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# The Mathema Tourist

**By Ivars Peterson**

**January 6, 2010**

## A Drama of Forensic Mathematics

The setting is a morgue. Attendants wheel in two draped bodies. Investigators examine the corpses, painstakingly seeking a link between two murders that appear unrelated.

This scene is part of an audacious experiment in mathematical exposition. The vehicle is a screenplay, written by number theorist Andrew Granville and his sister Jennifer Granville, an actor, playwright, and producer. In this case, the forensic experts are looking for evidence connecting integers and permutations, two concepts central to mathematics.

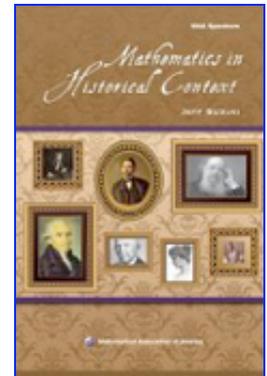
Titled *MSI (Mathematical Sciences Investigation): The Anatomy of Integers and Permutations*, this work debuted on Dec. 12, 2009, at the Institute for Advanced Study in Princeton. It represented a provocative amalgam of pure mathematics, drama (with some humorous touches), and live performance.

Granville describes the premise in the following words: "Two seemingly unrelated corpses are found, and our hapless detective believes that the crimes are unrelated; whereas the forensic investigators turn up conclusive proof that the two corpses were in fact twins."

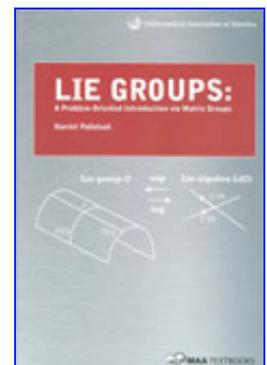
The mathematical underpinnings concern intriguing links between the prime factors of integers and the cycles of permutations. "Most of our training with these simple mathematical objects involves how they are used in understanding more complicated phenomena," Granville notes, "but rarely do we look at their anatomy, the inter-relation of their constituent parts."

In the fantasy world of Granville's *MSI*, the forensic detectives, loosely modeled on well-known mathematicians, proceed to make observations,

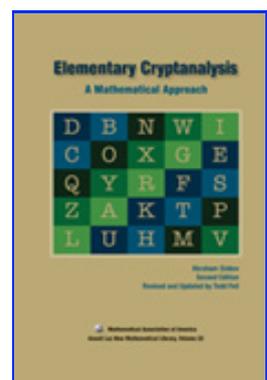
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identify key features, posit conjectures, and prove theorems to establish illuminating links between integers and permutations. Mathematical details appear in Granville's paper "[The Anatomy of Integers and Permutations](#)" (pdf), a companion piece to the *MSI* script.

For the script's public debut, Granville brought together a cast of professional actors to read the parts on stage, representing the characters Jack von Neumann, Professor K.F. Gauss, Emmy Germain, Sergej Langer, Barry Bell, and a narrator.

Michael Spencer designed the production, using an ingenious array of signs hung at relevant times on lines stretched across the stage to help highlight and visualize ideas and activities as they came up in the reading. Musician [Robert Schneider](#) of [The Apples in Stereo](#) composed the accompanying music, written in prime-numbered time signatures (a prime number of beats in each measure).

The screenplay, as staged at IAS, was entertaining, clever, and thought-provoking. It drew attention to several cultural issues in mathematics: how research is done, particularly the roles of student and advisor; the role of women in mathematics; and, in Granville's words, "the influence and conflict of deep and rigid abstraction."

But the script probably didn't succeed in its attempt to appeal to a broad audience. Even though Granville was careful to explain prime numbers, for example, and provided some nice analogies to elucidate other mathematical ideas, certain key terms, such as  $\log n$  and function, were left unexplained. Moreover, Granville insisted on presenting some proofs in the script, and I (and probably much of the audience) found it easy to get lost in the intricacies.

I did notice that the theme Schneider composed for the presentation (which was repeated throughout the production) tended to stick in my mind. And that fitted with one of the keys to solving the mystery—the iPod playlists embedded in the brains of the two crime victims.

I also appreciated Granville's tribute to math popularizers in the character Barry Bell, an amalgam of the names of biographer [E.T. Bell](#), author of *Men of Mathematics*, and writer and reporter [Barry Cipra](#) (pdf).

You can find out more about Granville's expectations for his unique endeavor in an [article](#) from the Université de Montréal, where Granville teaches, and in this [audio segment](#) from an interview I conducted with Granville last year.

Based on what he learned from staging the production and from the audience's reaction, Granville hopes to rework the screenplay and present it again, perhaps at a future iteration of the [Joint Mathematics Meetings](#).

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Comments are welcome. You can reach Ivars Peterson at [ipeterson@maa.org](mailto:ipeterson@maa.org) or visit the blog version of this article at <http://mathtourist.blogspot.com/>.

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