2,25	Venice → Antwerp	14	2,25
Paris → Lyon	11	2,25	Lyon → Antwerp	14	2,25
Venice → Antwerp	10	2,04	Lyon → Paris	13	2,09
Antwerp → Wittenberg	10	2,04	Venice → Lyon	13	2,09
Cologne → Venice	10	2,04	Cologne → Paris	12	1,93
Wittenberg → Antwerp	9	1,84	Paris → Antwerp	12	1,93
Lyon → Cologne	9	1,84	↔Lyon	12	1,93

A might have been in touch with only one book producer B, and B, in turn, might have had an impact on C or D, and so forth.

This interpretation does not disregard or violate the data at hand but rather tries to understand it in the context of an actual social situation. Additionally, if we think of the relationship between the book producers more in terms of their “awareness” of certain trends (e.g., the publication of Clavius’s commentary or the text of Sacrobosco, always preceded by and therefore tied to Melanchthon’s preface), the more transregional aspect of the network simply confirms that the reoccurrences of some paratexts (mirroring certain trends) are not mere chance but prove that book producers knew about those trends and adjusted their ventures accordingly. All of this could and often has happened without any social or economic relation between book producers who published the *Sphaera* editions that were used as templates, or manifestations of *Sphaera* editions that proved successful in other cities.

6.2 Validation and Corroboration for Local Cooperation

The fact that similar editions were printed within one city over a longer period of time is not a surprise. Many print shops were owned by families and dynasties, passing over the portfolio of the print shop or publishing house to the next generation. Within one city, mutual awareness of and occasional cooperation with local competitors, or a mere (and perhaps not always approved) imitation of their publishing program (or parts thereof) can more or less be taken for granted according to current scholarship and the many examples described in this volume. This holds true especially for places that did not control book production through privileges—like Venice and Paris did—for the printing of ancient and medieval authors and for the production of textbooks, such as Sacrobosco's *Tractatus*.¹⁹

A good example to illustrate the local dynamics of this network is Wittenberg, a small city, yet one giving home to many printers, and a highly productive center, especially with regard to religious books of the Reformation (Oehmig 2015). In octavo *Sphaera* editions featuring Melanchthon's notorious letter to Grynaeus and presenting an amended text of Sacrobosco, probably edited under the auspices of Georg Joachim Rheticus (1514–1574) (Rosen 1974; Pantin 2020), must be seen as the vehicle of Wittenberg's success in the market for *Sphaera* editions. These many editions featuring Melanchthon's paratext also dominate the links generated in both the alive and the non-alive networks.²⁰

By looking closer at editions from Wittenberg, we see that they not only feature the same paratexts but also resemble each other in ways that markedly underline how different print shops collaborated or influenced one another's businesses. By looking at so-called fingerprints (the multi-part code generated from the typesetting of several pages of an edition) some resemblances emerge so strongly that they cannot be ascribed to mere chance, but should be seen as some form of a relation between the printers or family-run print shops in early modern Wittenberg. For example, the treatise *Novae quaestiones Sphaerae* by Sebastian Dietrich (1521–1574)—a short reworking of Sacrobosco's treatise in the form of questions and answers, most likely written for university teaching of astronomy—was printed for the first time by Johann Krafft the Elder (1510–1578) in 1564 (Dietrich 1564). Fingerprints and a close inspection of this edition reveal that all seven subsequent editions produced in Wittenberg more or less have a very similar, almost identical *mise-en-page*. Krafft's second reprint of 1570 (Dietrich 1570) seems to have been the template for later editions printed by Anton Schöne (fl. 1569–1585) and Clemens Schleich (fl. 1569–1589) in 1573 (Dietrich 1573), by Matthaeus Welack (1540–1593) in 1583

¹⁹ Many text parts in *Sphaera* editions however were written by contemporary authors and therefore publishers could be awarded with privileges for those editions, as is also proved by a considerable number of editions in our corpus. The role of privileges in the production of textbooks awaits further research. On privileges in general, see (Nuovo 2013, 195–257).

