Mathematicians' Religious Affiliations and Professional Practices: The Case of Charles

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This paper reports on the second of three case studies, all intended to explore the implications of religious affiliation in the professional lives of mathematicians. These case studies yield implications for various topics within the field of mathematics education. For example, each of the first two cases has revealed a religious influence on the participant's childhood decision to study mathematics. Naturally, we might conclude that such an influence exists for many school-aged, religious mathematics students. Other implications range from the mutual influence of students' mathematical and religious practices to the religious value of teaching and researching mathematics. In this spirit, I report on my experiences with Charles, the second of the three mathematicians of my study.

One might find religious implications for various professions, but professional mathematics provides particularly interesting cases: Mathematics, as a discipline, has a long reputation for providing truth and certainty. Though more recently this reputation has been called into question (Kline, 1980), there is something about the context-free, abstract nature of mathematics that makes the subject seem incontrovertible. Yet religion is often considered as an avenue to Truth. In fact, I recall one of my undergraduate mathematics professors proclaiming that "mathematics is the only truth with the possible exception of theology." Well then, how might these two truths co-exist?

In a previous paper (Norton, 2002), I reported on the first of the three case studies concerning the relationship between mathematicians' religious beliefs and professional practices. From my experiences with that participant—a Jewish man named Joseph—I concluded that mathematicians must reconcile their practices with their life philosophies or religions in order to make their mathematical practice meaningful. This reconciliation is difficult when mathematical thought and religious beliefs (and values) are viewed as contradictory. In fact, such a view is the case for Charles.

"If the scientific community concedes even one miraculous event, then how can it credibly contest the view that the world (and all its fossilized relics) was created in one instant just 6,000 years ago?" (Singham, 2000, p. 428). Singham's short statement summarizes the ongoing conflict between religious belief (especially Judeo-Christian beliefs) and scientific thought. Nord's reply to such questions, on the other hand, anticipates one possible resolution by noting that evolution and other scientifically defined processes may just be "God's way of doing things" (1999, p. 30). The purpose of this paper is to analyze the similar conflict and resolution experienced by Charles so that we might draw conclusions for mathematics education from his struggle. Indeed, an emergent theme from this case—the paucity of value for secular study (and, indeed the devaluation of many scientific branches that seem to contradict Biblical truth)—may have important implications for the work of mathematics teachers in secondary schools in the United States.

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Methods

In order to study the implications of religious affiliations in the lives of professional mathematicians, I conducted interviews with three university mathematics professors. I identified three religious groups representing the diversity of religious beliefs in their mathematics department: Jewish, Christian, and Buddhist. Here I will abbreviate my report on the methods of the larger study, which can be found in Norton (2002), and focus on the case of Charles. Like myself, Charles is a Christian but our views are somewhat different because I am a Catholic and he is a Protestant.

Charles is a full professor in a large southern university's mathematics department and is expected to do mathematical research and teach classes. However, he also has a long list of additional duties that are described in the background section. Data collection for Charles' case was similar to the other cases. I conducted a single, one-hour interview and was able to collect additional data from archival sources. These documents included his online vita and a booklet describing the faculty of their department. I used this data in addition to some of the interview data for background information about Charles.

After transcribing, reading, and rereading the interview transcript, I coded, grouped, and identified concepts from the data. These concepts were then developed in narrative form. First I developed

paragraphs from the concepts. Then I identified the major themes relating the participant's religion and profession and restructured the narrative section around these themes. The final narrative is the central component of the analysis of Charles' case. In order to relate Charles' case and build on emergent themes, I recount a few histories in the discussion section that I will use as a backdrop

Since the narratives are made up of my own words, I wanted to include something additional to capture Charles' words and phrases. So I incorporated poetic transcription (Glesne, 1999), restructuring words from the transcripts into a poem. I began with a list of phrases and organized them into stanzas centered on particular themes or concepts. The stanzas began to take form as I shuffled and reduced quotes. In forming the stanzas, I was careful to stay close to my interpretations of their meaning. While I used only Charles' literal phrases and words in this section, their order and concatenation may be very different from the literal transcriptions. I hope that the end result gives the flavor of the participant's voice and language that is missing from the narratives. Thus my presentation of Charles' story consists of three parts: background, narrative, and poem.

