

## Alice in NUMB3Rland

By Alice Silverberg

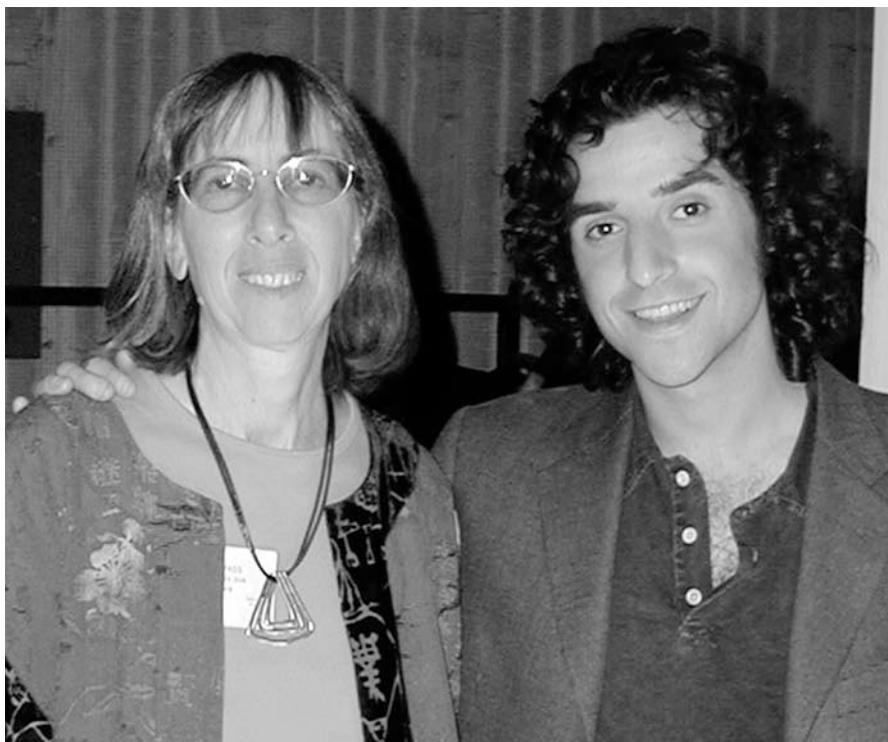
On May 12, over 12 million viewers saw the name of my cat, Ceilidh, flash across their TV screens. Why? Because I'm a consultant for the CBS show NUMB3RS, and a perk was that some of my work, including equations for a cryptosystem called CEILIDH, named in memory of my cat, was the blackboard text in one scene.

The premise of NUMB3RS is that Charlie, a mathematics professor at "CalSci," helps his FBI agent brother solve crimes. Did the CEILIDH cryptosystem have anything to do with that episode's plot? No, not really. Like much of the mathematics in NUMB3RS, it was something that would have made sense if it were in the right context, but it wasn't. Does that matter? Not if you're watching the show for the chase scenes, the acting, Charlie's hair, the family relationships, or to be entranced by the idea that mathematics has an impact on the real world; these are all things that NUMB3RS does very well.

If you're watching NUMB3RS because you think you're learning some mathematics, or because you think you're watching mathematics as it's actually used in the real world, be warned: you're not. Getting the math right and getting it to fit with the plot are not priorities of the NUMB3RS team, according to Cheryl Heuton, one of the show's producers and creators, who correctly points out that few viewers will know the difference.

The popularity of *A Beautiful Mind*, *Good Will Hunting*, *Proof*, and *Arcadia* shows that there is a potentially large audience fascinated by mathematicians and mathematics, with an interest in knowing more. Personally I think they'd prefer authenticity to jargon. But I'll agree with Cheryl that learning mathematics takes time and work, and watching TV isn't the way to do it. That's what schools and teachers are for. However, I'd prefer that the NUMB3RS team value mathematics enough to try harder to get it right.

