Equations from God – Pure Mathematics and Victorian Faith, Daniel J. Cohen, Johns Hopkins University Press, 2007, 181 pp.

In her autobiography, Mary Somerville expressed a view widely held by early nineteenth century mathematicians, "Nothing has afforded me so convincing a proof of the unity of the Deity as these purely mental conceptions of numerical and mathematical science which have been by slow degrees vouchsafed to man…all of which must have existed in that sublimely omniscient Mind from eternity." However, by the beginning of the twentieth century, the prevailing view of mathematicians was that mathematics was a professional discipline and that theological reflection about it was professionally inappropriate. We see here two perspectives on mathematics – one religious, one secular. In early nineteenth century England, the religious perspective predominated; in the twentieth century, the secular perspective had hegemony. *Equations from God* by Daniel Cohen tells the story of this transition - the secularization of mathematics over the period from roughly 1850 – 1900. As such it is an extremely helpful book for anyone interested in the relationship between mathematics and religious belief. Cohen is a historian who understands mathematics. He has thoroughly researched his subject – often exploring letters and personal papers of his subjects as well as professional writings.

His introductory chapter begins with the story of the 1846 discovery of Neptune. The planet's discovery had been predicted based on observations of perturbations in the orbit of Uranus and the anticipated location of Neptune was calculated on the basis of Newton's laws. When it was actually found, the discovery was widely viewed as convincing evidence of the transcendent truth of mathematics built into the universe and originating in Divine thought.

In chapter one, Cohen traces the historical origin of this vision of mathematics beginning with Plato and Proclus. He also discusses Kantian idealism (the notion that ideas not material things are the indispensable features of reality) and its role in fostering a climate that exalted mathematics. Thus in early nineteenth century England, many thinkers – not just mathematicians – viewed mathematics as superior knowledge, that is, as knowledge free from the contamination of this "muddied world."

Chapter two focuses on a particularly clear exemplar of this way of thinking – Benjamin Peirce, professor at Harvard for a half century and sometimes called the "father of American pure mathematics." Peirce was a Unitarian, a close friend of Ralph Waldo Emerson, and an unrepentant elitist. Cohen summarizes Peirce's outlook: "His theology de-emphasized 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…The notion that mathematics was a divine language suggested to Peirce that sectarian distinctions were artificial and thus not to be tolerated, that advanced research in subjects such as mathematics should be the main priority of a university rather than teaching, and that although all men were created in the image of God, some individuals attained a closer kinship with His mind."

Chapter three focuses on George Boole. It's not widely known that Boole's work in symbolic logic was largely motivated by religious concerns. After his death, his wife, Mary, wrote "Mathematics had never more than a secondary interest for him; and even logic he cared for chiefly as a means of clearing the ground of doctrines imagined to be proved, by showing that the evidence on which they were supposed to rest had no tendency to prove them. But he had been endeavoring to give a more active and positive help than this to the cause of what he deemed pure religion." Pure religion to Boole was similar to what it was for Peirce. Cohen traces Boole's movement away from traditional Christian belief

in the general direction of Unitarianism although he never joined that church. He also traces Boole's development of symbolic logic and the role of both Scripture and theology in that process.

Chapter four focuses on Augustus DeMorgan, born in India of evangelical parents. He moved away from their faith by his early twenties. Although he never gave up belief in the "fatherly care of God," he was unable to take a Master's degree at Trinity College, Cambridge, because he was unwilling to subscribe to the thirty-nine Articles of the Church of England. DeMorgan was an especially important historical figure in the secularization of mathematics because he was one of the founders o f the London Mathematical Society, one the first professional organizations dedicated to mathematics. Other similar organizations followed. These organizations shaped the culture of our contemporary mathematical communities in particular ways. DeMorgan defined mathematics against what he did not like in other settings, especially in religion. Cohen describes DeMorgan's vision like this: "Where religious sects constantly bickered, mathematicians would discuss matters peacefully; where polemical fanatics overstated their cases, mathematicians would be cautious in their proclamations; where amateur mathematicians and arrogant metaphysicians discussed grand notions, professional mathematicians would limit their purview; where the evils of dogma and religious establishment smothered nonconformity, mathematicians would be open to the new and different – as long as dogma and religion were not involved." To achieve this, "mathematicians would have to sacrifice the age-old transcendental characterization of their discipline. They could no longer claim that mathematics was a divine language because it then became a proper subject for clergymen and mystics as well; they could no longer assert that mathematics was perfect and infallible because it then became a new dogmatic church like the one they had struggled against; no longer could they even flaunt the supreme precision of mathematics because that was just the sort of hubris they disparaged in contemporary intellectual discourse."