²⁰ Melanchthon died in 1560. Therefore, many links are disregarded after this year in the alive-network, while his preface did not cease to be an important supplement to many editions printed thereafter.

(Dietrich 1583), and by Lorenz Säuberlich (fl. 1597–1613) in 1605 (Dietrich 1605). Yet those editions were not reissues, and they differ in minor details: the woodblocks for some of the initials had already been replaced by Krafft himself in his later editions, and likewise in editions printed by some of his Wittenberg competitors and successors in the decades to follow. Another example of a similar kind is an edition of the *Libellus de Sphaera Iohannis de Sacro Busto* printed by Johann Krafft the Younger (fl. 1589–1614) and published by Zacharias Schürer & partners (fl. 1600–1626) in 1601 (Sacrobosco and Melanchthon 1601), which was then reprinted in 1629 by the widow and the heirs of Zacharias Schürer (fl. 1626–1640) (Sacrobosco and Melanchthon 1629). Those two editions were also not reissues, but new, yet strikingly similar editions—reprints using more or less the same typesetting but, for example, printing the initials from different woodblocks.

These spot tests in the Wittenberg market for *Sphaera* editions strongly suggest the existence of deep economic and social relationships among those book producers that also published *Sphaera* editions in this German city (Chaps. 4 and 5). Of course, these alleged relationships did not only extend to *Sphaera* editions, as can be confirmed by looking at books written by other authors, printed and published in early modern Wittenberg. For example, the print shop owned by Peter Seitz the Elder (d. 1548), who was later succeeded by his heirs, printed various, mostly religious treatises connected to the Reformation in the German language, most of them between 1550 and 1570. Those editions, authored by well-known theologians such as Urbanus Rhegius (1489–1541), David Chyträus (1530–1600), Peder Palladius (1503–1560), Martin Luther (1483–1546), and Johannes Garcaeus (1530–1574), had been published and printed earlier by Johann Krafft the Elder and Joseph Klug (1490–1552). Not only did the Seitz print shop produce treatises others had published before but also vice versa. For example, Ursula Seitz, widow of Peter Seitz the Elder, introduced Moritz Breunle's (b. 1500) *Ein kurtz formular und Cantzley buechlein* (Breunle 1548) to Wittenberg's print market in the year of her husband's death (1548). This successful so-called formulary was first printed in Leipzig and Augsburg in 1529 (Breunle 1529a, b), but, from 1552 onward, was also printed in Wittenberg at various times by Veit Kreutzer (fl. 1538–1563) (Breunle 1552, 1553, 1559, 1561) and the heirs of Peter Seitz the Elder (fl. 1548–1578) (Breunle 1554, 1556, 1557)—both also producers of *Sphaera* editions.²¹ These examples, just as in the case of *Sphaera* editions, strongly suggest that Wittenberg's book producers were highly aware of their competitors' products and adjusted their book production accordingly, or even took over "rival assets."

²¹ For Veit Kreutzer's and Peter Seitz I Heirs's production in the context of the *Sphaera* corpus, see respectively <http://hdl.handle.net/21.11103/sphaera.100789> and <http://hdl.handle.net/21.11103/sphaera.100789>. Accessed 8 June 2021.

6.3 *Validation and Corroboration for Transregional Awareness*

Although local dynamics, as presented in the example of Wittenberg's production of *Sphaera* editions, show stronger support in the network and are also much easier to corroborate, some transregional or transnational aspects of the network also need to be addressed but await further confirmation through additional historical research. Much indeed could be said about specific transregional relations, and many of them can be, if not explained, at least interpreted against the background of historical and intellectual settings that are known to scholars of the field. For example, earlier research (Sander 2018) already shows that the *editio princeps* of the *Sphaera* including Melanchthon's letter, published by Joseph Klug in 1531 in Wittenberg (Sacrobosco and Melanchthon 1531), was not the only Wittenberg edition featuring Melanchthon that was republished shortly thereafter in Venice by Melchiorre Sessa I (1505–1565) (Sacrobosco and Melanchthon 1532). Obviously, Venice's book market demanded editions of scholarly texts that were somehow related to Melanchthon and his intellectual and humanist movement.