I became a NUMB3RS consultant for several reasons. I wanted the cryptog-



Alice Silverberg with David Krumholtz

raphy and number theory (which are areas I know something about, that can easily be made accessible to the general public) to be more correct and less silly, I wanted to improve the depiction of the female scientists (more scientist and less sex object), and I wanted to help make the representations of mathematics and mathematicians more credible. At the Joint Mathematics Meetings last January the NUMB3RS "researcher" Andy Black gave a presentation followed by a Q&A session, at which I seconded someone else's concerns about the depiction of women and asked how many of their mathematician consultants were female. His answer was "None," so I gave him my contact information, and he called me a couple of weeks later.

Typically, Andy emails a draft of the script to the consultants. The FBI plot is already in place, and the writers want mathematics to go with it. The placeholder "math" in the draft is often nonsense or jargon; the sort of things people with no mathematical background might find by Googling, and think was real math. Since there's often no mathematics that makes sense in those parts of the script, the best the consultants can do is replace jargon that makes us cringe a lot with jargon that makes us cringe a little.

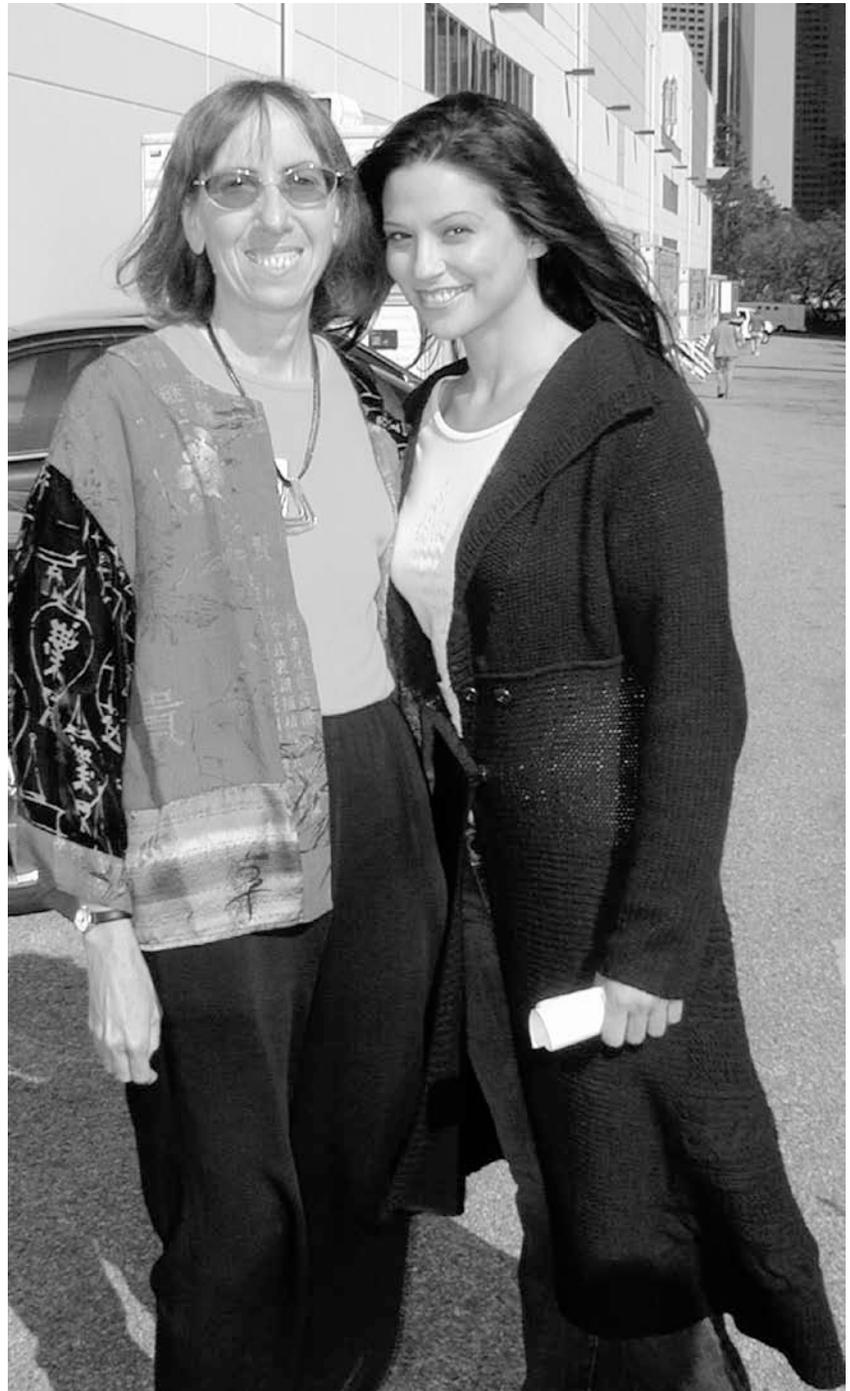
From then on, it's the Telephone Game. The consultants email Andy our suggestions ("replace 'our discrete universes' with 'our disjoint universes'"; "replace the nonsensical 'we've tried everything — a full frequency analysis, a Vignere deconstruction... we even checked for a Lucas sequence' with the slightly less nonsensical 'It's much too short to try any cryptanalysis on. If it were longer we could try frequency analyses, or try to guess what kind of cryptosystem it is and use a specialized technique. For example, if it were a long enough Vigenère cipher we could try a Kasiski test or an index-of-coincidence analysis'"). Andy chooses about a quarter of my suggestions and forwards his interpretation of them to the writers and producers. The script gets changed ... and then the actors ad lib something completely different ("disjointed universes": cute, but loses the mathematical allusion; "Kasiski exam": I didn't mean that kind of "test"). More satisfying were occasional phone conversations, including talking with one of the writers, Julie Hébert, about the development of a potential new character.

