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Review: Pythagoras' Revenge: A Mathematical Mystery; The Housekeeper and the Professor

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Pythagoras' Revenge: A Mathematical Mystery, by Arturo Sangalli. Princeton University Press, Princeton, 2009, 224 pp., ISBN 978-0-691-04955-7, \$24.95.

The Housekeeper and the Professor, by Yoko Ogawa (translated by Stephen Snyder). Picador, New York, 2009, 180 pp., ISBN 978-0-312-42780-1, \$14.00.

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Like many readers of *The College Mathematics Journal*, I'm a fan of fiction with mathematical connections. No doubt that is part conceit in my case, but also part genuine fascination (and, frequently, admiration) for what and how authors convey mathematics and portray mathematicians to a broad audience. Below I consider two very different novels in which mathematics plays a central role. At issue is not only what mathematics does for the story, but also what each novel says, both explicitly and implicitly, about mathematics and mathematicians.

Scholars agree that Pythagoras left no written record of his work. But what if he did? Furthermore, what if the ancient Pythagoreans were correct in their belief in reincarnation—might then their master today walk the earth anew? These pressing questions motivate the mystery/thriller *Pythagoras' Revenge*. The story involves two intersecting and ultimately converging plot lines. One concerns Elmer J. Galway, professor of history at Oriel College, Oxford. He is approached by an antiquarian book seller to appraise what appears to be an ancient manuscript of an eyewitness account of the death of Pythagoras and the end of the Pythagoreans. The other—more far-fetched—plot involves the Order of the Beacon, a Neo-Pythagorean (and, of course, secret) cult convinced that Pythagoras has reincarnated and dedicated to finding him, and which resorts to nefarious methods when necessary. What ensues are searches for clues to more ancient writings, to the location of a first century *neopitagorica basilica* in Rome, and to the identity of the supposed Pythagoras reincarnate. There are also break-ins, even a kidnapping. The action generally moves briskly, and is framed by some carefully documented historical and archeological details—a sort of ancient Greek *Da Vinci Code*, only much shorter. One imagines a Hollywood screenplay is in the works.

It's possible to find the premise of *The Housekeeper and the Professor* just as unlikely as a search for a reincarnated Pythagoras, but Ogawa somehow manages to make the situation appear plausible. The novel, set in Japan in 1992, is told in first person by a young single mother who works as an agency housekeeper and is assigned to a 64-year-old, Cambridge-educated, former mathematics professor. In 1975 the Professor was involved in a serious automobile accident and suffered brain damage that left him with only eighty minutes of short-term memory. (His pre-1975 memories remain intact, however.) He functions by clipping notes to his suit jacket, including a portrait of the Housekeeper (who is new to him each day), and, most important, a reminder that reads: "My memory lasts only eighty minutes." He has withdrawn into his cottage, working mathematical problems whose solutions he submits to journals for cash prizes. (He often wins.) His conversation frequently consists of nerdy, numerical *non sequiturs*, such as when he first meets the Housekeeper:

"What's your shoe size?"

This was the Professor's first question, once I had announced myself as the new housekeeper. No bow, no greeting. If there is one ironclad rule in my profession, it's that you always give the employer what he wants; and so I told him.

"Twenty-four centimeters."

"There's a sturdy number," he said. "It's the factorial of four." He folded his arms, closed his eyes, and was silent for a moment.

"What's a 'factorial'?" I asked at last. I felt I should try to find out a bit more, since it seemed to be connected to his interest in my shoe size.

"The product of all the natural numbers from one to four is twenty-four," he said, without opening his eyes. "What's your telephone number?"

He nodded, as if deeply impressed. "That's the total number of primes between one and one hundred million." (pp. 6–7)

The reader shares in the Housekeeper's recollections of her small daily adventures with the Professor and her 10-year-old son, nicknamed Root by the Professor because the top of his head reminds him of a radical sign. (No given name of any character is provided.) The Professor's initial diffidence wears away as the Housekeeper and Root learn to negotiate the Professor's limitations and appreciate his love of numbers.

In terms of the actual mathematics presented, Sangalli is more ambitious than Ogawa. As one might expect from a book involving Pythagoras and Pythagoreans, Sangalli includes discussions of the irrationality of $\sqrt{2}$, ratios and the musical scale, figurate numbers, a proof of the Pythagorean Theorem (of course), and some Pythagorean numerology. In addition, there are solutions of Sam Lloyd's famous Fifteen Puzzle and a particular problem in combinatorial probability (neither of which should have been so challenging, or novel, to the mathematician in the story who solves them). More central to the plot is the notion of a precise definition of a random sequence. Sangalli provides very clear mathematical explanations that are kept appropriately elementary for a broad readership. However, some of the more involved mathematical discussions are relegated to appendices. This technique was disappointing; I would have preferred it if the reader had to confront *all* the mathematics in the main work, although I recognize that including all the mathematics in the story itself would have been very difficult to accomplish without disrupting the plot.