While this case was most likely not based on any economic relation between Klug and Sessa, other cases do in fact suggest such relations and cooperation. As Ian Maclean argues in this volume (Chap. 6), Francesco Zanetti (1530–1591) and Giovanni Battista Ciotti (1564–1635) might have collaborated in their undertaking to publish Clavius's commentary on Sacrobosco. That print shops that produced works by Jesuit authors (Chap. 11) might have benefitted from the order's transregional network goes without saying and yet awaits further in-depth research by book historians.

As for other *Sphaera* editions, once again a look at the editions' fingerprints is revealing. Although being rather the exception, one case, again related to Wittenberg and Melanchthon, is telling: It fell to Jean Loys (d. 1547), a Flemish printer who set up his business in Paris around 1535, to put Melanchthon's notorious letter as a preface on the French book market in 1542 (Sacrobosco and Melanchthon 1542). Fingerprints and a close inspection of the typesetting show that he did not use any of the four preceding editions from Wittenberg—Klug had published in 1531, 1534, 1536, and 1538—but the latter's edition of 1540 (Sacrobosco and Melanchthon 1540), at least to typeset Melanchthon's preface. Yet, as for the otherwise nearly identical typesetting of this paratext, Loys did not typeset the catchwords of Klug's print.²² Moreover, the treatise by Sacrobosco, which was also newly edited (probably by Rheticus for Klug's edition of 1538), had been used by Loys as well. However, this text was not copied in terms of typesetting from any preceding edition produced in Wittenberg or anywhere else, and even new woodblocks seem to have been used. When Jean Richard (1516–1573) introduced Melanchthon's preface to Antwerp in

²² A catchword is a word or syllable placed at the foot of a printed page that is meant to be bound along with other pages in a book. The word anticipates the first word of the following page. It helped the bookbinder to make sure that the leaves were bound in the correct order.

1543 (Sacrobosco and Melanchthon 1543b), he seems to have drawn on the typesetting of either Loys's edition of 1542 or of Klug's edition of 1540. As for Sacrobosco's text, Richard's typesetting differs in detail from both of those editions. Moreover, his edition also includes Sacrobosco's *Computus*, which was first published, together with his *Sphaera*, in Klug's edition of 1538 (Sacrobosco and Melanchthon 1538). But things get even more complicated: As a closer look reveals, Richard seems to have typeset the text of both Sacrobosco's *Sphaera* and *Computus* without a strict template. Albeit he took the typesetting of Melanchthon's letter to Grynaeus as his template from an edition of 1540 (Wittenberg) or 1542 (Paris), he compiled his edition by using textual parts (*Computus* and Melanchthon's dedication letter) as had only been done before in 1538 (Wittenberg) and 1543 (Wittenberg, printed by Peter Seitz the Elder) (Sacrobosco and Melanchthon 1543a). So, while the editions of 1540 and 1542 do not contain those additional textual parts, the editions of 1538 and 1543 contain Melanchthon's letter in different typesetting. This complex micro-analysis suggests that both Loys in Paris and Richard in Antwerp, in one way or another, were impacted by editions printed by Klug in Wittenberg. This impact, though not yet tangible through any documents providing an economic relationship, also indicates that printers used the typesetting of previous editions as templates and that Richard had clearly inspected more than one *Sphaera* edition to design his own publication.