Seeing the filming of the CEILIDH scene was a real treat. The entire team, especially the actors, came across as

highly professional. I talked with actor David Krumholtz, who was thoroughly charming. I met that episode's writer, Dave Harden (who assured me they'd fix the "Kasiski exam" error), and producer/creator Nick Falacci, who told me that what's great about NUMB3RS is that the math isn't jargon... and didn't seem fazed when I expressed shock that he thought it wasn't jargon. Cheryl was very generous with her time... in which she mostly explained why talking with mathematicians would be a waste of their time.

The NUMB3RS team will do what they think will make people watch. Viewers who care whether the mathematics makes sense or fits the plot, or whether the show depicts life in academia in a realistic way, should make it clear, on fan forums and in letters to the network, that getting the math right will have an effect on whether or not they watch the show. What could NUMB3RS do if there were viewer demand for it? They could hire someone with a mathematics background, whose responsibilities would include helping integrate the plot with the mathematics, communicating more effectively with the consultants, correcting the actors when they ad lib the mathematics in a way that doesn't make sense, checking that words are pronounced correctly, and helping the actors act and dress like mathematicians.

Many professors I've talked to about this would prefer that the character Amita's role were more "The Grad Student" and less "The Love Interest" (under California law Charlie would have undergone two hours of mandatory sexual harassment prevention training and education and should have known that various aspects of his relationship with Amita violate the rules). The NUMB3RS team hasn't been responsive to my comments about that or the depiction of women, or to my complaints about excessive violence (which I believe makes the show inappropriate for the school-age children to whom CBS, Texas Instruments, and the National Council of Teachers of Mathematics are marketing it). Nor was there any interest in changing the CBS website, which has character profiles for all the male characters but none of the female ones, and has



*Alice Silverberg with Navi Rawat*

Amita's last name spelled in two different ways, both incorrect. (Not to mention that most of the male consultants get paid but the female consultant doesn't.)

I have mixed feelings about NUMB3RS. I still have concerns about the violence, the depiction of women, and the pretense that the math is accurate. However, if NUMB3RS could interest people in the

power of mathematics enough for society to greater value and support mathematics teaching, learning, and research, and motivate more students to learn it deeply, that would be a positive step.

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