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Mathematics for Human Flourishing (Book Review)

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Abstract

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MATHEMATICS

MATHEMATICS FOR HUMAN FLOURISHING by Francis Su. New Haven, CT: Yale University Press, 2020. x + 274 pages, with questions for reflection, hints and solutions to puzzles, endnotes, and index. Hardcover; $26.00. ISBN: 9780300237139.

Mathematics is one of those subjects people unabashedly confess to being no good at, justifying their antipathy by claiming not to have much of a math brain, as if their mindset is caused by flawed genetics. Those of us who locate the origins of math anxiety more in the realm of nurture than nature—due to ill-advised and uninspired influences from parents, teachers, and peers—believe that there are effective ways to attract students (and adults) to explore and enjoy mathematics, even if they don't become mathematicians. For some, this means developing creative ways to present and relate significant mathematical ideas—going beyond worksheets, rote learning, and pedestrian applications—to engage students in imaginative recreational activities (e.g., see my review of Paul Lockhart's trilogy in the March 2019 issue of *PSCF*).

One way to reach out to those disaffected with mathematics is to connect it to their everyday lives and interests. This may involve problems, puzzles, and games, but it can also be done by situating mathematics within a larger social context—humanizing mathematics so that students experience it not as a cut-and-dried collection of rote techniques to be memorized but as a field that has been developed by human beings with desires and interests and roles within their culture. Connections can be made between mathematics and philosophy or astronomy or physics or biology or technology or business—there are many ways to link mathematics to other areas of life, because mathematics is so foundational to today's world. Mathematics can also be humanized by connecting it to literature, linking it to a poem, a song, a story, or even a dramatic presentation of some important mathematical idea or event. Studying relevant historical developments and the biographies of mathematicians provides still other linkages. The ways in which we currently calculate may be compared and contrasted with the methods used at other times and places. The rules and strategies for playing traditional games in different cultures can be analyzed using mathematical ideas.

While each of these ways reveals how mathematics is an integral part of our human experience, *Mathematics for Human Flourishing* takes a somewhat different tack.

Book Reviews

Instead of concentrating on mathematical ideas and techniques, and showing how great mathematics is and what it can do (though some of these topics are also explored), Francis Su focuses more broadly on what human skills, habits, and dispositions—he calls them "desires" and "virtues"—are fostered by a wholesome pursuit of mathematics. His answer to the question "Why do mathematics?" is that "mathematics connects to our deepest human desires … [and so] helps people flourish" (p. 10). Su invites those who find mathematics cold, boring, and lifeless, and/or who have been demoralized and disenchanted by previous encounters with mathematics, to consider how "the proper practice of mathematics cultivates virtues" that enable one to live well, to experience shalom, to be fully human.

Su is an award-winning mathematical educator and writer and a past president of the Mathematical Association of America. He writes in an engaging manner, telling stories, making connections, explaining ideas, and posing thought-provoking puzzles and games in ways that open up new vistas for a broad audience. One might suspect, therefore, that his mathematical training and career were fairly smooth sailing. However, Su confesses that his path to mathematical success was not without considerable obstacles and disappointments. He occasionally had feelings that he didn't really belong, was once told by a professor that he would never be a successful mathematician, at times struggled with self-doubt, and for a while even considered dropping out of his PhD program. Dealing with adversity no doubt made him a stronger mathematician and communicator, and it also made him more sensitive to issues experienced by those who were having difficulty with mathematics and to the importance of addressing the human side of mathematics.

Chris, a federal prison inmate who was determined to learn mathematics on his own, corresponded with Su prior to and during the writing of this book. Excerpts of his letters and conversation are included at the end of each of the thirteen chapters and in the epilogue as illustrations of and responses to the themes and problems being discussed. As Chris is not due to be released for at least another decade, his interest and perseverance in pursuing mathematics was an inspiration for Su, convincing him that "mathematics has something to offer everyone" (p. 19). Su addresses his book, therefore, to a wide audience, especially to those who believe they are not "math people." For the most part, the level of mathematics assumed by the book is not very high, but that doesn't mean Su sticks to mundane topics ordinarily associated with elementary school mathematics. His hope is to expand his readers' idea of what mathematics is and does, "to imagine mathematics in a new way" (p. x). In this he has certainly succeeded, beyond what can be conveyed in a short review.

