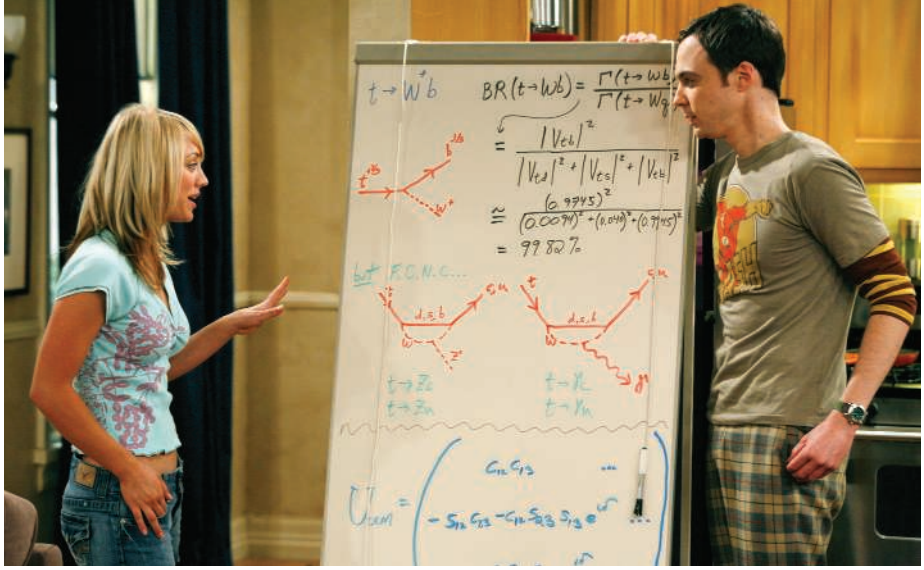

Weird science. Real physics and math make cameos on *The Big Bang Theory*.

SCIENCE AND SOCIETY

Talk Nerdy to Me

A surprise hit, the new TV comedy *The Big Bang Theory* plumbs science for laughs, thanks to aid from physicist David Saltzberg and friends

Leonard: *"At least I didn't have to invent 26 dimensions to make the math work."*
Sheldon: *"I didn't invent them. They're there."*
Leonard: *"In what universe?!"*
Sheldon: *"All of them. That's the point."*

Physicists may be notorious for coming up with weird concepts such as alternative universes. But a popular situation comedy based on their work seems almost as fanciful. Yet last October, the American TV network CBS premiered *The Big Bang Theory*, and about 9 million people now watch it each week—enough for CBS to quickly renew the show for another year. The *Washington Post*'s critic Tom Shales calls it "the funniest new sitcom of the season." Apparently, it isn't just quarks that can be strange and charming.

Centering on two male physics postdocs and the blonde bombshell who moves in next door, *The Big Bang Theory* follows the sitcom formula of placing quirky, exaggerated characters in situations both odd and mundane. But where the show breaks the mold is that most of those characters and situations revolve around science, highly accurate science for the most part, thanks to experimental particle physicist David Saltzberg of the University of California, Los Angeles (UCLA), who's been with the show from the initial episode. From making sure lab equipment looks suitably haphazard to supplying the equations displayed on the show, Saltzberg's presence is regularly felt on the set; he even has a director's chair with his name on it. "I can't overestimate his value to what we do," says Bill Prady, who along with Chuck Lorre created the show.

Hollywood has a tradition of exploiting geek humor, from Jerry Lewis's *The Nutty Professor* to the *Revenge of the Nerds*. Many current TV shows, particularly forensic crime dramas such as *CSI*, draw regularly on math and science, both for plot elements and the occasional laugh. *Numb3rs*, in which a mathematician helps his FBI agent brother, is even used as the basis for teacher's worksheets provided by Texas Instruments and the National Council of Teachers of Mathematics. Given all of that, working on film or television can be a perk for a Los Angeles–area scientist or physician. Kevin Grazier of NASA's Jet Propulsion Laboratory in Pasadena, for example, consults for three shows.

Still, *The Big Bang Theory* is the first time a prime-time comedy has taken science this seriously—and Saltzberg is surely the only particle physicist to advise a sitcom. *Science* recently spoke with him and Prady, and paid a visit to the set of *The Big Bang Theory*, to learn how cutting-edge research gets injected into the show.