Charles' story

Background

Charles is a European-American man, about fifty years of age. He was raised in his mother's church, the United Church of Christ, in Montana. His mother and two sisters were very devoted Christians, but his father was agnostic. Charles struggled with many of the Christian doctrines, such as the deity of Jesus, for much of his life. The tension between him and his sisters led him to renew his faith during graduate school, but he continued to wrestle with many church doctrines years later.

Charles was never a very social person. Even as a child his extracurricular activities were restricted to band and church. At a very young age Charles also became aware of his mathematical talent. He was set apart from his peers in public school mathematics classes, often working alone or with a small group of other gifted students on higher-level mathematics. His mathematical talent also caught the attention of his professors in college and eventually led to his graduate studies at Princeton.

Charles is now married and a father of three. He describes his profession as one of teaching, advising, serving on committees, and helping to make departmental decisions. His research (mostly in Number Theory) must be squeezed in whenever other commitments taper off, such as at the beginning of the school year. This situation is very different from the one he imagined for himself when he decided to become a mathematics professor. Though he seems to enjoy teaching, research is his main interest and he considers many other duties subsidiary to that.

Narrative

Struggle followed by peace. In describing his religious beliefs and mathematical interests, Charles talked a lot about his childhood and the frequent conflict he experienced in his family. He described his mother as a very strong person who worked in the church. In fact, his parents both signed the original covenant of their Congregationalist church in Montana. However, Charles' father perceived contradiction between Biblical inerrancy and theories of evolution, which made religion problematic for him. These perceptions led to quarreling between Charles' parents, quarreling that ended when the father stopped attending church. The theme of conflict followed by peace continues throughout Charles' story.

Charles' two sisters were both very involved with Protestant Christian churches. Both went on religious missions, and one became a pastor. However, their church was not the same as their mother's. This difference led to tensions between Charles' mother and sisters. Eventually, his mother came to peace with his sisters' decisions, but his sisters' strong faiths continued to cause tension for Charles who, in contrast, had not become comfortable with his Christianity.

Throughout his life Charles has attended church regularly, though he has struggled with many doctrinal issues. In particular, he seemed to share his father's view that creationism is inferior to evolutionism. As a high school class assignment, he wrote a rebuttal to the theory of creationism; his sisters had written in favor of it in similar assignments. The tension between his scientific views and his sisters' faith in religious doctrine remained throughout Charles' graduate school studies.

Charles noted that while growing up he was not part of a church youth group and that he had been quite shy. Although he had attended church through graduate school, it wasn't until he began post-doctoral work in Cambridge that he found a group of young Christians with which he could identify. At that time, he renewed his own Christian beliefs. He said that it was the tension with his sisters that brought him to the point of renewal. Though he continued to struggle with many other doctrinal issues, he founded his beliefs on three main doctrines: "I believed that God answered prayer… that if Jesus were alive I would follow him… and that I couldn't be justified before God on my own merits."

When he moved to the South in 1981, Charles began attending a Presbyterian Church. There, a friend questioned him about the doctrine of Jesus' deity, and Charles resisted the provision of pat answers to these questions. "I wasn't going to be steam-rolled into any doctrinal confessions at the start without thinking about things," he said. The tension that ensued between him and his friend led to a distancing between them. Only years later, after meeting and marrying his Christian wife, did Charles come to a peace about that issue and other religious beliefs. He had needed time to resolve such issues for himself.

During the period of his life that he was struggling with doctrinal issues, Charles was trying to reconcile his mathematical interests with his Christianity. As early as seventh grade, Charles knew that he was gifted in mathematics. His teachers knew it too. He was the best mathematics student his college professors had seen at their school. He liked mathematics because he was good at it and he enjoyed the competitiveness involved in it. At the same time, he was careful "not to show out", though he was "inwardly very proud." While he had a great deal of mathematical talent and a strong desire to develop that talent, Charles felt he needed to find religious meaning for pursuing such a profession.

When Charles was about eight years old, he prayed for his sick parakeet to get better, promising that in return he would find the best way to serve God. The parakeet got better and ever since Charles struggled with finding the best way to serve. By the end of his undergraduate years, he was "in a knot" trying to decide what career he should pursue to serve God. Though he was never gifted socially, for a time Charles thought about becoming a pastor. "I used to think that being a pastor was the only thing you could do [to serve God]…but I can see that I am not gifted to do that kind of work." He was clearly gifted in mathematics, but felt he needed to do something that would directly benefit man. He considered professions in physics or engineering, tackling environmental problems. However, upon graduating, he chose to continue doing the work he enjoyed; he began a graduate program in pure mathematics at Princeton.