Mutual awareness among book producers in different cities or even countries is by no means a phenomenon exclusive to *Sphaera* editions. As in the cases of local relationships, this can be further corroborated through spot tests of treatises published in various cities by different printers in our network. For example, Peter Seitz the Younger (d. 1577) published a commentary on Ovid in 1559 that originates in Georg Sabinus's (1508–1560) lectures at Kaliningrad (Sabinus 1559).²³ This work by Sabinus (a former student of Luther and Melanchthon in Wittenberg) was first published in Wittenberg in 1555 and 1556 (Sabinus 1555, 1556) by the print shop of the Heirs of Georg Rhau (fl. 1548–1566), who did not publish any *Sphaera* editions. After this edition was reprinted again in Wittenberg by Clemens Schleich and Anton Schöne—also printers of *Sphaera* editions²⁴—in 1572 (Sabinus 1572), it found its way into the hands of Jérôme de Marnef (1515–1595) and the widow of Guillaume Cavellat, Denise de Marnef (fl. 1567–1616), two leading book producers of *Sphaera* editions in Paris.²⁵ Their edition of 1575 (Sabinus 1575) was reprinted twice in Paris (Sabinus 1579, 1580).

The Seitz print shop also published Gemma Frisius's (1508–1555) *Arithmeticae practicae methodus facilis* in 1550 (Gemma Frisius 1550). This extremely successful

²³ On Sabinus's commentary on Ovid and its early modern editions, see (Mundt 2019).

²⁴ For Clemens Schleich's and Anton Schöne's production of *Sphaera* treatises, see respectively <http://hdl.handle.net/21.11103/sphaera.100318> and <http://hdl.handle.net/21.11103/sphaera.100317>. Accessed 8 June 2021.

²⁵ For Jérôme de Marnef's and Guillaume Cavellat's production of *Sphaera* treatises, see respectively <http://hdl.handle.net/21.11103/sphaera.100754> and <http://hdl.handle.net/21.11103/sphaera.100726>. The widow of Guillaume Cavellat, Denise de Marnef, also produced *Sphaera* treatises: <http://hdl.handle.net/21.11103/sphaera.100281>. Accessed 8 June 2021.

mathematical treatise was first published in 1540 in Antwerp by Gillis Coppens van Diest (1496–1572) (Gemma Frisius 1540). Reprinted at least sixty-five times thereafter, it was printed in Wittenberg several times by Georg Rhau (1488–1548) and by the heirs of Seitz the Elder, then several times in Paris, among other printings by Jean Loys, Thomas Richard (fl. 1547–1568), and Guillaume Cavellat (1500–1576)—all of them also producers of *Sphaera* editions²⁶—in Lyon by the father of Jean de Tournes (1539–1615)—a printer of a *Sphaera* edition²⁷—and in Leipzig and Strasbourg by printers with no business in *Sphaera* editions. Further overlaps with producers of *Sphaera* editions appear in reprints of Frisius’s treatise, demonstrated through the prints of Maternus Cholinus (1525–1588) in Cologne (Gemma Frisius 1564, 1571, 1576), by Jean Bellère (1526–1595) in Antwerp (Gemma Frisius 1581), and in Wittenberg by the heirs of Krafft the Elder (Gemma Frisius 1579), Matthaeus Welack (Gemma Frisius 1583), Simon Gronenberg (fl. 1572–1602) (Gemma Frisius 1587, 1593), and Lorenz Säuberlich (Gemma Frisius 1604).²⁸ Although not all of these links are present in our network based on paratext recurrences, most of them are, and the striking matches of the book producers in the cases of Sacrobosco and Frisius are certainly not to be taken as coincidences but can be interpreted as an indication of a shared market for books on astronomy and arithmetic. Both Sacrobosco and Frisius provided textbooks for two university-taught disciplines of the *quadrivium*, and there was certainly a market for these textbooks in university cities like Wittenberg, Antwerp, Cologne, and Paris.

