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in the final analysis

"The Wakandans used vibranium to develop technology more advanced than any other nation, but as Wakanda thrived, the world around it descended further into chaos. To keep vibranium safe, the Wakandans vowed to hide in plain sight, keeping the truth of their power from the outside world."

—N'Jobu in *Black Panther*

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"Mastering the most utilitarian metal of the moment is a societal equivalent of a superpower."

Finding delectation in materials or STEM (science, technology, engineering, and mathematics) is not hard wired into my job description; I just naturally embrace this community both professionally and personally. Even when reading a book or viewing a movie, I'm on the watch for a materials connection. Case in point: I'm a big fan of the Marvel Cinematic Universe, or MCU for short. A set of interconnected movies based on comic-book characters, the MCU began in 2008 with the release of *Iron Man* (a great materials movie). As of 2018, 20 movies will have been released as part of the MCU with many more in production. The films have ranged in quality from pretty good to exceptionally good. That's not me speaking as a fanboy (although I suppose that I am); the critical review aggregation service Rotten Tomatoes rates every MCU film as "fresh."

One of the MCU films that qualifies as "exceptionally good" based on critical and box-office consensus is 2018's *Black Panther.* It deserves the accolades. The story is largely set in the mythical monarchical African country of Wakanda, which appears agrarian and impoverished to all outward appearances. The outward appearances are a pantomime, however, as the Wakandans have great mineral wealth in the form of an unobtainium-type meteorite metal called vibranium. Thanks to this secret resource and a STEM-savvy populace, the science, technology, and culture of the Wakandans greatly exceeds that of the rest of the world. If the Wakandans were warlike instead of peaceful and secretive, conquest of the world would be a simple matter.

I discussed the film with *JOM*: The Magazine editor and MCU fan Lynne Robinson, and she astutely observed that the vibranium in the movie is effectively a metaphorical equivalent for steel in the Industrial Revolution—mastering the most utilitarian metal of the moment is a societal equivalent of a superpower. Agreed. Entertainingly, *Black Panther* illustrates those superpowers associated with materials technology, biotechnology, nanotechnology, simulation technology, energy technology, and so-on-and-on technology.

The debut of *Black Panther* coincided quite neatly with the official roll-out of the next-generation TMS STEM outreach program that succeeds *Comic-tanium*™: *The Super Materials of the Superheroes* (while integrating elements of it): *Materials Explorers*™. What is *Materials Explorers*™? Concisely from the web site, the program "is a free curriculum that makes science come to life by connecting STEM concepts with science fiction, fantasy, pop culture and real-world technologies."

The backbone of the program comprises TMS volunteer members going into intermediate and high school classrooms, serving as role models, and helping teachers with their lesson plans by explaining how sometimes abstract STEM concepts actually work in a science, engineering or technical environment. It takes some pre-classroom time between the member and the teacher and about an hour in the classroom itself. The support materials from TMS are free, and there are no participation fees. At present, eight modules are available from which volunteer participants can select: additive manufacturing, biomedical materials, Bladesmithing, light energy behind lightsabers, materials science of superheroes, science of sound, structural materials, and smartphones. Based on our pilot experiences, the program is simple, accessible, and effective. All of the details are on the web site: www.materials-explorers.org.

In the pilot phase at test schools, the most popular modules were biomedical materials and, . . . wait for it, . . . the materials science of superheroes—and that's before *Black Panther* debuted in theaters. Something tells me that this module is about to get even more popular with heightened interest in all things Wakandan. To have a firsthand experience, visit www.materials-explorers.org to get started.