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Glen Van Brummelen. *Heavenly Mathematics: The Forgotten Art of Spherical Trigonometry*.
Heavenly Mathematics: The Forgotten Art of Spherical Trigonometry by Glen Van
Brummelen

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Weber). Reflecting on the “evolution of the testing of evolution,” Steven Orzack identifies an ambiguity in references to the “ubiquity” of natural selection, noting that biologists studying behavioral, morphological, and life history traits typically invoke only natural selection, whereas most who study population genetics and molecular evolution typically prefer some combination of natural selection, genetic drift, and genetic constraints. The ambiguity, he suggests, has impeded the testing of evolution: “Too often the exact evidentiary basis for a claim that a trait is optimal has been left ambiguous” (p. 335).

What of the imprint of Darwin on broader cultural and political debate? Here there are instructive essays on social Darwinism (Naomi Beck), language evolution (Barbara King), cultural evolution (Kenneth Reisman), Darwin in English literature (Gowan Dawson), gender issues (Georgina Montgomery), evolutionary epistemology (Tim Lewens), and ethical controversy (Richard Joyce). Religious responses to Darwinism are sampled in essays on Protestantism (a commendably sensitive theological analysis by Diarmid Finnegan), creationism (Ronald Numbers), Catholicism (John Haught), Judaism (a masterly depiction of diversity by Marc Swetlitz), and Islam (Martin Riexinger). Evolutionary medicine has a welcome concluding chapter to itself (Tatjana Buklijas and Peter Gluckman).

And yes: there is a chapter on Alfred Russel Wallace, where John van Wyhe corrects caricatures and, following David Kohn, distinguishes Wallace’s taxonomic approach to the phenomenon of divergence from the explanatory principle of divergence wielded by Darwin.

What does all this add up to? Is *The Cambridge Encyclopedia of Darwin and Evolutionary Thought*, as the blurb maintains, the “definitive” work on Darwin? As an intellectually challenging monument to the importance of Darwin and his legacy, it probably comes as close to meeting that description as any such compendium could. I assume it will be digitized to extend the reach it deserves. Ruse and his associates at Cambridge University Press are certainly to be congratulated on an achievement that will be a hard act to follow in 2059.

JOHN HEDLEY BROOKE

Glen Van Brummelen. *Heavenly Mathematics: The Forgotten Art of Spherical Trigonometry*. xvi + 192 pp., illus., tables, apps., index. Princeton, N.J./Oxford: Princeton University Press, 2013. \$35 (cloth).

Spherical trigonometry was once an important part of mathematics, but in modern times the formulas have been programmed in computers and the subject has pretty much disappeared from view. In the book under review, one of the foremost experts in the history of trigonometry teaches the subject in a gentle way in its historical context.

Chapters 1–3 focus on Greek plane and spherical trigonometry, including applications to the size of the earth, the distance of the moon, the celestial sphere, and other aspects of ancient astronomy. In Chapter 4, Glen Van Brummelen discusses “the medieval approach,” meaning simplifications of the ancient Greek theorem of Menelaus that were developed in greater Iran around 1000 C.E. In his explanation of ancient and medieval spherical trigonometry, modern notation is used for easy understanding. Chapter 5 is about right-angled spherical triangles, mostly in the context of early seventeenth-century mathematics. The reader will learn from this chapter that logarithms were developed in connection with spherical trigonometry and its astronomical applications, where multiplications of numbers in many decimals were frequently needed. Chapter 6 is about oblique spherical triangles in a general historical setting. The basic theory of spherical trigonometry is now complete, and the rest of the book consists of excursions: Chapter 7 discusses some beautiful applications to regular polyhedra; and in Chapter 8 stereographic projection is presented as an alternative to spherical trigonometry, together with the medieval astrolabe and some curious nineteenth-century applications. Chapter 9 concerns navigation. The book includes a guide to the literature, and in each chapter there are exercises, some of which were taken from old textbooks. Thus Van Brummelen invites his “eagle-eyed students and readers” (p. 103) to explore the rich history of the subject further by themselves.

Although Van Brummelen warns his reader that his book is not a scholarly work for historians of mathematics, one can gain a good deal of historical insight from it. Some quibbles: the reader may be confused by the exercise on parallax on page 17; on page 51 I would hesitate to call the spherical trigonometrical simplifications that were discovered around 1000 C.E. in Iran a “revolution”; in the section on page 139 entitled “Crystallographic Breakthrough” the relationship to crystallography is not explained in any detail.

