

Summer Reading

Does anyone just relax on the beach anymore? The history of vacations is complicated and apt to depend on location as well as era, but I remember a time, eons ago and far, far away, when a summer vacation unquestionably meant time spent at the beach, and there was no such thing as a winter vacation. And because there is really not very much to do at the beach, there was also a great tradition of recreational reading in those long-lost lazy summertimes. Well, in case any of you have the time to catch up on your reading this fine July, here are a few literary suggestions that have materials research connections.

First, allow me to suggest a book that aroused a minor controversy and murmurings about academic freedom earlier this year, when a charitable foundation provided grants to a number of U.S. universities on the stipulation that they include it as required reading in at least one course. It is also rumored to be in production as a movie, starring Brad Pitt and Angelina Jolie, but of course you always want to read the book before you see the movie, right? Ayn Rand's *Atlas Shrugged* has been controversial ever since it was published, in 1957, but it has also never been out of print, so it must have something going for it. It is certainly the heavy-weight of my three suggestions, both literally and literarily, weighing in at 1,075 pages and packing a blatant political message. This one would justify the purchase of an electronic reader, on weight-savings alone. As far as the message is concerned, well, pay heed to Robert Frost: "Education is the ability to listen to almost anything without losing your temper or your self-confidence." Once in every chapter, the narrative veers off into a speech of 30-or-so pages about the effect of government control on free enterprise, delivered by one of the story's heroes. These are placed in the story line about as fittingly as an ape in an opera, even occurring in the midst of one torrid bedroom scene somewhere between the discarding of silken clothing and the opening of silver cigarette cases. Despite all this, the book is not entirely unamusing: There are striking characters, atmosphere, intrigue, power, romance, mystery, shadowy political figures, a Shangri-La-like earthly Eden... and technology! A major theme of the book is the disruptive effect of new technology, and the particular case in point is a material invented by one of the leading characters, Hank Rearden. "Rearden metal" threatens to displace steel from its traditional markets and creates industrial disruptions that

precipitate government controls. These controls, in turn, remove incentives for innovation, and the leading entrepreneurs and inventors start to vanish from the scene. The consequences of this titanic shrugging, as portrayed in the novel, are worthy of some consideration in the light of the present-day, real-life support levels for scientific research in the United States. The book might be paired intriguingly with the National Academies' report *Rising Above the Gathering Storm*. ("In your book report, compare and contrast...")

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For a little light relief, you might read *Cat's Cradle*. Kurt Vonnegut's writing is highly crafted and economical without ever feeling terse, so his books are delightfully easy reads, despite addressing some of the most serious themes of our time. In this novel he draws upon his experience working in public relations for General Electric (GE), in Schenectady, where he met Irving Langmuir among other scientific luminaries who worked there in the golden age of industrial research. The GE R&D Center and some of its staff make thinly disguised appearances in the book, wherein its most distinguished member invents a polymorph of solid water called Ice-nine. Ice-nine is more stable than the substance with which we usually cool our drinks, and is solid up to 45.8°C. Clearly founded in classical nucleation theory, as allegedly explained to the author by Langmuir himself, all that is needed to transform regular water into Ice-nine is a suitable seed. This raises some very intriguing technical questions about why Ice-nine nuclei do not form spontaneously at the undercooling of a typical body of water, and these might even be good questions for your use in PhD preliminary exams. If it were real, we could probably use a little Ice-nine today, to combat the melting of polar ice that seems to be entirely composed of old-fashioned ice-one, and then you would also have an opportunity to consider questions of solid-solid phase transformations which Vonnegut did not address in the story. (Maybe the book would have taken a different form if Vonnegut had written it in the era of global warming instead of in

1963, when other methods of world destruction were more in vogue.) In any event, you can ponder the underlying scientific issues and easily predict the eventual outcome, while you enjoy the work of one of the most delightful satirists of the late 20th century.

Moving on from Vonnegut's light touch with heavy subject-matter, you can turn to the genre of "illustrated novels," better-known as comic books. We have already seen the release of a summer blockbuster movie, *Iron Man*, based on the classic Marvel comic book character of the same name. Originating in 1963, Iron Man is a mere human who derives his strength and powers from a high-tech armored suit. I would like to draw your attention, however, to the reissue of a collection of the DC Comics classic series: *Metal Men*. The Metal Men, which include one woman, first appeared in 1962, thus pre-dating the Iron Man offering from the rival comic-book publisher. The metal men of the title are six anthropoid robots, each made of, and exhibiting the unique properties of, an elemental metal: gold, iron, lead, mercury, tin, and platinum. These robots are endowed with human-like characters that are also based on their materials properties. At the end of each adventure the metal men always prevail over some threat to the world, although they are usually all destroyed in the process. Their inventor is evidently a master of recycling as well as robotics, though, because they all appear, ready for battle, at the beginning of the next adventure. You can certainly pick at the technical details, but there is a lot of innocent fun in these adventures, and some considerable truth in the descriptions of the properties that the metal men exhibit. It is suggested by some bloggers of the superhero genre that the very successful Marvel Comics *X Men* series (debuting in 1963) was inspired by the Metal Men, even though the X Men are biological mutants rather than engineering marvels. If true, that would mark an interesting parallel with real life, in which the United States Steel Corporation (founded by financial superhero J.P. Morgan) mutated into the anonymous USX Corp. in 1991, then back to United States Steel in 2001.

Whatever your choice in literature, use your vacation from the laboratory as an opportunity to kindle or re-kindle a habit of reading. Anthony Trollope observed (somewhat metallurgically) that "the habit of reading is the only enjoyment in which there is no alloy; it lasts when all other pleasures fade."

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