

# the **BiG BANG** MATERIALS THEORY

We live in a time in which skepticism of science, including its value as well as its conclusions, seem to be growing. While evolution (including human evolution), the safety and effectiveness of vaccines, global climate change, and cosmology featuring a universe that has billions of years of existence are all well established scientifically, many people don't believe in them. Given what we know about the value of scientific research, it is hard for us as materials researchers to accept that. Such skepticism calls into question our understanding of all science, including materials research. We need some method to convey our values and our culture to the global community. Wouldn't it be nice to have a widely viewed television show based upon our values and our culture? The show could be a comedy that transects the work and day-to-day lives of some of us. The focus of the show could be two materials researchers, a theorist and an experimentalist, at a major university somewhere in the world. Viewers would come to understand different threads of materials research and appreciate us as human beings with ordinary needs, such as friendship, love, outside interests, and all of the other things that make us human.

This idea obviously plays off the tremendously popular American television comedy, *The Big Bang Theory* (TBBT), which recently closed production after a 12-year run.<sup>1</sup> The title of the comedy is wonderfully evocative, playing off the cosmological concepts at the heart of the origin of the universe as well as the love lives of the protagonists. Even the theme music to the show connects us to all of this through the amazing lyrics created by the Canadian rock band Barenaked Ladies.<sup>2</sup>

One of the recurring themes from the show was the use of whiteboards in the background with equations and figures relevant

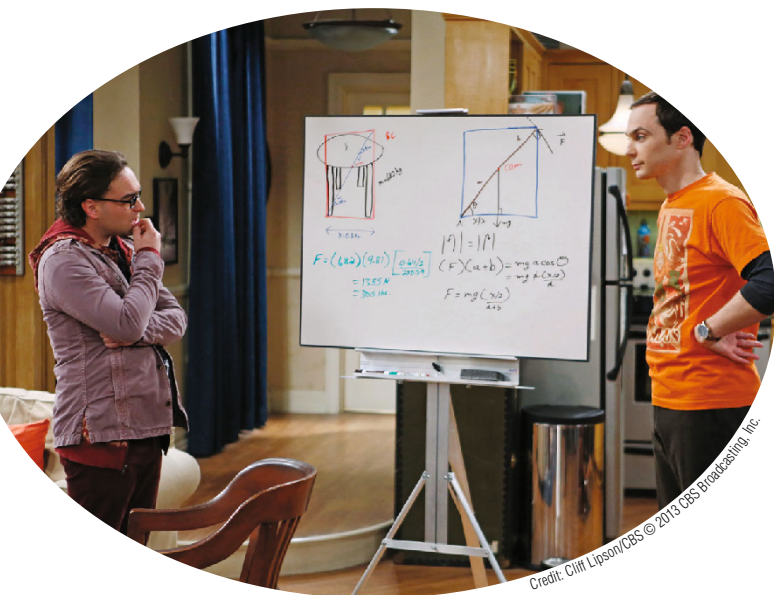
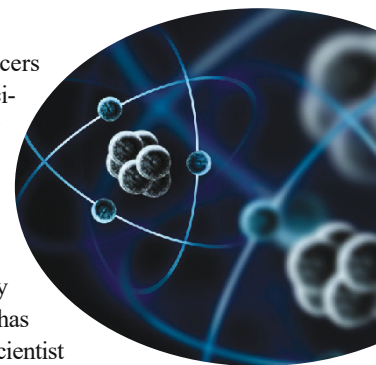
to their scientific work. The producers worked exceptionally hard to get the science right. This was accomplished by hiring technical consultants, including David Saltzberg, a professor of physics and astronomy at UCLA. Later in the show's run, Mayim Bialik, who plays the character Amy Farrah Fowler, joined the cast. Bialik has a PhD degree in neuroscience (a real scientist playing the role of a scientist for a change!) and provided guidance on issues in microbiology and neuroscience.

I imagine whiteboards playing a key role in our materials show as well, with the two main protagonists studying quantum materials, big data in materials research, artificial intelligence in materials research, perovskites, biomaterials, nanomaterials, topological materials, electron microscopy, or a host of other topics generally covered by the MRS Fall and Spring Meetings.<sup>3,4</sup> If our show leveraged California Institute of Technology (Caltech) as a home for our characters, such as TBBT, then the producers could use any of a number of brilliant materials researchers from the Los Angeles area as consultants.

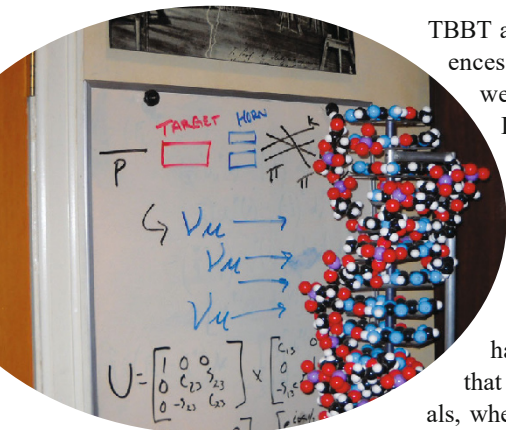
As a recurring theme, TBBT also had encounters between the protagonists and real scientists. Stephen Hawking had a recurring role on the show as himself. Nobel Prize winners George F. Smoot, Kip S. Thorne, and Frances H. Arnold also appeared on the show as themselves. Brian Greene, Neil deGrasse Tyson, Bill Nye, and NASA astronaut Michael J. Massimino appeared as themselves. The interactions between these people and the characters greatly enhanced the feeling of a connection between the real world and science.