The volume under review can be considered a companion volume (perhaps even an introduction) to Van Brummelen’s scholarly and widely

acclaimed *Mathematics of the Heavens and the Earth* (Princeton, 2009). *Heavenly Mathematics* will be of interest to mathematically inclined historians of science and also to students of mathematics and engineering. Because spherical trigonometry is relevant in applications of modern science, this elegant book may even contribute to a renaissance of the subject.

JAN P. HOGENDIJK

■ Antiquity

Jacques Jouanna. *Greek Medicine from Hippocrates to Galen: Selected Papers*. Translated by Neil Allies. Edited with a preface by Philip van der Eijk. (*Studies in Ancient Medicine*, 40.) xix + 403 pp., index. Leiden: Brill, 2012. \$203 (cloth).

This collection presents sixteen essays by Jacques Jouanna, editor extraordinaire of Hippocratic texts, in an English translation by Niel Allies, under the editorial supervision of Philip van der Eijk. The collection, then, serves two purposes: to gather together articles by one of the leading figures in the history of ancient medicine and to make these widely available to the English-reading public. Let us consider these two aspects separately.

The essays presented here, spanning the period from 1980 to 2008, are divided into three sections. The first section examines the context in which the texts of the Hippocratic Corpus were composed; the second studies in detail some of the salient concepts of Hippocratic medicine; and the third is devoted to the reception of Hippocratic medicine, and in particular the treatise *On the Nature of Man*, by later medical authors, most prominently Galen. Interestingly, the papers in the final section are all relatively recent, indicating a shift, to be observed generally in the field of ancient medicine, from the study of the Hippocratic texts to the study of Hippocratism throughout antiquity and beyond. The reader can only be impressed by Jouanna's in-depth knowledge of the ancient medical texts, including Egyptian medical papyri. Detailed philological analyses help him to gain a better understanding of the medical content of these treatises. Indeed, Jouanna comes to the field as a classicist, and he shows how important an understanding of classical culture is for comprehending ancient medicine. The Hippocratic writers were active at the same time as the great Athenian tragedians, rhetoricians, philosophers, and historians; they share the same vocabulary and similar worldviews. They also

reacted against some aspects of Greek culture—for instance, the use of religious purifications in cases of serious illnesses such as the terrifying “sacred disease.” One of the recurrent themes in Jouanna's work is the contrast between the “rational” medicine of the Hippocratics and the “magico-religious” views prominent at the time. Note that the use of quotation marks is mine, not that of Jouanna. Although Jouanna is very careful not to label the views of ancient priests, purifiers, and magicians as “irrational,” I feel that using the word “rational” only in relation to Hippocratic medicine is misleading. Recent scholarship on ancient magic and religion has shown that their healing was perfectly “rational,” in that it had coherent and theoretically grounded principles. Besides, and as Jouanna observes, Hippocratic physicians were certainly not atheists, arguing that all diseases were “sacred” and invoking healing gods in the famous “Hippocratic Oath.” I appreciate, however, that Jouanna's use of the word “rational” has a long history, in particular in the French humanities.

This leads me to the second aspect of this volume: the translation aspect. The Colloque Hippocratique, the meeting of Hippocratic scholars held every three to four years since 1972, and of which Jouanna is one of the founding fathers, welcomes papers in several languages: French, English, Italian, German, and Spanish. At the last few meetings, however, most scholars have chosen to address the audience in English rather than in their native language. It is a sad reality that, as English grows even stronger as a scholarly *lingua franca*, the knowledge of other languages rapidly diminishes. Instead of letting the study of ancient medicine become the preserve of a tiny group of multilingualists, Philip van der Eijk has designed a project aimed at making its texts and studies available in English translations. The goal here is certainly not to “dumb down” but, rather, to show students how fascinating the study of ancient medicine can be, in the hope that they will understand how important it is to read its sources, in due time, in their original language. In this context, this translation of Jouanna's essays into English will certainly be extremely useful to anyone with a budding interest in Hippocratic studies. Neil Allies's translation is of excellent quality, especially since translations of Greek and Latin quotations were made afresh for the volume (see p. xvii). Having read many of these papers in the original French, I could recognize the style and rhythm of Jouanna's prose. Excellent indexes (a general one and one of passages cited) make this collection even more valuable.

LAURENCE TOTELIN