for Integers,” which uses Coptic and Byzantine sources to show that such tables fall into two broad classes—short “elementary” and longer “extended” or “professional” versions.

Of the papers that compare only two cultures, the majority look at the Orient. K. Chemla and A. Keller compare the study of quadratic irrationals in China and India; B. van Dalen looks at Islamic and Chinese astronomy under the Mongols; and K. Plofker studies iterative approximations in India and Islam. But the most original study is surely that of A. Volkov, who looks at the transmission of a Chinese mathematical treatise to medieval Vietnam.

Only three papers study transmission between East and West. L. Dun compares the method of false position and Hero’s method for determining the purity of gold in China and Europe, while T. Levy examines how Islamic mathematics provided sources for Hebrew mathematics from the 12th to 16th centuries. Finally, D. Pingree goes against the usual grain of East-to-West transmission by studying “Philippe de la Hire’s Planetary Theories in Sanskrit.” Of those papers that look within a single culture, S.R. Sarma studies “The Rule of Three and Its Variations in India,” while A. Djebbar compares mathematical practices in eastern and western Islam.

Finally, two papers confine themselves exclusively to Europe. R. Franci looks at the river-crossing problem from Alcuin to Tartaglia, while M. Folkerts studies “Regiomontanus’ Role in the Transmission of Mathematical Problems” from Italy to Central Europe. A final “internalist” paper may well be the best in the volume. C. Burnett’s study of “Indian Numerals in the Mediterranean Basin in the Twelfth Century” traces the detailed history of the eastern and western forms, using original manuscripts, tables, and photographs to make a significant contribution to this complex story.

As is all too common with conference volumes, the greatest failing is the absence of a summary chapter that can unify these disparate papers and provide some overall conclusions regarding the nature and patterns of mathematical transmission. Despite this weakness, and the tendency of some papers to skirt the stated theme of the conference, it must be said that every one is of the highest scholarly quality, with most founded on the careful study of original documents and unpublished manuscripts. Simply as a collection of outstanding articles in the history of mathematics, this volume is worthy of note.

Geographically, there is a clear preference for the Orient; only two of the 19 contributions are devoted exclusively to medieval Europe and only a few of the rest include the West as the source or target of transmission. All of the remaining papers focus on Islam, India, and China. Temporally the focus is clearly on the Middle Ages, broadly interpreted as the years 500 to 1500 A.D. Høyrup and Berggren might begin in antiquity, but only Sesiano’s study of classical Greece and Pingree’s look at 18th-century astronomy fall entirely outside these boundaries. This volume might thus find its most appropriate home in the personal collections of those scholars who are most interested in the history of mathematics in the medieval Orient.

References


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Ptolemy’s Geography: An Annotated Translation of the Theoretical Chapters

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In his Geography, Claudius Ptolemy (second century C.E.) did for Greek mathematical cartography more or less what he had done in his Almagest for Greek mathematical astronomy. That is, he synthesized the chief results of
earlier works, organized and expanded their observational data, and laid out unified geometric models for their subject matter—and in the process made them essentially obsolete, so that most of what we now know about them is derived from what Ptolemy’s work preserves. Again like the Almagest, the Geography became the primary treatise of its kind in the Western world from late antiquity into the Renaissance, although not all the people who used and disseminated it entirely understood it or correctly reproduced it.

Although the Geography is probably most widely known nowadays for the elaborate maps in some of its surviving manuscripts, it was designed to be far more than an atlas. In fact, Ptolemy was well aware that the topographical data available to him were too incomplete and unreliable to generate thoroughly dependable maps. The real focus of the work is the proper method of constructing a world map, from choosing the best map projection to drawing the reference grid to plotting the longitudes and latitudes on it. Ptolemy begins this “mapmaking kit” in Book 1 with an overview of the substance and current development of cartography as a branch of knowledge, including the inadequacy of contemporary data (most of which was based on travelers’ reckoning rather than astronomical observation) and some critiques of its most salient inconsistencies. He then discusses the theoretical issues underlying planar map projection and presents two geometric models for creating such a map.

Books 2–7 consist mostly of lists of geographical features to be depicted in a world map, along with their coordinates. Book 7 ends with what the translators convincingly identify as summary descriptions or “captions” to accompany a planar world map and a similar projection of a “ringed globe,” i.e., a spherical map inside a sort of armillary sphere arrangement representing the principal astronomical circles. Finally, Book 8 explains how one should make finer-scale regional maps from subsets of the world-map data and provides a similar set of captions for them.

Remarkably, the authors have managed to include not only a skilful and readable translation, but also (i) a survey of the history of the Geography and its manuscripts; (ii) a discussion of the basic facts of geocentric cosmology and ancient cartographic practice; (iii) a commentary on Ptolemy’s geographic premises and geometric models; (iv) several very instructive facsimiles and reproductions of Ptolemaic maps; and (v) eight appendices comprising analyses of some controversial issues in ancient geography, an editorial apparatus, and a very handy glossary of classical place names—all in fewer than 200 clear and well-written pages. Berggren and Jones have admirably emulated the well-known works of their teachers Asger Aaboe and Gerald Toomer (to whom their book is dedicated) in presenting a historically and technically complex subject in a straightforward, concise, and comprehensible way.

