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Extended Book Review: Mathematics in Popular Culture: Essays on Appearances in Film, Fiction, Games, Television and Other Media, edited by Jessica K. Sklar and Elizabeth S. Sklar; Loving+Hating Mathematics: Challenging the Myths of Mathematical Life, by Reuben Hersh and Vera John-Steiner; Mathematicians: An Outer View of The Inner World, by Mariana Cook

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MEDIA COLUMN

WIMM Watch: *Glee:* The Brittany Code

Sarah J. Greenwald

On the fourth season finale of *Glee* [1], Fox's popular singing drama, two MIT mathematics professors deemed ensemble character Brittany Pierce a mathematical genius, but I was not convinced.

Last season Brittany failed to graduate high school, but this year she has obtained a near-perfect SAT score. Perplexed at such a high score from someone who has only a 0.2 GPA, the professors administer a math test. Brittany scores a 0 on it. However, the faculty are very interested in the back of her test paper. Brittany has drawn numbers in various colors using crayons. In a work that looks like it was created by a small child, the numbers are facing every which way (and angle). The professors ask her about them:

> Brittany: *I didn't know any answers on the test… So I had all these numbers swirling around in my head so I just decided to write them all down so my brain would stop feeling so tickly.*

The faculty somehow seem to identify Avogadro's constant, Planck's constant and a large prime number on her test paper and choose to call it "The Brittany Code." They note that it is the "most important breakthrough of the 21st century" and feel that she might be the "most brilliant scientific mind since Albert Einstein." Later in the episode we find out that she has been offered early admission to MIT.

I found this all to be a very strange turn of events for the show. Brittany's character has always been portrayed as the stereotypical dumb blond, so I don't know what to think of the idea of her subconscious being able to create a prime number that only a supercomputer typically can.

This seems to be yet another example of a disturbing trend of numerology being disguised as mathematics on TV (see [2]). However, in this particular show, I couldn't even find the numbers they referred to, and was left with the impression that the show's writers were too lazy to even look up Planck's constant or Avogadro's number and put some of the digits on Brittany's test paper. At the very least, I might have been happier if they had managed to sing about "mathematics" in the episode, but alas that was not to be either.

[1] "All or Nothing." *Glee* Season 4 Episode 22. Original airdate May 9, 2013. http://www.fox.com/glee/recaps/season-4/episode-22/

[2] Greenwald, Sarah J. "*Touch:* The Amelia Sequence." Association for Women in Mathematics Newsletter, 43(3), May–June, 2013, p. 16.

BOOK REVIEW

Mathematics in Popular Culture: Essays on Appearances in Film, Fiction, Games, Television and Other Media, edited by Jessica K. Sklar and Elizabeth S. Sklar. McFarland, 2012 ISBN-13: 978-0786449781.

Loving+Hating Mathematics: Challenging the Myths of Mathematical Life, by Reuben Hersh and Vera John-Steiner. Princeton University Press, 2011. ISBN-13: 978-0691142470.

Mathematicians: An Outer View of The Inner World, by Mariana Cook. Princeton University Press, 2009. ISBN-13: 978-0691139517.

Review by Gizem Karaali, Pomona College, gizem.karaali@pomona.edu

I was delighted to have the opportunity to review three books on a topic near and dear to my heart. In recent years it has become a passion of mine to think of and speak about the place of mathematics in the real world, in the world of those who are not doing mathematics for a living. I care about the applications and the implications of mathematics, but more than that, I care about the feelings and the impressions attached to it. Often math anxiety or skepticism comes up; the latter may be due to how frequently others (mis)use statistics, but the former is often directly related to the way we (mathematicians and math teachers) teach math (see for instance Jo Boaler's classic *What's Math Got to Do with It?*[1]). However, besides the troubles with our pedagogy, I think we as a community help

perpetuate several myths about mathematics and reap and enjoy the fruits of our specialness.

When mathematicians speak to outsiders, they like to emphasize how it is about objective and universal truths (or occasionally, Truth with a capital T) and how its purity is at the root of its power (see Figures 1 and 2 at right).

If it ever comes up, some will also point out that mathematics is a democracy or perhaps more accurately a meritocracy. In particular those who make it to the top of the echelon of academic mathematics are the geniuses and the bright prodigies. These are recently becoming more and more human as many among them strive to communicate with the rest of the world to share what math is all about and whatnot, but still when push comes to shove, they remain different from the rest of us by means of their sheer genius.