The mathematics of *The Housekeeper and the Professor* is generally confined to aspects of number theory. In particular, there are references to imaginary numbers, primes and twin primes (including the Twin Prime Conjecture), perfect, abundant and deficient numbers, amicable numbers, figurate numbers, Euler's formula (with a recurring and unfortunate printing error in my edition), and Fermat's Last Theorem. Almost all the mathematics is presented as curious facts and computations (as in the passage quoted above) without much by way of logical argument. One notable exception is the problem of determining the sum of the first n consecutive natural numbers. The Professor initially gives Root the problem of finding the sum $1 + 2 + \dots + 10$, but this is gradually re-examined, explained, and generalized in the course of several passages (and

over several days). In effect, Ogawa provides a small, fictional clinic in conjecture, proof, and guided student discovery.

Ogawa and Sangalli come to their respective works from entirely different perspectives and ultimately this made a big difference in how successful I found the two books. Sangalli has a Ph.D. in mathematics and is an expositor of popular science and mathematics (see [2], for example). *Pythagoras' Revenge* is intended to serve as a vehicle for explaining some mathematics and mathematical philosophy to a wide audience. The Pythagorean belief that “all is number” and that the universe is governed by a mathematical order is juxtaposed with the more contemporary (post-modern?) idea that mathematics is instead infused throughout with randomness. In fact, in his preface, Sangalli explains that his original plan was not to produce a work of fiction, but rather a “reflection on the triumph and tyranny of numbers in modern societies.” However, by weaving these ideas into a larger story, he hopes to reach a broader audience, “from high school students to PhDs.” He may well reach a larger number of readers with a novel than with a work of non-fiction. And he certainly did his homework regarding rare manuscripts and archeological excavations, and he does a very good job with the mathematics. But Sangalli is not a novelist, and it shows. No fewer than eighteen major characters are introduced (listed, for the reader’s convenience, before the prologue), but there is little development of any of them. At times it’s hard to keep everyone straight. I had to read through twice to identify the main protagonists with any certainty. Consequently, it is difficult to enjoy the plot fully or even to care about what happens to the characters. Moreover, the cult of the Beacon stretches credibility more than a little, and the main mathematician of the story, Jule Davidson, is not much of a hero. (Alright, I’ll admit that I wanted the mathematician to be at least as smart and heroic as the historian.)

In contrast, Ogawa is a fiction writer by profession and has won several awards in Japan for her work. Indeed, *The Housekeeper and the Professor* (which first appeared in English as *The Gift of Numbers* [1]) won the Yomiuri Prize for fiction in 2004 and was adapted as a film, *The Professor’s Beloved Equation* [3], in 2006. It is foremost a story about relationships and family, not mathematics. Yet it is through mathematics and baseball (“no other sport is captured so perfectly by its statistics, its numbers”) that Root and his mother ultimately are able to understand and bond with the Professor, and it is mathematics that provides the steadfast reality the Professor needs to maintain his sanity. Ogawa introduces the mathematics with a gentle touch, and through lyrical prose (at least lyrical in this English translation) she deftly conveys the compulsion of problem solving, the piecemeal and halting progress towards a solution, and the poetry of numbers:

“A problem has a rhythm of its own, just like a piece of music,” the Professor said.
“Once you get the rhythm, you get the sense of the problem as a whole, and you can see where the traps might be waiting.” (p. 35)

Finally, what should we expect from mathematical fiction? While I admire seeing substantial mathematical ideas explored as part of a good story, I don’t require deep or new mathematics to enjoy a work of this genre. Rather, what I most look for is how the characters interact with the mathematics—how they think about the problems and how mathematics affects them. In

Pythagoras' Revenge, Sangalli attempts to present some serious technical ideas, but I found that they became lost in an overdeveloped plot full of underdeveloped and somewhat unappealing characters. (Who *are* these nutty Neo-Pythogoreans, anyway?) I was disappointed that few characters in the story actually demonstrate any reverence for mathematical arguments, for proofs; it's all about the hunt for documents and a *nouveau* Pythagoras. On the other hand, in *The Housekeeper and the Professor*, Ogawa explicitly portrays rather simple mathematics only; anything more advanced is just hinted at. Nonetheless, the reader cannot but see mathematics as something meaningful and beautiful and precious. Surely the real Pythagoras would have appreciated the mathematical spirit expressed by Ogawa, and would have been proud of the Professor and his two loving disciples.

References

1. Y. Ogawa, *The Gift of Numbers* (trans. Y. Sugawara), Picador, New York, 2006.
2. A. Sangalli, *The Importance of Being Fuzzy*, Princeton University Press, Princeton, 1998.
3. T. Koizumi (dir.), *The Professor's Beloved Equation (Hakase no aishita sūshiki)*, Japan, 2006.