



The BIG News

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**BUSINESS, INDUSTRY, AND GOVERNMENT SPECIAL INTEREST GROUP OF
THE MATHEMATICAL ASSOCIATION OF AMERICA**

Book review of Humble Pi, by Matt Parker Reviewed by Benjamin V.C. Collins

Coming to BIG SIGMAA:

*BIG SIGMAA is organizing a virtual programming event on **Careers in the Non-Profit Sector**. If you have any experience or interest in that topic, please contact SIGMAA Chair Caroline Maher-Boulis or Vice Chair for Programs Vinodh Chellamuthu.*

Matt Parker is likely a familiar face to many of you. You may have seen one of his funny and informative talks at MathFest or the Joint Meetings. Perhaps you have followed his YouTube Channel, “Stand-up Maths,” or seen him as a guest on “Numberphile” or “BritLab.” If so, it won’t surprise you that his book *Humble Pi: When Math Goes Wrong in the Real World* (Riverhead Books, 2019) is humorous and insightful. But it also has some important lessons for those of us working in Business, Industry, and Government, or those of us teaching students who aspire to such positions.

Take, for example, Chapter Thirteen, Does Not Compute.

This chapter tells the story of a cancer patient who was given the chemotherapy drug fluorouracil at 24 times the intended rate, because of a computational error on the part of the nurse who administered it. This dosage proved to be lethal. While it’s easy to blame the nurse, the Computer-Human Interaction for Medical Devices (CHI+MED) project analyzed the case, and rightly recognized that it is much deeper than that. The whole system needs to be redesigned to make this mistake harder to make. They developed a calculator app that routinely double-checks for the sort of computational error the nurse made, and they recommend

built-in safeguards on the pump software that would check for abnormally high dosages of potentially dangerous drugs. As someone who works for a medical software company, this example hits fairly close to home. (To be clear, I have no idea if my company was involved in this particular case, nor do I directly work on chemotherapy dispensing equipment.)

Chapter Three, Little Data, while less specific to my industry, was probably more relevant to my daily work. This chapter contains a long section on potential pitfalls in Microsoft Excel. I confess that as I was reading it, I

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JMM Highlights

There are no official BIG SIGMAA activities at the Joint Meetings in 2022. However, there are plenty of things that may be of interest to our members. Here are a few that we have gathered. For more information, see the [JMM website](#).

- COMAP Workshop: An Introduction to COMAP's Certificate in Modeling (CiM) Program for Educators
Wednesday January 5, 2022, 1:00 p.m.-4:00 p.m.
- AMS Panel: Advocacy for Mathematics & Science Policy
Thursday January 6, 2022, 9:30 a.m.-11:00 a.m.

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Book Review, continued

found myself wondering about my own use (and misuse?) of Excel. I've certainly run up against issues where Excel is treating something as a number that's not really a number; it just looks like one. I read with some trepidation that the European Spreadsheet Risks Interest Group estimates that over 90 percent of all spreadsheets contain errors. Certainly none of my spreadsheets contain errors! Perhaps I and my colleagues need to start putting the same sorts of quality controls in our spreadsheets that we have in our coding.

Parker is a natural explainer. Some of his topics, particularly probability and randomness, can get pretty abstruse, but he keeps things at a level that should be accessible to a reasonably intelligent undergraduate. Interspersed with plenty of humorous examples, he has good solid explanations of the mathematical issues involved in the errors. Take his example, in Chapter 9, A Roundabout Way, of precision versus accuracy:

I can accurately say that I was born

on Earth, but that is not very precise. I can say I was born at precisely latitude 37.229° N, longitude 115.811° W, but that is not at all accurate.

That illustrates the difference pretty accurately (*and* precisely) without a lot of technical details. The book itself won't turn anyone into a quality control expert, but it will certainly give everyone working in a practical field plenty to think about in terms of how they control risk.

I think the most important lesson of *Humble Pi* is that error is inevitable. Although mathematics is an exact science, applied mathematics is subject to human error, which can't be controlled. In Chapter 9.49, Too Small to Notice, he tells the story of a shift maintenance manager for British Airways replacing the bolts on an airplane's windshield with bolts that were almost, but not quite, identical. The windshield popped out of the plane at 17,000 feet, and tragedy was only averted by heroic action by the flight crew. Parker carefully traces the many factors, large and small, that contribut-

ed to this near disaster. It's easy to blame the shift maintenance manager, but there were many policies that Parker points out could have made this mistake less likely — from the obvious step of marking the similar bolts with obviously different colors, to the policy change of classifying the windshield as a “vital point” of catastrophic failure, which would have required a double-check, to the complete overhaul of the structural design of the cabin so that it was impossible for the windshield to explode outwards. His point is that human error is inevitable, and so needs to be anticipated and mitigated in our project management, not just ignored.

Yes, it's fun to laugh and point at math done badly. But it's also important to learn from it. Especially for those of us working in Business, Industry, and Government, there are important lessons to be learned from these failures. Those lessons are an important part of the story that Matt Parker is telling. We should all be grateful that he tells it with such flair.

Puzzle Corner

On the island of Smullyana, everyone is either a knight or a knave. Knights always tell the truth, and knaves always lie.