This is where the oldest book among the three under review comes in. *For Mathematicians: An Outer View of The Inner World*, the photographer Mariana Cook ventured into the universe of ninety-two mathematicians through interviews and photographs and was enamored of their inner world: Their vision of an amazingly deep and connected life of the mind which seeks elegant solutions to often simple-sounding but rather tricky problems, their gracious and generous perspective of mathematics. Each essay reads like a beautiful self-portrait, each photograph manages to capture something special about the unique personality involved.

Mariana Cook and the ninety-two mathematicians she has interviewed make a great case for mathematics, its beauty, its amazing power, and its status as a pinnacle of human achievement. Thirteen of these interviewees are women. As declared in the Introduction, "the hope of its creators is that this book might be a way of indicating that the pursuit
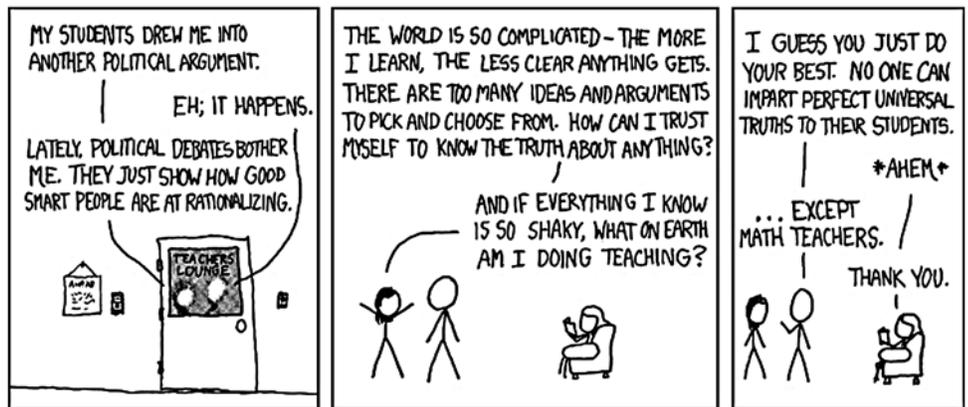

Figure 1: Certainty, from http://xkcd.com/263/, accessed September 23, 2013.

Figure 2: Purity, from http://xkcd.com/435, accessed September 23, 2013.
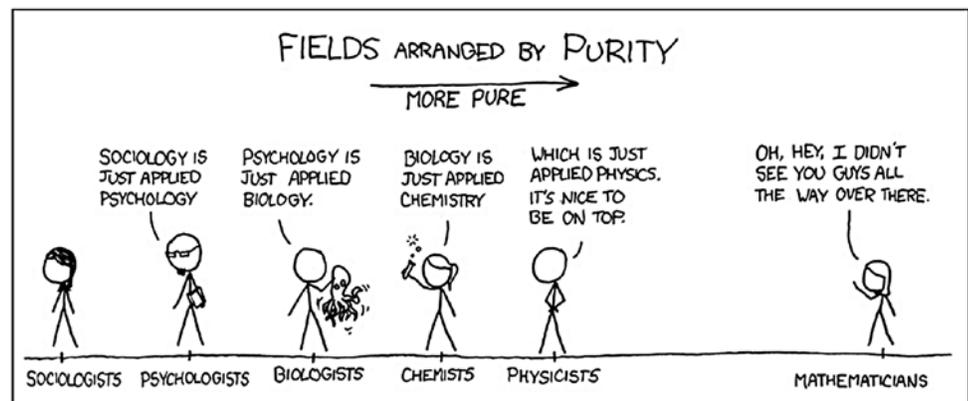
of mathematics is a continuing activity that attracts a wide variety of delightful, individualistic, and devoted men and women, and might give at least some indication of what motivates and inspires these mathematicians." To this end, at least for this reader, the book does a very convincing job indeed.

Those portrayed are the heroes of mathematics, they are at the top of the game of math, all teaching at world-renowned institutions (with a quite visible bias for Princeton of course, given that the selection of people to be included was not really random, in the statistical sense of the term), and it is clear that they are all geniuses!