Once again, Charles came to peace—this time about his choice of careers: "It's okay to have been a mathematician." With more mature judgment, he sees that everyone plays a part in God's plan. He cannot expect to produce the key idea in solving pollution problems or any other social or environmental problem. People work one step at a time on small, technical aspects of problems. This is just as true in mathematics.

God orchestrates. Charles believes that "God orchestrates everything that happens in history." This belief resolves the conflict between evolution and creationism because, as Charles explains, God created the world through evolution. The industrial revolution, evolution and other scientific developments are part of God's plan. He works through people so that they find Truth. However, "it takes the eyes of faith… to see God's hand [in it]."

As for Biblical inerrancy, Charles does not believe that God wrote the Bible, but that God inspired the authors. He feels that God was present to Isaiah, Paul, and the other Christian prophets. He reveres them as "the greatest souls that ever were", and respects them as the "giants of another domain." Because of their importance in that domain, Charles compares them to Newton and Gauss of mathematics.

God orchestrates ideas in the domain of mathematics, just as he orchestrates everything else. In all of the sciences, mankind is "wavering toward a truth." Though individual theories may fail, better ones replace them. So though people sometimes take the wrong path in their theories, there is a general trend toward Truth. Every piece of mathematical knowledge contributes to that Truth as well. Charles feels like an explorer in his own search for mathematical knowledge.

In a way, mathematics actually stands out from all other scientific knowledge: "Mathematics is the most certain of all of the sciences." Charles seems bothered by the fact that, historically, there has been a lot of vagueness in mathematics: "People would just do things [in mathematics] because they worked." Since then, people have tried to re-establish solid grounding for mathematics. There are still problems such as the existence of undecidable statements, but Charles says that shouldn't stop one from working on them. Historically, new developments shed light on problems so that they are resolved in new ways. This process is part of approaching Truth.

Looking back, Charles feels at peace with his decision to pursue mathematics and feels that God has blessed his career. He feels he is a channel used by God to bring mathematical knowledge to the world. In fact, Charles can recall at least four instances when that channel was quite direct. Each time, he was completely stuck on a mathematical problem. Each time, he prayed for an idea, and each time God gave him one. Though others may argue the idea would have come anyway, the certainty and immediacy of the ideas have made Charles believe his prayers were answered.

At the time he decided to become a mathematician, Charles anticipated a career centered on research, developing new mathematics. However, he finds himself occupied with a lot of busy work. There are committee meetings, departmental duties, and subsidiary tasks such as grading papers and meeting

with students. His mathematical research must be "squeezed around the corners," when the pressure of seeing students is not so great. While he would like to focus more on his research, Charles does try to build relationships with his students as well.

In the classroom, Charles identifies himself as a Christian on the first day of each semester. He feels that this openness has had a positive influence on many of his students, though any more mention of it in the classroom might be "inappropriate." Students often approach him after class that first day to let him know that they appreciate his openness about his Christianity, and as a result some have developed stronger personal and professional relationships with him. "I've had impact on a few students—not very many," he concluded.

Wavering Toward a Truth

It takes the eyes of faith to see God's hand;
I'm probably not as conscious of it as I should be.

Church was part of her life, all of her life, but biblical truth
Was his tremendous stumbling block.
So my parents quarreled constantly, until the break point.

My sisters were youth with a mission, off in some crazy left field.
My tension, my struggle, my mother's heart anxiety,
We eventually became at peace with it.

Montana, Boston, Princeton, Georgia. Straight as an arrow,
Easily miles beyond the closest of my classmates, I kept my pride
Hidden (secret, inward, non-godly motives) and continued on a reasonable path.

I'm not going to be steam-rolled into any doctrinal confessions—not at the start,
Not without thinking about things. But if Jesus were alive now I would trust Him.
And eventually I came to a peace about the deity of Christ.

The ongoing enterprise of Mathematics—I see that as my calling
My parakeet got sick. I prayed. My parakeet got better.
I was just in a knot, but would serve God the best way I could.