In advancing the idea that mathematics cultivates virtues, Su underscores that he is not saying that the pursuit of mathematics makes mathematicians more virtuous than other people. He is using the term "virtue" in the Aristotelian sense of "excellence of character that leads to excellence of conduct" (p. 10). This may not match our normal usage, but it fits into a trend in philosophy over the past half century in which "virtue ethics" has made a strong comeback.

So what are these desires and virtues that Su thinks the proper pursuit of mathematics can help promote? The book's chapters have one-word titles: exploration, meaning, beauty, truth, justice, love, and others meant to conjure up some basic human desires. Each chapter then examines various aspects of mathematics and relates them to particular virtues—for example, the chapter on exploration talks about mathematicians' use of imagination and creativity and their sense of joyful surprise and wonder at what they discover. The chapter on meaning discusses how abstract thinking can isolate and help understand key features of a situation, revealing the essential mathematical elements involved in disparate but similar phenomena; the chapter on truth emphasizes the need to think rigorously, to honestly acknowledge error, and to practice intellectual humility. Many of these virtues may be considered intrinsic structural features grounded in mathematical practice when it is done well—mathematics progresses through interactive exploration, benefits from perseverance when facing difficulties, requires abstract thinking and rigorous argumentation, and so on.

The chapters on power, justice, community, and love point out aspects of mathematical practice that probably come closer to what one would ordinarily associate with human virtues: the need to be humble, to respect human dignity, to have a heart of service, to show concern for the marginalized and oppressed, to be hospitable and loving toward others "through and because of mathematics" (p. 205). Unconditional love for those we interact with as we do mathematics, Su says, "has the promise of changing the practice of mathematics from a self-indulgent pursuit to a force for human flourishing" (p. 207). These virtues are less characteristic of mathematical practice per se and are more-human qualities one would like to see practitioners exhibit as full-orbed persons. While these may (should?) accompany mathematical practice, whether they do depends more on one's deepest commitments and aspirations and outlook on life (worldview) and not so much on one's excellence and competence in doing mathematics. At one point Su exhibits awareness that an underlying driving force must animate the virtues he discusses, saying that "every human longing contains at its core a question of ultimate significance" (p. 97). However, he never breaks out of the framework of mathematics long enough to explore this deeper religious foundation. He notes, for example, that the permanence of mathematical truths is grounded in mathematical reasoning, but does our "trust in reason" (p. 98) stand on its own, absolute, or is it grounded in something more

fundamental? Likewise, he repeatedly emphasizes that we should respect the dignity of all human beings, but he doesn't explicitly base this on humans being created in God's image. Su's decision not to delve into religious matters such as these may allow him to reach a wider audience, many of whom might find religious discussions off-putting.

Readers may still wonder whether Su's crediting mathematics with all the virtues he identifies does not claim too much for mathematics. Su admits that some might think he is making an idol of mathematics, something "to be prized above all other pursuits in life." There is a genuine temptation for someone who recognizes, as a participant, that "mathematics is a marvelous human endeavor" (p. 12) to wrongly make it "an ultimate thing" (p. 204). Su stresses, however, that mathematics is not "a panacea to address every ill. It won't solve every human problem, and it's not a spiritual answer to the ultimate purpose of humankind, [though] it does contribute in important ways to a life well lived" (p. 218). Su's ultimate loyalty as a mathematician and a human being is affirmed in the closing sentence of his acknowledgments: "as a follower of Jesus, I am grateful to the one who defends the dignity of all human beings and sustains my own experience of human flourishing" (p. 227).

In the end, then, Su's thesis is not that mathematics is the source of human flourishing but that it lends itself to being practiced in a way that promotes human flourishing. As he says in one of his public posts, "My book is about the elevation of human dignity, and how we are using math to raise people up or tear people down." At a time when character and virtue seem constantly under attack, a book showing how mathematics can support a lifestyle of love toward one's neighbor is refreshing. My recommendation: pick up a copy of Su's book and read it from cover to cover.

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