But let us go a bit deeper and read a bit more. The Preface says a lot in very little space:

> Mathematicians are exceptional. They are not like everyone else.… For starters, most of them are a great deal smarter.… Truth is the ultimate authority in mathematics.… Mathematicians are bound

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[1] *What's Math Got to Do with It?: How Parents and Teachers Can Help Children Learn to Love Their Least Favorite Subject*, Jo Boaler, reprint edition, Penguin Books 2009.

by fairness.... There is a notable kinship among mathematicians. Students are appreciative of the time and effort given them by their professors, and in turn, they nurture the next generation.

Isn't this the image of mathematics and of mathematicians we love to portray to the outside world? And we often believe it ourselves. We believe that we are the chosen ones, that we have, in Cook's words, "the capacity to perceive the world abstractly at a remarkable level of sophistication" and of course, we are smart and fair. And yet we nurture and we appreciate.

This is the ideal of what mathematics is and for most determines who a mathematician should be. Some might remember that Reuben Hersh in an earlier collaborative work (with Philip Davis in *The Mathematical Experience*[2]) wrote about *the ideal mathematician* too, but his ideal mathematician was unmistakably a caricature of the absent-minded math professor disconnected from the rest of the world. Many of us believe that this is not what we strive toward. An ideal is by definition (taken directly from my laptop dictionary) a standard of perfection, a principle to be aimed at. In this sense then, I think it is fair to say that our ideals are portrayed faithfully (and most attractively) by this book.[3] But again the dictionary tells us that an ideal exists "only in the imagination"; it is "desirable or perfect but not likely to become a reality." So what to do with that sense of the word? How much of the Cook book offers us myths as opposed to realities?

Reuben Hersh and Vera John-Steiner in *Loving+Hating Mathematics: Challenging the Myths of Mathematical Life* take the myths of mathematics head on and turn some of them upside down. They start out in their preface specifically pointing out the four myths as they see them:

Myth 1: Mathematicians are different from other people, lacking emotional complexity.
Myth 2: Mathematics is a solitary pursuit.

Myth 3: Mathematics is a young man's game.
Myth 4: Mathematics is an effective filter for higher education.

They challenge these myths persistently. They challenge by telling stories; their narrative touches upon the lives of Joan Birman, Israel Moiseyevich Gelfand, Sophie Germain, Alexandre Grothendieck, Clarence Stephens, Bella Abramovna Subbotovskaya, Karen Uhlenbeck, and many other mathematicians. They pose intriguing questions about the nature of mathematics and what it means to be doing mathematics. Even though most mathematicians mentioned are white men, the authors do attend to the issues of gender disparities and are careful to note explicitly that the field benefits from being open to diversity. In fact, there is a lot to read here about this latter issue. Readers of this newsletter might like to learn that a whole section of chapter 6 covers AWM (pp. 218–223). One of the education chapters focuses on an explicit comparison of the Potsdam method, the method used in SUNY Potsdam (then Potsdam College) in the seventies and eighties to invite students of diverse backgrounds and abilities to the mathematics major and to develop a sense of community where all felt welcome and capable, with the Moore method, which encouraged stiff individualistic competition and intentionally or inadvertently discouraged those who were typically perceived not to belong to the world of mathematics. In fact nowhere else in the book are the two authors more explicit about their disapproval of a character they describe. R. L. Moore pretty much comes across as racist and elitist, a perspective that is not always the standard portrayal of this past president of the AMS and member of the National Academy of Sciences.

Like the first book mentioned above, this book is intended for an audience of non-mathematicians. Hersh and John-Steiner clearly think that the public image of mathematics could use some help. John-Steiner says in an interview: "Instead of the sense of panic that surrounds mathematical achievement in the USA, we need to make the field and its practitioners more accessible to the public, less forbidding, and that is part of the objective of our book."[4] In the same interview, Hersh does not spare his words; the following are probably also aimed at some of his own colleagues: "teaching a math class is not just an unwelcome interruption in the

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[2] Reprint edition, Mariner Books 1999.

[3] As Robert Clifford Gunning writes accurately in the Introduction, "Cook is a superb photographer who could not only create perceptive records of the individuals she talked to but could also bring out some of the aspects of their personalities that might indicate the sort of people who find the mathematics an overwhelming delight and challenge and what motivates them in this really rather arduous and compelling activity."