The pair defended the show against charges that it has too few women scientists and mocks physicists as Klingon-speaking nerds. Whether giving a talk about the sitcom at the Kavli Institute for Theoretical Physics or simply attending a party, Saltzberg inevitably encounters people offended by the show's putative sexism and nerdism. Most of the show's detractors, he notes, have never seen a whole episode. Prady stresses that *The Big Bang Theory* means no ill will. "If the scientific community is concerned with how we depict them, be gentle and be patient," he says. "We are you; we love you."

Sheldon: "*This is one of those circumstances people unfamiliar with the law of large numbers would call a coincidence.*"

Saltzberg got his unusual gig via a friend, a Hawaiian astrophysicist who'd helped on the show's unaired pilot. When the show was picked up by CBS, the producers went searching for a local to vet last-minute changes. Saltzberg generally looks over the scripts in advance and then drives in once a week to Burbank for the show's evening tapings. Saltzberg is "right there to give us the new word we need," Prady says. "A couple of weeks ago, he provided us with a terrific, genuine joke, and it was on the air."

The sitcom features Leonard and Sheldon, the two physicists, and Penny, an actress/waitress who is their bridge to the world of people who don't have a periodic table shower curtain. She's a loyal friend, even attending Leonard's talk on supersolidity—at which she falls asleep. Leonard's subject matter was suggested by the show's "geek of the week," in this case graduate student Matt Mecklenburg, who'd accompanied Saltzberg to the set, as colleagues, friends, and students do every week.

One can argue about whether *The Big Bang Theory* is funny—TV critic Maureen Ryan of the *Chicago Tribune* called its jokes "tired and mean-spirited"—but it's clear that Prady and his writers have scientific chops, accurately incorporating physics terms such as "soft component of cosmic radiation" into dialogue even

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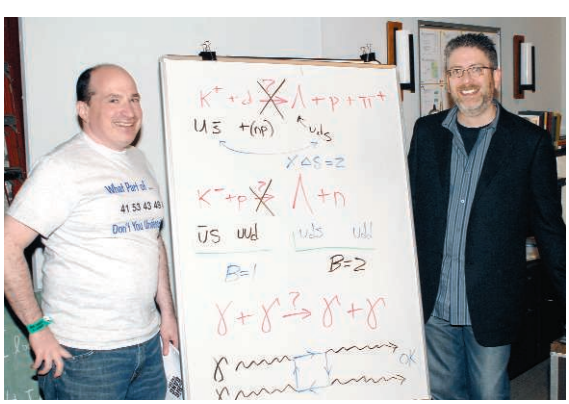

Odd couple. Physicist David Saltzberg (*left*) and Bill Prady, *The Big Bang Theory*'s co-creator.

CREDITS (TOP TO BOTTOM): WARNER BROS. TELEVISION ENTERTAINMENT

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before Saltzberg sees a script. Several years ago, one writer dressed up for a Halloween party as the Doppler effect. The show incorporated the idea, putting Sheldon in a bodysuit with white vertical stripes separated by less and less distance. He made accompanying train noises whose pitch went up and down. To his dismay, no guest got it.

Prady, a self-taught software programmer, initially envisioned programmers at the heart of a sitcom. But sitting at a computer all day doesn't make for great physical comedy. Physicists, however, write on whiteboards, and that visual element had appeal: "We realized this was a better way to show somebody working with their mind," Prady says.

Leonard: *"Sounds like a breakthrough, should I ask* Science *to hold the cover?"*
Sheldon: *"It's time travel, Leonard. I will have already done that."*

Some episodes of *The Big Bang Theory* could inspire an evening of studying math or physics. Saltzberg likes to inject scripts with terms such as Casimir effect, molecular positronium, and giant magnetoresistance (the subject of the 2007 Nobel Prize in physics). "I go for stuff that sounds really fake—that you think is Hollywood science but find out not only is it real, it's topical," he says.

Saltzberg views the show as a tool for science education: PBS's *NOVA* with rim shots. During an awkward date, Leonard gets an olive to rotate inside a glass—and corrects Penny, and likely most viewers, that centripetal, not centrifugal, force explains the trick.