Should we do this? Should we do that? Time, time, very busy, very busy time:
You get 30 unhappy undergraduates beating down your door,
And research gets squeezed in the corners of whatever time is left.

It's okay to have been a mathematician: explorer of non-physical world.
You can see this rock up ahead of you. It's not like reaching into fog.
You reach up for it, and in the fullness of time Truth will be found.

They say the universe is contracting; the next day it's expanding.
Science goes in fads (and pastors decry it as the work of the devil).
Now they think there's lots of dark matter. So we bumble along, but truth will be found.

You can either put up or shut up, you can take it as I *do* (I think it's rather unique):
I prayed for an idea, God cared about that piece of work, and
An idea came into the world. The idea came into the world.

Seeing the immense amount of vagueness, what can one person do?
One small step at a time, you shouldn't give up on the restoration of rigor.
And what surfaces at the end—that's God's.

Discussion

What can mathematics educators learn from the case of Charles? Charles' approach to mathematical meaning lies at the heart of the answer. In order to frame his approach and final stance on mathematical meaning, I begin by placing him within the historical spectrum on views of mathematical truth. Situating him historically is important because Charles' views of mathematical truth were eventually embedded in religious truth, and this larger truth gives meaning to his practice. Next, in order to highlight the void that Charles was attempting to fill, Charles' search for meaning can be compared to Joseph's built-in meaning for mathematics. Finally, I draw on Charles' search and resolution to reveal implications for mathematics classrooms. In particular, mathematics educators need to demonstrate the usefulness of mathematics in solving important social problems and invoke students' natural curiosities in the classroom so that students are motivated to develop meaning for mathematics.

Working Toward Reconciliation

Charlotte Methuen (1998) identified four historical relationships between mathematics and religion: conflict, independence, dialogue, and integration. These ideas can be useful in discussing Charles' relationship to his religion and mathematics profession. In the previous paper about Joseph (Norton, 2002), I suggested that he seemed to hold an *independent* relationship between his mathematics and his Jewish religion. For Charles, I argue that the relationship is one of *conflict* followed by *integration*. Methuen identified the relationship for 16th century mathematician Philip Melanchthon as one of integration as well, though without the preceding conflict. That is, while Philip Melanchthon's philosophy that "the study of mathematics offers a vehicle by which the human mind may transcend its restrictions and reach God," (Methuen, 1998, p. 83) makes mathematician and pastor one, Charles doesn't see mathematics serving such a distinguished role.

Charles' struggle for mathematical meaning and value of mathematical practice began in childhood. When he prayed to God to save his parakeet and God responded, Charles was committed to keeping his promise of serving God in the best way that he could. Initially this promise stood in the way of his mathematical career. He knew very early in his life that he wanted to do research in mathematics and his teachers continually recognized his talent. But he felt that in order to fill his promise he might have to become a pastor because it was difficult for him to find religious meaning for his mathematical activity. However, he seemed to value doing things to help others, as a way of serving God. At first his view of efficacious service was restricted to direct human service, such as tackling environmental issues as an engineer. But later Charles found religious value in bringing Truth to the world, even among the secular sciences.

Charles believes that God orchestrates everything that happens in the Universe. This belief holds for both mathematical advancement and religious prophecy. In this way, Charles can serve God by helping to bring mathematical Truth to the world, so that "it's ok" for him to be a mathematician. However, the domain of mathematics does not stand out in importance from other secular studies, and the path toward Truth in these fields is not a direct one. In all domains of study, we are "wavering toward a truth." The ideas we hold today were brought to the world by God and through us, but they can still be proved false in the future. That is, by continually developing new ideas (with God's help), we are getting closer to Truth. In sum, Charles' view helped to integrate his mathematical practice and religious beliefs.

Like the twentieth-century mathematician Paul Erdös (Hoffman, 1998), Charles believes that there is absolute mathematical Truth. Erdös imagined a book in which all mathematical truths were written and jealously guarded by "the Supreme Fascist." Hardly a religious man, Erdös explained that "you don't have to believe in God, but you should believe in the Book" (p. 26). For Charles, on the other hand, the Book is held by God and the ideas that we are able to bring to the world may only be *leading toward* the Truth. Though Charles singles out mathematics as the most certain of the sciences, he does not feel that God's book is limited to this domain.