7 Conclusions and Outlook

As mentioned at the beginning of this paper, in our quest for a more systematic approach, we used network analysis to detect potential relationships among book producers. Such relationships can be properly defined only by means of further historical research. They could be real relations of an economic nature, social relations on a broader level, or just “mutual awareness,” indicating that the producers were observing and being influenced by one another’s production. Taking into consideration the corpus of editions containing Sacrobosco’s *Tractatus de sphaera*, we have

²⁶ For Jean Loys’s and Thomas Richard’s production of *Sphaera* treatises, see respectively <http://hdl.handle.net/21.11103/sphaera.100816> and <http://hdl.handle.net/21.11103/sphaera.100347>. Accessed 8 June 2021.

²⁷ For Jean de Tournes’s production of *Sphaera* treatises, see <http://hdl.handle.net/21.11103/sphaera.100911>. Accessed 8 June 2021.

²⁸ For Maternus Cholinus’s, Jean Bellère’s, Johann Krafft’s I and his heirs’ (Matthaeus Welack’s, Simon Gronenberg’s, and Lorenz Säuberlich’s) production of *Sphaera* treatises, see respectively <http://hdl.handle.net/21.11103/sphaera.100400>, <http://hdl.handle.net/21.11103/sphaera.100338>, <http://hdl.handle.net/21.11103/sphaera.100955>, <http://hdl.handle.net/21.11103/sphaera.100684>, <http://hdl.handle.net/21.11103/sphaera.100778>, and <http://hdl.handle.net/21.11103/sphaera.100294>. Accessed 8 June 2021.

considered the circulation of paratexts to be an arguably dependable intimation of such relationships, at least as an impetus toward further historical research.

We admit that the absolute numbers of paratexts and publications constituting our networks might be too small for such a line of reasoning, but we are confident that, if a greater number of historical sources is considered, this method can become standard. The geographical network analysis in particular has shown that it is possible to draw inferences that at least sound plausible and can be corroborated by in-depth historical spot tests. As a preliminary result, we can state that the strongest and most frequent relationships between book producers in the context of the academic book market occurred within one and the same city, suggesting a few local centers of the network, particularly Venice, Wittenberg, and Paris. This is indeed in agreement with book historians' research on the production of school and textbooks (Gehl 2013). The analysis however also indicates transregional relationships between book producers. While economic relationships seem more likely in the local contexts, many of the transregional links seem to indicate a mutual (or occasionally one-sided) awareness of editions published by colleagues in other cities. Editions containing a similar set of text parts, especially the same paratexts, are arguably not coincidental or an effect of an unrelated yet similar demand for certain books in various cities. More likely, it seems that the transregional character of the early modern academic book market fostered a certain awareness for successful or highly demanded editions, later to be introduced into local markets with their own local dynamics.

Along with the first preliminary historical insights, our results allow historical researchers to prioritize close readings of the historical sources in order to find out what relationships really existed. Approaches along this line might include relating the *Sphaera* editions based on their fingerprints more completely and systematically than has been done here. Thereby possible reissues of the same text among different book producers can be identified, marking their collaboration as quite likely. Moreover, a comparison, by means of machine-learning technology, of the imagery within the treatises might indicate such collaborations even further, suggesting that printers exchanged, or at least reused, the same woodblocks for different editions.²⁹ These consecutive approaches may lead to further investigations regarding family or business relations between book producers. Interpreting the results of this study may also allow for a more political perspective. It is intriguing to read the results against the background of political alliances or relationships between cities. Finally, the relationships might reveal more about confessional boundaries (or their absence) as far as the book market was concerned. Here, Clavius's and Melancthon's paratexts are obviously promising cases.

²⁹ A first step toward the completion of a machine-learning algorithm that allows for the discovery of similarities among early modern illustrations—a specific “Deep Similarity Model”—has already been achieved (Eberle et al. 2020).

Abbreviations

Digital Repositories

Sphaera CorpusTracer Max Planck Institute for the History of Science. <https://db.sphaera.mpiwg-berlin.mpg.de/resource/Start>. Accessed 07 June 2021.

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