In our show, the real people would have to be connected more closely to materials research. Lucky for us, there is a broader range of researchers with which our characters could interact. For example, I can imagine guest appearances by Andre Geim, Konstantin Novoselov, Isamu Akasaki, Hiroshi Amano, Shuji Nakamura, F. Duncan M. Haldane, and J. Michael Kosterlitz, among Nobel Prize winners in Physics.<sup>5</sup> I can also see them interacting with Nobel Prize winners in Chemistry such as Robert F. Curl Jr., Alan J. Heeger, Hideki Shirakawa, Gerhard Ertl, Dan Shechtman, Jean-Pierre Sauvage, Sir J. Fraser Stoddart, and Bernard L. Feringa.<sup>6</sup> We could also co-opt Bill Nye, The Science Guy, for our program.

TBBT also had an ongoing relationship with various characters from *Star Trek*, *Star Wars*, *Battlestar Galactica*, and *Firefly*.<sup>1</sup> Following my theme of shameless imitation, we could have cameos by actors from the various Stargate franchises,<sup>7</sup> as well as from *Deep Space Nine*<sup>8</sup> and *Star Trek: Voyager*.<sup>9</sup>



Credit: Cliff Lipson/CBS © 2013 CBS Broadcasting Inc.



TBBT also had ongoing references to *Doctor Who*,<sup>10</sup> as well as characters from DC Comics<sup>11</sup> and the Marvel Universe.<sup>12</sup> Stan Lee, the creative brain behind the Marvel Universe, also had a cameo.<sup>13</sup> Both the DC and Marvel universes have ongoing plot lines that involve exotic materials, whether involving various

forms of kryptonite,<sup>14</sup> the wonderful technologies used by Batman<sup>15</sup> and the Flash,<sup>16</sup> or the materials adamantium and vibranium, as well as the exotic materials in the infinity stones used by Iron Man, Captain America, Nick Fury, and others.<sup>12</sup> Our characters would be fascinated by materials such as naquadah, naquadria, neutronium, and trinium from the Stargate franchises.<sup>17</sup> I can visualize the interactions, discussions, and arguments among our characters about these fictitious materials. TBBT also had episodes in which there were discussions of graphene,<sup>18</sup> the strength of materials,<sup>19</sup> and non-Newtonian fluids. These are right in our wheelhouse as materials researchers.

We all have our own experiences as materials researchers. We also observe the antics of our fellow materials researchers. How many stories have we heard that happened because of our research or because we were attending a MRS meeting? With all of this input, the scripts for our television show would practically write themselves.

Perhaps Chuck Lorre, Bill Prady, and Steven Molaro, the executive producers of TBBT, could be enticed to produce our show as a spin-off. Many of the same sets could be used. I'm sure that materials researchers would be fans of comic books and graphic

novels and would likely spend a lot of time at the comic book store. Similarly, the set associated with the Athenaeum at Caltech could be reused. Also, the actor Joshua Malina could reprise his role as President Siebert of Caltech. We could even have occasional interactions with *all* of the key players in TBBT. Imagine the contention between Sheldon and a super-intelligent teenage materials theorist.

A television situational comedy focused on the daily lives and foibles of materials researchers would be a wonderful method and an excellent outreach vehicle to generate interest in materials research. Now, we only have to come up with a title for the show and persuade the Barenaked Ladies to write us a theme song. Does someone have Chuck Lorre's telephone number?

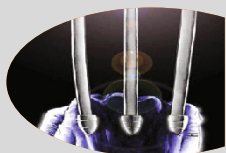
Steve Moss

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## ON OUR WHITEBOARD

Below are a few examples of fictitious materials that might be discussed *ad nauseam* by our show's protagonists and materials scientist guest stars.



### ADAMANTIUM

Metal alloy with extremely stable molecular structure. Practically indestructible as a skeleton or claw.



### VIBRANIUM

Alloy with extraordinary abilities to absorb, store, and release large amounts of kinetic energy. Useful for superhero suits and shields.



### KRYPTONITE

A green, crystalline material that emits a peculiar radiation. Harmless to humans, but can weaken a superhero.



### NAQUADAH

A rare superconductor that greatly amplifies energy. Extremely potent when paired with explosives.



### NEUTRONIUM

A highly dense phase of matter composed primarily of neutrons. Under some circumstances, could manipulate time and space.



### TRINIUM

Metal that is 100 times lighter and stronger than steel when refined. Useful for production of starships.