Chapter 5 completes Cohen's telling of the story of the secularization of mathematics. DeMorgan was soon joined in the London Mathematical Society by others of like mind. One of their principal goals was the establishment of professional standards, what Cohen calls a "professional superego." One of their central principles was the exclusion of theological rhetoric in professional papers. This chapter is particularly helpful for ACMS members. It traces the parallel developments of mathematics' professionalism and its isolationism from popular culture and other professional areas. It looks at a number of attempts to provide Christian apologetics based on mathematics and how these had the effect of driving the mathematical community further in the direction of secularization. It examines other secularizing influences such as the advent of non-Euclidean geometry and Bertrand Russell's logicism. And it includes a sad portrayal of Charles Dodgson, a man who was unwilling to adjust to the forces of secularization and professionalization and was ostracized by the mathematical community.

There are several ways, it seems to me, that this book can be helpful to ACMS members.

First, it clarifies our position within the mathematical community. On one hand, ACMS members share a commitment to the traditional, orthodox, understanding of the Christian faith. This shapes our sense of purpose, our values, and how we create meaning. On the other hand, our careers are in mathematics, so we are committed to a professional community that demands a complete separation of mathematics and religion. Thus we live with what amounts to a socially created and enforced schizophrenia. This is quite different from the discipline of philosophy, for example, in which the Association of Christian Philosophers comprises about 10% of the membership of the APA and is seen as a valuable, contributing, subcommunity. In fact, this strict separation of mathematics and theology is a

relatively recently adopted social convention. And there really are significant intellectual issues in the relationship between mathematics and theology, even though discussing them violates this convention.

Secondly, many ACMS members teach at Christian colleges that expect their faculty to "integrate faith and learning." Other ACMS members investigate the relationship between their faith and their profession simply because of their personal interests. *Equations from God* highlights some of the risks in such a venture. The classical Platonist perspective – that mathematical theorems are eternal, transcendent truths – was Christianized by Augustine. That is, the Platonic forms were seen as ideas in the mind of God that were used as patterns in creation. Aquinas differed from Augustine in a few ways, but affirmed the main features of the Augustinian perspective. The Protestant reformers did not disagree with them but tended to be more suspicious of natural theology than their Catholic predecessors, urging a greater focus on Scripture and less on the fruits of reason. It's not hard to see how someone could start from the notion that mathematics consist of ideas in the mind of God, move to a belief that he or she is thinking God's thoughts after Him, then to a belief that mathematical knowledge (because of its certainty) is superior to knowledge of scripture (its interpretation depends on one's hermeneutic), and then to a kind of elitism. Indeed, the nineteenth century thinkers who adopted the divine perspective on mathematics strongly tended toward elitism and Unitarianism and avoided traditional Christian doctrines such as the deity of Christ. So the reformers' caution was well-advised. Nevertheless, there is no avoiding the fact that a belief in the doctrines of God as creator *ex nihilo* and as omniscient requires the subsequent belief that God knew all of the mathematics we see in the material universe at the time of creation. So the notion that much of mathematics consists of ideas in the mind of God seems unavoidable. The lesson we ought to draw from people like Peirce is not to avoid the notion of equations from God, but to hold it with humility.

Thirdly, especially chapter 5 provides a number of cautionary tales against facile attempts at apologetics using mathematics. A Christian looks at a particularly elegant proof and sees it as pointing to God's beauty; an unbeliever does not see it that way and mathematics is not likely to change that perspective. Orthodox Christian belief has always seen faith as a gift; attempts to compel it by "proof" are always going to be seen as offensive. Nevertheless, as Augustine pointed out 1600 years ago, we can never fully understand the meaning of anything until we can relate it to God. Thus, for the believer, the subtlety and beauty of mathematics always points beyond itself. We shouldn't hesitate to say such things but we should be attentive to our audience and our intention.

Lastly, *Equations from God* nicely highlights two interpretations of mathematics – one secular, one religious. Currently, the secular one predominates in the mathematical community. But the Victorian era during which it came to prominence existed within the overshadowing influence of the Enlightenment. Today, in a post-modern era, our surrounding culture is more accepting of the legitimacy of differing interpretations of the same phenomena. Thus, I think it is time for ACMS members to begin to work toward a change in the professional culture of the mathematics community – in which the notion that mathematics consists of transcendent ideas in the mind of God is seen as a legitimate interpretation that can be discussed without fear of ridicule or ostracism.