Leonard, played by Johnny Galecki, is the experimentalist who longs for Penny and has a disastrous fling with Leslie, a brilliant labmate, who spends part of their tryst correcting an equation. In the episode in which Leonard first asks Leslie for a date—"a biosocial exploration with a neurochemical overlay," he calls it—the two test how long it takes a powerful lab laser to heat up soup.

Leslie is the only female researcher on the show, a complaint Prady and Saltzberg hear often from women, whether scientists or journalists. Prady promises that more female scientists will appear. "The [female-male] ratio is actually higher on the show than it is in my part of the field, which is pretty bad," Saltzberg unhappily adds.

The show's writers saw that firsthand when they toured UCLA labs. Prady met a physicist who lies about what she does in social situations, because she feels her career intimidates men. "We're going to have Leslie do that," Prady says. "Whenever anybody says they lie about who they are, there's a rich story to tell there."

The show's other lead character is string theorist Sheldon, played by Jim Parsons as an arrogant, emotionally oblivious, yet endearing, former child prodigy. When Penny complains that a bad relationship lasted 4 years, "as long as high school," Sheldon, perplexed, replies, "It took you 4 years to get through high school?" He's even less tactful to non-Ph.D. engineers, calling them "Oompa-Loompas of science," a knowing jab at the academic pecking order.

Sheldon's lack of social graces and other quirks have led to speculation that he must have Asperger syndrome, an autism spectrum disorder commonly assumed to be prevalent in scientists and computer programmers. Although Prady concedes that Sheldon fits the diagnosis, he rejects the idea that this is the ultimate in negative geek stereotypes, saying the character is an affectionate composite of the programmers he used to know.

In character. Jim Parsons (Sheldon) as the Doppler Effect, Johnny Galecki (Leonard) as Frodo, Kunal Nayyar (Raj) as Thor, and Simon Helberg (Howard) as Robin Hood.

Saltzberg also doesn't believe the show paints a depressing picture of scientists. "I am willing to discuss it with anyone who has seen a couple of episodes," he says, noting that a UCLA physics student who recently visited the set remarked that she wanted to be just like the show's characters. "This is our attempt to show our own lives," Prady says. "My father-in-law is a brilliant pediatric rheumatologist, but he is capable of saying, 'That's a very interesting story, but who is this Tom Cruise?' "

Sheldon: *"That's my work. It's just some quantum mechanics. A little string theory doodling around the edges. That part there—that's just a joke. It's a spoof of the Born-Oppenheimer approximation."*

UCLA hasn't objected to Saltzberg's spending his free time consulting for the show—he gets an on-air credit and fee—but Warner Bros.' lawyers have stopped on-air disclosure of Sheldon and Leonard's academic home. Still, a slip during the pilot, and its Pasadena setting, obviously hint at Caltech, whose walkways and fountains grace *Numb3rs*'s "CalSci."

Science is vital to the show but not at the expense of humor, Saltzberg must always remind himself. At a rehearsal, he catches that an equation he provided with accompanying Feynman diagram appears scarily complicated but is actually too basic to cause physics postdocs the terror the scene requires. The writers gamely try out new dialogue, but nothing clicks. They finally ask Saltzberg to provide a new, more challenging equation, with the same solution as the old one so no dialogue has to be changed. Mercifully, before Saltzberg has to improvise, everyone realizes that all it takes is modifying the characters' reactions: It's an engineer who's most frightened.

Although Saltzberg always winces when he realizes he's let something wrong slip in, he's also amused that even his most accurate contributions come off as fake. "If I look on the [Internet] message boards, there's still complaints—no matter how right you get the science, there's going to be some fraction of people who think it's wrong!"

Saltzberg has found scientific allies for his defense of the show—and a few fans of his own. "Our outreach department really enjoys watching the show; the science adviser is very good," says Rebecca Thompson-Flagg, public outreach specialist for the American Physical Society. (The society plans to send the show material with its logo for use.) Science writer Jennifer Ouellette recently penned an op-ed in *Symmetry*, a magazine for particle physicists, calling on its readers to embrace the show. (David Harris, the physicist who is editor of the magazine, loves the show.) "I bought a T-shirt at the American Physical Society that said, 'Flirt harder, I'm a physicist,' " Saltzberg says. "I don't know why we should hold television up to a different standard than we hold ourselves."

–KAREN HEYMAN

Karen Heyman is a freelance writer in Santa Monica, California.

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