[4] "Loving and Hating Mathematics," Serena Golden, *InsideHigherEd*, May 17, 2011, http://www.insidehighered.com/news/2011/05/17/discussion_with_authors_of_new_book_on_mathematical_life, accessed September 19, 2013.

life of a mathematician, but actually an encounter with other human beings."

Mathematics in Popular Culture: Essays on Appearances in Film, Fiction, Games, Television and Other Media, the book by the mother-daughter duo (Elizabeth Sklar and Jessica Sklar), is a collection of essays. As such the reader may feel comfortable skipping around and picking and choosing what she wants to read. I initially did just that, and found that I really enjoyed all the essays I read. So I started again at the beginning and read straight through. First of all, I was fascinated by the facts: I learned a lot about my favorite online comic *xkcd* ("*XKCD:* A Web of Popular Culture," Karen Burnham) and two of my favorite math movies *Mean Girls* ("*Mean Girls:* A Metamorphosis of the Female Math Nerd," Kristin Rowan) and *Stand and Deliver* ("*Stand and Deliver:* Twenty Years Later," Ksenija Simic-Muller, Maura Varley Gutierrez and Rodrigo Jorge Gutierrez); I also learned much about the most infamous mathematician of our time, Ted Kaczynski ("The Mathematical Misanthrope and American Popular Culture," Kenneth Faulkner). I was also fascinated by the disciplinary diversity of contributors: Only about half of the whole list of contributors is made up of people who would traditionally be called mathematicians, and one of the two editors, Elizabeth Sklar, is an English professor. Perhaps as a result, the book is a genuinely multidisciplinary look at mathematics in popular culture, not just written by mathematicians who have the inside perspective (which might not necessarily be "the right perspective") but also brings to the topic diverse and yet thoughtful reactions to math in popular culture.

While reviewing this book, I checked Amazon for reviews. There was only one, and I was startled by its unpleasantness. This helped me realize that the book may not necessarily appeal to a reader who is looking merely for a fun read, but more to an educated reader who enjoys scholarly thought and careful analysis.

To some alien who just landed on our world and for whatever reason wants to know about our mathematics,[5] I'd suggest, first read Sklar's edited volume together with the portraits in Cook. (Sklar's volume will bring you up to speed with our pop culture as a bonus even if you only want to

understand math). Then think for yourself whether (and if so how) the perceptions and presentations of mathematics and mathematicians in popular culture that are analyzed in the Sklar essays can be propagated by the portraits: though certainly humanizing them (and aiming thus to dismantle part of Myth 1 and possibly some of Myth 3 in Hersh and John-Steiner's list), Cook's essay basically accentuates the genius factor in mathematics. (Who in their right mind would strive to become a mathematician if they know for a fact that they are themselves not geniuses?) And then come back to Earth, a planet that includes many more kinds of math people, by reading Hersh and John-Steiner. Get "a joyous and balanced view of the mathematical life of reason, emotion, and learning," a perspective of mathematics that might be just a tad more realistic, just a tad more inclusive, just a tad more welcoming to people of different backgrounds and tendencies.

MATHEMATICS, LIVE!

A Conversation with Yingda Cheng and Fengyan Li

Interviewer: Evelyn Lamb, postdoc, University of Utah. She blogs about math for Scientific American *at Roots of Unity and for the American Mathematical Society at the Blog on Math.*

Yingda Cheng and Fengyan Li are both researchers in numerical partial differential equations. Cheng is an assistant professor at Michigan State University, and Li is an associate professor at Rensselaer Polytechnic Institute in Troy, New York. They organized a special session on numerical PDEs at the AWM research symposium in March 2013, and I talked with them there. This is an edited transcript of our conversation.

EL: Would you like to start talking about how you started doing math?

YC: When I was young, I was very interested in science in general. When I went to college, I was undecided between math and physics. Eventually I went with physics for quite a few years. Pretty much at the last year of my college, I decided I didn't really want to do physics, I wanted to do math. But I didn't want to do pure math, I wanted to do applied math.

At the time I think I was trying to embrace the idea of using computer software algorithms to solve real application

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[5] Perhaps the alien is itself a mathematician? Mariana Cook in her Preface provides a possible explanation: "The mathematicians in each galaxy will be able to see patterns in one another's language. They will decipher symbols and soon they will exchange ideas with a respect for their mutual effort to understand."