Like the Hindu mathematician, Ramanujan (Hoffman, 1998), Charles believes that God's method of dissemination is often very direct. Ramanujan claimed that his great mathematical ideas were delivered to him in his sleep, by the goddess Namagiri. Charles' connection to divine ideas is based, instead, on one of his central religious tenets: God answers prayer. The immediate relevancy of the ideas he receives in reply to prayer has convinced Charles that God often participates in Charles' mathematical activity in a very direct way. This belief is the strongest suggestion that Charles' mathematics and religion are integrated. Also in this way, he feels that his career has been blessed.

Finding Value in Mathematical Activity

In the paper about Joseph, I pointed out the meaningfulness of Joseph's "meritorious activity" as a mathematician. Joseph was raised with a religious

value for secular study so that his mathematical pursuits were never in conflict with his religious beliefs. On the contrary, his mathematical pursuits were encouraged and possibly motivated by his religious beliefs. In fact, Joseph approached mathematical study in much the same way he approached his religious study of the Talmud. The case is very different for Charles who had to struggle for many years in search of mathematical meaning. His mathematical talents and interests remained at odds with his religious beliefs throughout most of his youth as he tried to reconcile the two domains.

While Christianity certainly does not preclude scientific and mathematical thought, we have seen how one particularly bright Christian mathematician struggled in coming to peace with his profession. The difficulty derives from the absence of value for secular studies in many Christian communities. Whereas this value was embedded in Joseph's Jewish religion, Charles had to undergo the arduous task of building it up on his own. His somewhat reclusive childhood may have aggravated the task. Perhaps if he could have engaged in dialogue with other Christian mathematicians about their perspectives, he might have been spared some of the anxiety. Herein lies the important message of Charles' story.

If students hold religious beliefs that do not value mathematical study, they are not likely to be motivated to overcome many of the cognitive struggles they experience in learning mathematics. As teachers in secular schools, we cannot foster a community for them to share religious perspectives and build religious meaning for mathematical study. However, we can strive to help them to find, in their Christian lives, a need for mathematics and a safe place—i.e., without religious conflict—in which to practice it.

Charles experienced conflict between scientific Truth and religious Truth very early in life, over the debate on creationism and evolutionism. Mathematics is safe in the sense that it need not make any claims about Truth at all, much less ones that might contradict religious Truth. Mathematics, in one sense, is a game played with logical rules and based on a few initial assumptions—none of which make any claims about the physical world or the nature of the spirit. In another sense, mathematics is a tool that can be applied in various fields that operate on additional assumptions in order to draw logical conclusions. If the conclusions within these other fields contradict one's religious beliefs, one can dismiss the assumptions of those fields. These perceptions of mathematics are not only safe, but more aligned with modern philosophy of mathematics than Melanchthon's perception of mathematics as "the vehicle to God" (Methuen, 1998, p. 83) or Erdös' lofty regard for "the Book" (Hoffman, 1998, p. 26). Morris Kline's *Loss of Certainty* (1980) provides ample evidence to demonstrate that mathematics is a human and fallible endeavor.

On the other hand, mathematics should still provoke a sense of amazement for its power to model and predict events and for the beauty of its inter-connectedness. Both of these aspects of mathematics allude to the need for it, but this perception of need may be circumvented if one perceives that religion offers a priori answers for all of life's needs. What need do students (Christian or otherwise) have for solving mathematical problems if everything we need to know can be found in a religious text or through divine intervention? Moreover, if mathematics is not an initially satisfying activity for students (unlike Charles), why should they seek its meaningfulness or necessity as Charles did?

In posing problems, mathematics educators should try to appeal to students' curiosity and sense of wonder. If mathematical problems appeal to students, as they did to Charles, we have a nice start. However, this appeal was not enough for Charles. He needed to know that his activity served a greater purpose. If mathematics is not "the vehicle to God" that Melanchthon imagined, maybe it is the application of mathematics in helping people to solve worldly problems that makes it a worthwhile and meritorious activity. Finally, as Charles concluded, it may be that we are all doing our part to bring God's truth to the world. While Biblical Truth will be most essential to many Christians, it is possible to attribute *all* knowledge to an omniscient God, and whatever parts people play in sharing that knowledge, it contributes to the whole. Charles' assumption that mathematics is the most certain of all sciences may explain why mathematics is so central to the development of knowledge and why mathematics serves a key role in so many of the parts we play.

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