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Equations from God: Pure Mathematics and Victorian Faith (Book Review)

Abstract

Reviewed Title: *Equations from God: Pure Mathematics and Victorian Faith* by Daniel J. Cohen. Baltimore, MD: The Johns Hopkins University Press, 2007. 242 pages, notes, bibliography, index. ISBN: 0801885531.

Keywords

book review, Equations from God, Victorians, faith, Daniel J. Cohen

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EQUATIONS FROM GOD: Pure Mathematics and Victorian Faith by Daniel J. Cohen. Baltimore, MD: The Johns Hopkins University Press, 2007. 242 pages, notes, bibliography, index. Hardcover; \$50.00. ISBN: 0801885531.

Crediting religious faith and ecclesiastical affiliation as significant motivating and contextualizing factors has become commonplace in the history of science. It is still a relative novelty in the history of mathematics. The 2005 book *Mathematics and the Divine: A Historical Study* (see www.maa.org/reviews/MathDivine.html), consisting of thirty-five diverse articles on the relation of religion and mathematics, is a substantial exception. The book we are now considering is another. It is a revision of the author's prize-winning 1999 PhD dissertation written at Yale University under historian of Victorian science Frank Turner.

Daniel Cohen's training is in history of religion and history of science, with a particular focus on aspects of nineteenth-century British and American mathematics. This book kicks off a new series, the Johns Hopkins Studies in the History of Mathematics. While it fails to engage secondary literature published since 1999, it nevertheless draws upon and analyzes a wealth of Victorian primary source material—books, articles, personal correspondence, and sermons. Cohen breaks new ground in his treatment of nineteenth-century English-speaking mathematicians, bringing it more in line with what is typically done in history of science.

Cohen's main thesis is that pure mathematics in mid-nineteenth-century England and America (primarily mathematical logic, along with some work on algebra and number systems) owes its origin to neo-Platonic, Kantian, and transcendental philosophies of mathematics as well as to religious idealism seeking to promote toleration. Only later in the century, as professionalization became a greater concern, did British mathematicians officially begin to distance themselves from their earlier grand philosophical and theological positions. Taking a more modest and secular approach to mathematics, the door was left open to anti-religious agendas for symbolic logic that went far beyond merely bypassing theological justification and approbation for mathematical truths.

After an opening introduction that nicely summarizes the aims and outline of the work, Cohen devotes five chapters to developing his book's thesis. The first chapter sketches some historical sources and precursors for the early Victorian perspective on mathematics, chapters two through four discuss the work and outlook of three pivotal mathematicians (Benjamin Peirce, United States; George Boole, Ireland; and Augustus De Morgan, England), and the final chapter argues that the trend toward professionalization redirected the British outlook on mathematics during the last half of the century.

Cohen points out that many early-Victorian thinkers succumbed to an almost giddy neo-Platonic vision of mathematics. Chapter Two, "God and Math at Harvard: Benjamin Peirce and the Divinity of Mathematics," makes this abundantly clear. Pure mathematics transcends the mundane world of sensory experience, rising to sublime heights of spiritual truth in its equations and abstract mathematical patterns. Mathematicians grasp and formulate the most intimate divine truths in a way that cannot be matched by the divisive dogmas of sectarian theologies.

At his funeral in 1880, Benjamin Peirce was eulogized by a Harvard colleague as one who, being a first-rate mathematician, knew "more about the realm of spiritual being than anyone else who ever trod the earth, that he beheld God, entered into the Divine mind, drank in truth from its living and eternal fountain, as no other human being ever did" (pp. 42–3). Quite a claim, considering the potential merits of other candidates one might propose, such as Moses or St. Paul or St. Augustine! Peirce's vocation and faith were essentially one; mathematics is a religion in its own right. "His theology deemphasized the core dogmas of Christianity and indeed the figure of Christ himself, settling instead on a broad monotheistic faith in which the quest for mathematical truth and the quest to know God were identical. Benjamin Peirce saw his work with equations as a way to access the heavenly realm, and would occasionally add the exclamation 'Gentlemen, there must be a God' to his mathematical demonstrations" (p. 43). For Peirce, enthralled by the divine character of mathematics, there was "little need for the intermediary of Christ. God would be revealed through equations" (p. 75).

The centerpiece of Cohen's book is the genesis of mathematical logic. Cohen claims to have uncovered the "hidden story" behind the origin and rise of symbolic logic in Great Britain in the religious motivation of its creators. Boole and De Morgan, he notes, did not share the secular agenda of twentieth-century logical positivists who used symbolic logic to demolish various metaphysical and religious perspectives as meaningless. Instead, logic was a tool they could use to rise above rigid orthodoxy and sectarian conflict by challenging certain dogmatic claims. Logical activity was to be pursued in the service of true ecumenical religion rather than as a way to undermine all religion.

Cohen's treatment of Boole and De Morgan gives the reader a broad and detailed intellectual context in which to place their work, and it helps one understand what religious ideas may have motivated each logician to develop and apply his mathematical ideas. Cohen is not the first to point out this aspect of the history. MacHale's 1985 biography *George Boole: His Life and Work*, for instance, does something similar, and at times is more nuanced and cautious in its use of questionable source material. Yet Cohen's presentation gives us a more full-blooded picture of the overall context in which Boole and De Morgan actually worked than that provided by the typical history of mathematics narrative. Such works tend to concentrate so heavily on technical details that the reader often loses track of the country and century in which the ideas arose. An internalist approach gives us too little history, is often anachronistic, and is usually out of touch with current trends in historiography, where context is more than window-dressing.