Their achievement seems a little less miraculous, though no less praiseworthy, when we note that (as the book’s subtitle indicates) the authors deliberately refrained from translating most of the “nonthoretical” material, namely Ptolemy’s coordinate lists in Books 2–7 and his regional map captions in Book 8. So, in fact, the greater part of Ptolemy’s text does not appear in Berggren and Jones’s translation. In omitting it the authors chose wisely, since (as they explain in their Introduction) the manuscript tradition of these long lists of names and figures is extremely corrupt. There is no hope of knowing what Ptolemy’s coordinate data actually looked like, and hence no point in translating these parts of the work, until a reliable critical edition of the Greek text becomes available. In the meantime, Berggren and Jones have provided translations of a few samples from the coordinate lists and the regional map captions. For the sake of readers not previously familiar with the Geography, though, it would also have been helpful to include a more detailed table of its contents listing all the chapter headings in each of its books, in order to give a fuller idea of its overall structure and the content of the parts omitted from the translation.

Berggren and Jones remark that the likely audience for their translation ranges from historians of science to historians of the ancient world to geographers with an interest in the origins of their field. The geographers and ancient historians might wish to see more of Ptolemy’s topographical data, but historians of science have every reason to be delighted with their book as it is. Perhaps most importantly, Ptolemy’s geographical work now stands clearly linked—in literary style, in technical background, and in underlying motivation—with the other parts of his scientific corpus; also, it is revealed as an integral part (although now the sole surviving representative) of the Hellenistic mathematical cartography tradition. In recent years there has been something of a spate—or at least a steady trickle—of research on Hellenistic science, and on Ptolemy in particular (thanks in part to Princeton University Press, whose interest is manifested not only by the work under review but by their 1998 reissue of Toomer’s Ptolemy’s Almagest, besides the publication of Lionel Casson’s geographical Periplus in 1989). Perhaps it is slowly beginning to erode the persistent popular image of Ptolemy’s works as fossil remnants of “prescientific” ancient prejudices, overthrown in favor of a “mathematized” perspective only in the Renaissance (mostly by Galileo). The Ptolemy shown in this newer historiography, with his commitment to geometric models and observational data, and his simultaneous willingness to work...
around their inadequacies for the sake of a “big picture” of the world, is a far more interesting subject; Berggren and Jones are to be highly commended for their contributions to his rediscovery.

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Gino Arrighi. La matematica dell’Età di Mezzo. Scritti scelti

The volume under review gathers 32 papers by Gino Arrighi (1906–2001), some dealing with historiographical or programmatic issues, others with the mathematical contributions of Piero della Francesca, Francesco di Giorgio Martini, and Leon B. Alberti, but most with abaco sources. Chronologically, they range from the sixties through the eighties. The editors provide a short but useful introduction and a catalog of the 18 major medieval treatises that Arrighi transcribed and edited between 1964 and 1999—signposts for his long, tireless, scholarly career. Unfortunately, the volume lacks a crucial tool for works of this kind: an index. Almost all the papers reprinted here were originally published in Italian journals or in proceedings of Italian meetings and conventions that are not readily available outside of Italy. The volume thus provides convenient access to some of Arrighi’s still useful articles.

More than 50 years ago, Gino Arrighi was one of the first historians of mathematics to call attention both to the rich treasure of Italian medieval manuscripts then awaiting scrutiny, and to their crucial importance for the history of medieval mathematics in general. Although Arrighi was a mathematician and an engineer by training, his approach to the history of mathematics was very much that of the philologist: it was the historian’s primary duty to retrieve from the archives forgotten medieval mathematical manuscripts. His main concern, particularly in the fifties and sixties, was to launch a systematic search for the mathematical remains of the 13th, 14th, and 15th centuries, and particularly for evidence of abaco teachers, abaco schools, and abaco manuscripts. He made several proposals in order to reach an agreement on editorial conventions (articles I.1, I.2, I.4). His ambition was to organize a collective enterprise of cataloging, transcribing, and editing everything that was relevant from the point of view of the history of mathematics, and his main concern that this task be carried out efficiently, no matter who or how many took part in it. Strongly shaped by this inspiration, his own contributions aimed to provide the reader with accounts as close to the source under scrutiny as possible. In fact, Arrighi’s program also included the investigation of a series of general problems, but he considered the editing of the relevant material to be a prerequisite. Topics for investigation signaled by Arrighi include the development of methods to solve equations; the evolution of notations and the rising of an algebraic “tachygraphy” or shorthand; the relationship between discrete numbers and continuous magnitudes; and the study of the terminology used in early Italian scientific works, which he rightly understood to be of great interest for the history of the Italian language (p. 26). He also pointed to the usefulness of abaco sources for studying the geography of mathematical studies in northern Italy.

While there is little analysis (mathematical or otherwise) in Arrighi’s articles, they provide a great deal of valuable information. Particularly noteworthy in this respect is a series of articles on abaco schools in Florence and on the mathematics of della Francesca and Leon Alberti. Some parts of Arrighi’s program have been successfully developed by W. van Egmond, L. Toti Rigatelli, R. Franci, J. Høyrup, A. Simi, and others. Their contributions have been instrumental in bridging the historical and intellectual gulf that formerly separated Leonardo Fibonacci and Luca Pacioli. There can be little doubt that this field, one in which the history of mathematics has grown most vigorously in the past decades, is greatly indebted to Arrighi’s pioneering efforts—something that can be fully appreciated in the papers now