Question 1: On my first visit to Smullyana, I met two islanders. Conveniently, they were wearing name tags, so I knew their names, but I didn't know if they were knights or knaves or one of each. I asked Eden what she was, but just as she answered, my phone rang, so I didn't hear her answer. I asked what she had said, and George said, “She said that she is a knave.” I asked George what he was, and he

said, “I am a knight. Eden is a knave.”

What were Eden and George?

Question 2: On my second visit to Smullyana, I met three islanders, again wearing name tags. I asked Conrad if Adam and Elise were both knights, and he responded “Yes.” Just to check, I asked Conrad if Adam was a knight. To my surprise, he answered “No.”

What were Conrad, Adam, and Elise?

Question 3: One day, I had to visit the governor of Smullyana. I was

escorted to the governor's office, where I found two residents. Their name tags said that they were Caroline and Janelle. Unfortunately, I didn't know the governor's name, so I didn't know which one was the governor. I asked Caroline, “Is the governor a knight?” She answered the question, with either a “yes” or a “no.” I thought about it a minute, and I knew which one was the governor, although I didn't know if she was a knight or a knave.

Who was the governor?

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JMM Highlights (Continued)

- Society for Industrial and Applied Mathematics Special Session on Graduate Research in Industry and in National Laboratory Internships
Friday January 7, 2022, 8:00 a.m.-12:00 p.m.
- AMS Special Session on Advancing Data Privacy-Preserving Methodologies
 - Part I: Wednesday January 5, 2022, 8:00 a.m.-11:50 a.m.
 - Part II: Wednesday January 5, 2022, 1:00 p.m.-5:50 p.m.
- AMS Special Session on Geometry in the Mathematics of Data Science
 - Part I: Wednesday January 5, 2022, 8:00 a.m.-11:50 a.m.
 - Part II: Wednesday January 5, 2022, 1:00 p.m.-5:50 p.m.
- AMS Special Session on Real World Applications of Mathematics
 - Part I: Wednesday January 5, 2022, 8:00 a.m.-11:50 a.m.
 - Part II: Thursday January 6, 2022, 8:00 a.m.-11:50 a.m.
- SIAM Panel on a BIG world view: Business-Industry-Government Careers for Mathematicians
Wednesday January 5, 2022, 8:00 a.m.-9:30 a.m.
- Professional Enhancement Program (PEP) #3: Developing Mathematics Programs for Workforce Preparation in Data Science and Other Applications
 - Part A: Wednesday January 5, 2022, 1:00 p.m.-3:00 p.m.
 - Part B: Saturday January 8, 2022, 1:00 p.m.-3:00 p.m.

Do you know of anything that we missed? Email collinbe@uwplatt.edu, and I can add it to the newsletter.

Puzzle Corner Answers:

Answer 1: Of course, on Smullyana, no one ever says, "I am a knave." Knights truthfully say that they are knights, and knaves lie and say they are knights. So Eden couldn't possibly have said, "I am a knave." So we know that George is a knave, since he lied about what Eden said. So he also lied when he said that he was a knight, and when he said that Eden is a knave. George is a knave, and Eden is a knight.

Answer 2: Conrad can't possibly be a knight. If he were, then he would have told the truth that Adam and Elise are knights, but also told the truth that Adam is not a knight. Since those statements can't both be true, Conrad is a knave. Then we know that Conrad lied when he said that Adam was not a knight. So Adam is a

knight. But Conrad also lied when he said that both Adam and Elise were knights, so Adam and Elise are not both knights. Since Adam is a knight, Elise is not.

Answer 3: At first, it doesn't seem like we have enough information. The question doesn't even tell us Caroline's answer! However, the problem does tell us that I had enough information to figure out who the governor was.

Suppose that Caroline answered "yes." Then it may be that she is the governor and a knight, or that she is the governor and a knave. Or it may be that Janelle is the governor and a knight (and Caroline is a knight) or that Janelle is the governor and a knave (and Caroline is a knave.) So if she answered "yes," I had no way to

decide.

Suppose on the other hand that Caroline answered "no." Then she could not be the governor and a knight, because then the governor is a knight, and the truthful answer is "yes." Nor could she be the governor and a knave, because then the governor is a knave, and the truthful answer is "no." So if Caroline answered "no," she cannot be the governor.

Since I was able to decide, it must be that Caroline answered "no," and Janelle was the governor.

All of these puzzles are adapted from his books *Alice in Puzzle-Land* and *Satan, Cantor, and Infinity*, by Raymond Smullyan.



BIG SIGMAA

ERAU Research Experience for Undergraduates
REU Site: Research Projects in Data-Enabled Industrial Mathematics

Embry-Riddle Aeronautical University, Daytona Beach, FL
May 16, 2022 - July 15, 2022

Participating students will be provided with a stipend of **\$5,200** for the 9-week program, **\$175** weekly meal allowance, and up to **\$600** in travel expenses. On-campus single occupancy dorm rooms, paid for directly by the program.

Support for the program has been provided by the National Science Foundation (NSF) through REU Award Number DMS - 2050754

For more details go to website: [LINK](#) or contact Mihhail Berezovski at ERAU.

BIG SIGMAA WEB SITE:

[HTTP://SIGMAA.MAA.ORG/BIG/BIG_SIGMAA_HOME.HTML](http://SIGMAA.MAA.ORG/BIG/BIG_SIGMAA_HOME.HTML)

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