Cohen's monograph, by contrast, tells a well-written and interesting story about the mathematics as part of a bigger whole. Yet I should note there is something missing here that was present in the narrower narratives. One reads Cohen's book in vain to learn about the trends in mathematics or logic that fed into the new developments undertaken by Boole and De Morgan. This seems very peculiar to me. Why is there no discussion of the revival of deductive logic set in motion by the work of Richard Whately, William Hamilton, and others as a backdrop to

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that of Boole and De Morgan? Why is there no discussion of the rise of a more formal analytic approach to mathematics and algebra promoted by members of the Cambridge Analytical Society and others prior to the 1847 publications by Boole and De Morgan on symbolic logic? These antecedent trends provide the specific logical and mathematical contexts for evaluating their work and are just as relevant as the religious and philosophical and educational contexts that Cohen so artfully discusses. Cohen seems to think the broader epi-mathematical context explains everything of historical importance for the mathematics that ensues, so he can afford to neglect the ways these new developments are situated within the mathematics and the logic of the time. He writes as if Boole's and De Morgan's desire to rise above sectarian squabbles and promote a more tolerant attitude toward religion is motivation enough to explain their logical discoveries. This surely overstates the case; much more is needed to flesh out the full picture and demonstrate just why their innovations are so important. Perhaps technical mathematics and logic lie outside Cohen's particular expertise, but then he should indicate just what he is bracketing out and not leave the impression that what remains is a full analysis of all relevant factors. I am not requesting a return to old-fashioned history of mathematics, just more attention to the mathematics and logic involved. In fact, I would even welcome Cohen's approach applied to the technical trends themselves: identify the underlying worldviews and philosophical outlooks that drive and give them meaning, too.

Aside from this criticism of the book's scope and intent, I found this a well-researched and engaging book, one that breaks through the traditional mold for writing history of mathematics. It conveys a wealth of information about some well-known mathematicians, and it challenges modern stereotypes about the relation between mathematics and religion. Not all readers will agree, but I find it also contains an instructive cautionary tale about the dangers of Christian Platonism, which still attracts many mathematicians today: taking mathematical ideas to be divine may have a pious motivation, but such a viewpoint has within it the seeds of a full-fledged anti-Christian religion stemming from its pagan pedigree.

Who would benefit from reading such a book? Certainly anyone interested in the topic of science and religion. Those of us with a special interest in history of mathematics will likely want our own copy of the book. It is one of the few examples we have of how mathematics and religion can be related in a scholarly work.

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ORIGINS & COSMOLOGY

ORIGINS: A Reformed Look at Creation, Design, and Evolution by Deborah B. Haarsma and Loren D. Haarsma. Grand Rapids, MI: Faith Alive, 2007. 255 pages. Paperback; \$13.25. ISBN: 978159252276.

Origins: A Reformed Look at Creation, Design and Evolution is a theological and scientific analysis of the variety of creation-views held by evangelical Christians. Examining these views from the cosmological, geological, and biological

perspectives, it provides a clear, concise introduction of the issues in a manner that is accessible (and of interest) even at the high school level. Its impact, however, will extend far beyond the high school level. This book provides such a clear and broad perspective on the various approaches that it will be of value even to those who have been thinking about origins for many years. Each chapter concludes with a fine set of discussion questions and several references. Interspersed throughout the narrative are text-boxes which refer the reader to the book's excellent website for a more in-depth analysis of a particular topic.

The book begins with an outstanding overview of the scientific process, how worldviews influence that process, and the harmony that ought to exist as we allow both God's Word and God's world to inform us about creation. The Creator speaks to us, the authors continually remind us, not just through the words of Scripture, but also through the "words" of creation itself. By using extensive scriptural references, and by writing in a tone that is truly worshipful, the narrative succeeds in fostering a sense of unity in the midst of Christian diversity. It is highly sensitive to, and deeply respectful of, the diverse viewpoints that exist within evangelical Christianity. Although written by physical scientists, the biological data are covered well and all of the data are continuously analyzed in light of theological considerations.

In order to put the many influences on the origins question into perspective, the book does a very fine job of comparing our current situation to the Galileo affair of four hundred years ago. The authors show that in Galileo's day scriptural proof-texting, political maneuvering, over-reliance on inadequate scientific and religious traditions, and super-egos, which obscured access to God's truth, all had an impact on the controversy. History, they aptly show, is repeating itself in today's world as well.

I especially appreciate their chapter on the scientific process. Here they clearly lay out the three different levels at which scientific data are interpreted: experimental, observational, and historical. Each, they show with very clear examples, is a valid way by which the scientific process enables us draw to conclusions about the natural world. They show that we cannot always do experiments, but that data based on other ways of knowing are equally valid.

Although the authors are very sensitive and highly respectful of diverse views, they nonetheless do not mince words when it is clear to them that certain approaches are inconsistent with scientific data and/or biblical interpretation. The earth is not young and life has been evolving, as they see it, for a very long time. Given the thorough nature of their analysis and the gentle way in which they explore the options, it is difficult to imagine anyone objecting to their style. So cautious are they in their desire to help the reader reach his or her own conclusions, it seems at times as though the book does not take a position on an issue. But it does, and they let the analysis speak for itself. This is writing at its best. I think this is especially true in their analysis of the Intelligent Design movement.

This book is an outstanding resource, especially for young people in high school and college who are trying to put their growing knowledge of science into the context of the traditional evangelical faith. Personally, I know of no book that does this better or that I would recommend more highly.