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Extended Book Review: Really Big Numbers, by Richard Evan Schwartz; The Boy Who Loved Math: The Improbable Life of Paul Erdös, by Deborah Heiligman; The Short Seller, by Elissa Brent Weissman

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elegance found in the connection between symmetries and conservation laws—which I first met as an engineering major who landed in an undergraduate physics class called "Theoretical Mechanics"—marks the life-changing moment when physics and I found each other. I switched my major to physics and never looked back. I would love to see more Emmys (and Edwards) come to appreciate Emmy Noether and her elegant theorem, and choose to cast their lot with all of us who do mathematics and physics for the love of the game. This video will help towards that end.

In the opening lineup of distinguished female scientists, there was a conspicuous gap to the viewer's right of Emmy Noether. The message throughout the video seems to invite a young woman to stand in that gap alongside Emmy Noether, to join a company of first-rate intellectual companions who happen to be women. Despite a couple of minor technical caveats (and after three minutes the music begins sounding repetitious, but that may say more about me than about the music), I cheerfully endorse this video as an invitation, made with integrity, to help enlarge the Emmy Noether Circle.

[1] Alice Calaprice, ed., *The Quotable Einstein* (Princeton University Press, Princeton, NJ, 1996), 75.

Note from the Column Editors:

Google celebrated Noether's 133rd birthday on March 23 via a doodle. More information can be found at https://www.google.com/doodles/emmy-noethers-133rd-birthday

BOOK REVIEW

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Really Big Numbers, Richard Evan Schwartz (American Mathematical Society, paperback 2014, ISBN-13: 978-1470414252).

The Boy Who Loved Math: The Improbable Life of Paul Erdős, Deborah Heiligman (pictures by LeUyen Pham) (Roaring Brook Press, hardcover 2013, ISBN-13: 978-1596433076).

The Short Seller, Elissa Brent Weissman (Atheneum Books for Young Readers, hardcover 2013, ISBN-13: 9781442452558, paperback 2014, ISBN-13: 978-1442452565).

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First published in 1995, Jon Scieszka and Lane Smith's *Math Curse* is a classic today; it is packed full of math fun "for ages > 6 and < 99" as the front flap cover suggests. But perhaps both your son and your niece already have read that one and you are looking for a birthday gift that will continue the adventure? A perfect book for a similar range of readers is Richard Evan Schwartz's *Really Big Numbers*, published last year by the American Mathematical Society. If this is the AMS' debut into children's lit, we should demand more! The book is packed with mathematics, starting from the small and easy and moving on to larger and larger numbers, presumably as the reader's mathematical maturity evolves. On most pages there is a lot more a mathematically inclined parent or older sibling can find to wonder about and explore more deeply with the younger reader involved. The drawings are simple but clear, and the voice of the author is friendly, welcoming, and sincere. He begins with "When I was a kid, I liked to think about shapes and numbers. I never stopped thinking about them so I became a mathematician." And then we start climbing the ladder of numbers with him and get to larger and larger numbers. The storyline is simple but effective. This is a book that a child may first start reading when she is five and then come back to on a regular basis and go a few pages deeper each time. A middle schooler can of course read it cover to cover in one sitting, but I'd still suggest a slower, more deliberate read; the first bite is quite good, but the book grows on you; the simmering effect is delicious.

A book possibly aiming for a narrower age range, *The Boy Who Loved Math: The Improbable Life of Paul Erdős*, introduces its readers to Paul Erdős, the quirky twentieth century genius whose many collaborators gave us the infamous *Erdős number* (mine is 2 by the way, and yes, I am bragging!). In a few words to the readers, the author Deborah Heiligman explains how she came "to write a book about a brilliant and important mathematician" even though she thought that "math was for other people, not me"; many (non-mathematician) adults will sympathize. Throughout the book, her careful attention to detail, together with the playful illustrations by LeUyen Pham, makes this a delight to read. For many children, it will be easy to catch little Paul's enthusiasm about numbers. However his undeniable prodigy status may inadvertently convince some of them that perhaps math is not for them; after all, as four-year-olds, they could not tell

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someone they just met how many seconds she had lived as soon as they had heard when she had been born. The book is beautiful, but as someone who is quite wary of the genius myth (even when it is true), I would probably not give this as a gift to a young child who was not also a mathematical prodigy. For those who are older and already deeply into mathematics, however, this is a neat book, and, for them, could easily be a gateway to Paul Hoffman's *The Man Who Loved Only Numbers*, or Bruce Schechter's *My Brain is Open: The Mathematical Journeys of Paul Erdős*.

A third newcomer to the children's math-lit shelves, Elissa Brent Weissman's *The Short Seller*, will also appeal to a certain readership. If you have a preteen, especially a daughter who does not trust herself in mathematics and is slowly gravitating toward speaking disparagingly about math, this book could lead to some interesting and productive conversations. The protagonist of the book, the eleven-year-old Lindy Sachs, is exactly at that stage in her life. She is told that she is good at math, and for all practical purposes, she has been good at math, but she knows deep inside that everyone else is wrong, and that she is not really getting the point of it at all (peer pressure and impostor syndrome mixed in with some serious exposure to plug-and-chug math instruction). Then Lindy gets sick and has to stay home for an extended period. For a reason that may be convincing in some family settings, her dad encourages her to start playing with stocks. Clearly this is at least an upper middle class family, but Lindy is not a spoiled brat, she is just an eleven year old. I have been eleven once, many years ago, and that distance in time does not erase the memory of the sensations of that awkward age. To me, Weissman's Lindy is realistic and reflective, though tackling, besides the natural anxiety coming with that age, the additional one that results from her imprudence. I would not read this with my daughter who is

NSF-AWM Travel Grants for Women

Mathematics Travel Grants. Enabling women mathematicians to attend conferences in their fields provides them a valuable opportunity to advance their research activities and their visibility in the research community. Having more women attend such meetings also increases the size of the pool from which speakers at subsequent meetings may be drawn and thus addresses the persistent problem of the absence of women speakers at some research conferences. The Mathematics Travel Grants provide full or partial support for travel and subsistence for a meeting or conference in the applicant's field of specialization.

Mathematics Education Travel Grants. There are a variety of reasons to encourage interaction between mathematicians and educational researchers. National reports recommend encouraging collaboration between mathematicians and researchers in education and related fields in order to improve the education of teachers and students. Communication between mathematicians and educational researchers is often poor and second-hand accounts of research in education can be misleading. Particularly relevant to the AWM is the fact that high-profile panels of mathematicians and educational researchers rarely include women mathematicians. The Mathematics Education Research Travel Grants provide full or partial support for travel and subsistence for

- mathematicians attending a research conference in mathematics education or related field.
- researchers in mathematics education or related field attending a mathematics conference.

Selection Procedure. All awards will be determined on a competitive basis by a selection panel consisting of distinguished mathematicians and mathematics education researchers appointed by the AWM. A maximum of $1500 for domestic travel and of $2000 for foreign travel will be funded. For foreign travel, US air carriers must be used (exceptions only per federal grants regulations; prior AWM approval required).

Eligibility and Applications. These travel funds are provided by the Division of Mathematical Sciences (DMS) of the National Science Foundation. The conference or the applicant's research must be in an area supported by DMS. Applicants must be women holding a doctorate (or equivalent) and with a work address in the USA (or home address, in the case of unemployed applicants). Please see the website (http://www.awm-math.org/travelgrants.html) for further details and do not hesitate to contact Jennifer Lewis at 703-934-0163, ext. 213 for guidance.

Deadlines. There are three award periods per year. Applications are due **February 1**, **May 1**, and **October 1**.

still interested in math; Lindy's initial distaste for mathematics is pretty well explored and I'd not want to pass this on to anyone. But for the young child who is already drifting away, this might send a more constructive message, that math is so much more than school math.

The genre of math lit for children is not huge, but it is growing. My kid loves the early reader books by my friend and colleague Julie Glass (*A Dollar for Penny* (1998), *The Fly On the Ceiling* (2000)). I found Izolda Fotiyeva's *Math with Mom* (2003) too late for my daughter but will definitely read it with my son. For a neat twist on the traditional alphabet book, I recommend *The Technical Alphabet* (2014) by the engineer sisters Lavanya and Melissa Jawaharlal. More recently a colleague introduced me to Laura Overdeck's *Bedtime Math* series; these will soon join the growing math library in our house. Whether your goal is to raise mathematicians or simply adults who enjoy and appreciate mathematics, you have many books on your side.

EDUCATION COLUMN

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Preparing Teachers to Teach Statistics

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Statistical literacy is becoming an essential competency, not only for researchers conducting statistical analyses but also for informed citizens making everyday decisions based on data. It has long been advocated that statistics be included in the school curriculum. For example, the recommendations found in *The Reorganization of Mathematics in Secondary Education*, a 1923 report by the Mathematical Association of America National Committee on Mathematical Requirements, stated that statistics should be included in the junior high school curriculum and that a course in elementary statistics ought to be included in the high school curriculum. Many years later, first in 1989 and then again in 2000, the National Council for Teachers of Mathematics (NCTM) included statistics and probability as a strand in their standards (*Curriculum and Evaluation Standards for School Mathematics*, 1989; *Principles and Standards for School Mathematics*, 2000).

In 2007, the *Guidelines for Assessment and Instruction in Statistics Education: A PreK–12 Curriculum Framework* (GAISE) (http://www.amstat.org/education/gaise/) (Franklin et al., 2007) provided fairly detailed guidelines about how to achieve a statistically literate graduating high school student at the end of the student's PreK–12 education. And finally, more recently, the Common Core State Standards for Mathematics (CCSSM) (http://www.corestandards.org/) and other state standards have placed heavy emphasis on statistics and probability, particularly in grades 6–12. Because of the emphasis on statistics in K–12, the American Statistical Association (ASA) commissioned the writing of *The Statistical Education of Teachers* (SET) report (I am one of six co-authors). In particular, the SET report aims to further unpack the recommendations for statistics put forth in *The Mathematical Education of Teachers II* (MET II) report (Conference Board of Mathematical Sciences, 2012). MET II gives recommendations regarding the mathematics that PreK–12 teachers should know and how they should come to know it. A goal of SET is to articulate how teachers should be prepared to meet the current needs of students in statistics education.

The SET report (available free at the ASA website http://www.amstat.org/education/SET/SET.pdf) is organized in nine chapters and two appendices:

Chapter 1: Background and Motivation for SET
Chapter 2: Recommendations
Chapter 3: Mathematical Practices through a Statistical Lens
Chapters 4-6: Grade Level Content
Chapter 7: Assessment
Chapter 8: Overview of Research
Chapter 9: A Brief History of Statistics in Schools
Appendix 1: Examples that address particular difficulties that may occur while teaching statistics to teachers
Appendix 2: Example activity handouts that could be used to teach teachers

SET contends that, to prepare teachers to teach statistics effectively, it is important that (1) teachers be exposed to how statistical concepts are interconnected across the grade bands, and (2) teachers understand how the statistical process progresses *within* each grade band. The SET report also outlines statistical coursework for teachers in each of the three K–12 levels. Here are the recommendations, given by grade band.

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