

Using Sawyer and Czerneda in the Classroom

David DeGraff

Physics and Astronomy

Alfred University

Using science fiction in the classroom is a great way to turn abstract concepts into concrete ones, bring objects far off in time and space into the here and now. It can turn philosophical musings into testable science, and make the alien into something familiar. (Bowater et al. 15; Czerneda, *No Limits*, 3) It is important to use good examples of science (Czerneda, *No Limits*, 20) to show both science and science fiction in a positive light, but science fiction movies generally make sloppy use of science that doesn't make sense, and treat scientists in a bad light. I have too much respect for science fiction to treat it as a subject of ridicule.

Take Artificial Intelligence as one example. While movies and TV often portray the artificial mind as an evil monster to be feared, novels like Rob Sawyer's *Mindscan* get inside the head of the artificial mind and let us see the world from its point of view. We get to read its thoughts and feel its feelings. After reading *Mindscan*, no one can say that a robot mind is just following its program or is cold and unfeeling.

The Alien is another concept that written SF portrays much better than most movies or TV shows. Instead of being a monster to be defeated, written aliens, such as the crew members of *Starplex* in Sawyer's novel of the same name, or Essen from Julie Czerneda's *Beholder's Eye*. can go into the complexities of alien cultures. By seeing

through the eyes of another, we can see the similarities and differences of the different species. Julie Czerneda's *Survival*, the first volume of her *Species Imperative* trilogy, shows biology on a grand scale, what an interstellar ecology could look like.

In written science fiction, scientist themselves are portrayed as real people instead of stereotypes. I use both short stories and novels that accurately use science in a way that shows science's creative side.

I've used both *Mindscan* and *Survival* in two of the general education classes I teach at Alfred University: "Science in Science Fiction" and "Aliens and Alienation". "Science in Science Fiction" was designed to fulfill the science portion of the general education program at Alfred University. Courses that fulfill this distribution must introduce the scientific method, include both quantitative and qualitative analysis, show the importance of lab and field work, and show the interrelations between science, technology and society. Science fiction can easily be used to reach all of those goals. Using science fiction to do some quantitative analysis takes a little work on the part of the teacher, but it can be done.

I've taught Science in Science Fiction for both the general student population, and as a First-Year Experience (FYE) class. "Aliens and Alienation" was a team-taught class with Allen Grove, a colleague from the English department which was designed to satisfy the General Education science distribution as well as the literature distribution.

For the Science in Science Fiction class, I try to keep mostly to 21st century science fiction (Frederik Pohl's *Gateway* and Robert Heinlein's "All you Zombies" were the main exceptions) and students have the option of taking 4 tests and writing one paper, or writing four papers with a final exam. We use topics selected from Artificial

Intelligence (AI), Black Holes, Aliens, Biotechnology, Living in Space, Quantum Mechanics, Cosmology, and Time Travel, all of which have a wide variety of novels and short stories which treat the topics well. I use *Mindscan* for the novel in the AI section. The story is told with a first person narrator who gets his mind scanned into an artificial body so we see all the internal monologues, before and after, not just the external reactions that we would see from a third person, or from a movie. I used Julie Czerneda's *Beholder's Eye* for the alien section when I first started teaching the course, but switched to *Survival* recently, both to keep with the 21st Century theme and because it shows a competent scientist in action. For one unit of "Aliens and Alienation", which satisfied both the Literature and Science distributions, we read *Frankenstein* and *Mindscan*. For the Biotechnology unit we read *A Clockwork Orange*, by Anthony Burgess and the novella version of "Beggars in Spain" by Nancy Kress. For the pure alien section we read *Survival*, and the section with the most alienation we read *Gateway* by Frederic Pohl, *The Invisible Man* by H. G. Wells and *The Strange Case of Dr Jekyll and Mr Hyde* by Robert Louis Stevenson.

In the novel *Mindscan*, a company called Immortex has developed a way to upload a person's mind into an artificial body. The original people go to live out the rest of their natural lives safely out of the way on the moon while the robotic bodies continue the person's normal existence. Jake Sullivan, the first-person narrator, goes through this procedure because of a congenital brain defect that could leave him in a persistent vegetative state like his father. Since Jake is not a very thoughtful person, and didn't actually discuss his plans with anyone, he struggles for his friends', mother's, even his dog's acceptance of his new body.

One of the Mindscan papers in Aliens and Alienation had this prompt: Which is more ethical – Victor Frankenstein’s creation of life in *Frankenstein*, or Immortex’s creation of androids in *Mindscan*? In your answer, be sure to explain what actions make scientific work ethical or unethical, and back up your claims with specific details from each novel.

After brain surgery to fix the congenital defect, the biological version of Jake^{*} has a chemical imbalance in his brain that severely alters his personality. Also, Immortex is able to make repeated copies of Jake’s mind, and alter them in subtle ways to experiment on his mind. These parts of the story are how I can justify using consciousness studies as a science instead of philosophy. Controlled experiments are possible, so we can treat the fictional experiments as real for the purposes of the class discussions. Indeed, the Immortex scientist on the moon, Gabe Smythe, even says as much: “I’m hoping to turn consciousness studies into an exact science, not some hit-and-miss game of chance...Psychologists have been unable to test their theories...I’m elevating psychology from the quagmire of the soft sciences into the realm of the exact—giving it the same beautiful precision that particle physics has.” (*Mindscan*, 348-349)

One of the Science in Science Fiction paper prompts was: “Look at the final conversation between Jake and Smythe. Is this really a valid way to study the human mind? Does the fact that an electronic brain can be manipulated make it any less real? What about the manipulation of bio-Jake’s brain that takes place in the story? Does being

^{*} In class discussions we refer to the two versions as bio-Jake and robo-Jake to make the distinction easier. That terminology also prevents students from referring to bio-Jake as the “real” Jake.

able to manipulate either the real thing or the simulation make them any less than a full person?”

Karen Bassarian, a famous children’s author, also has the procedure done, but when the original Karen dies on the moon, her son sues to get his inheritance. A large portion of the book is taken up by a trial to find out if the mindscan of Karren is the “real” Karen Bassarian..

The paper prompt for this part of the book was to look at an alternate version of the trial that could have taken place. “The trial in *Mindscan* was whether the mindscan Karen was entitled to the *property* rights of biological Karen. What if the trial had been mindscan Karen suing to get her *human* rights as guaranteed in the Constitution, specifically the First Amendment and the Fourth Amendment. You are a junior attorney working for either the defense or the plaintiff. Write the arguments you should make. What arguments will the other side use to counter side, and how would you refute them? Whichever side you take, you must anticipate the arguments the other side will make, and present counterarguments.”

The idea of personhood leads to a lot of good class discussions. There are three levels of personhood that are explored in the book, three kinds of being who are considered to be fully human by some of the characters and less than human by others. The mindscans themselves are an obvious example of this. A large portion of the book is dedicated to a trial showing that the mindscan Karen is entitled to the property of her biological self. But by looking at the reaction Jake’s mother and girlfriend give him (to say nothing of the dog) we can tell that these characters do not see the mindscan version of Jake as the real person. All the student papers comment on this aspect of personhood.

But the novel opens with Jake's father having an aneurism and suffering severe brain damage. "He is aware of his surroundings, but that was about it. The doctors said he had the mind of an infant" (*Mindscan*, 23) When Jake and his mother go to visit him, it's clear that Jake considers the body to be nothing but an empty shell, but his mother still thinks of that shell as her husband. Most of the student papers make this comparison as well, and it is a lengthy part of the class discussion.

The abortion debate is another instance where full personhood is debated. In the United States of the novel, fetuses are considered fully human, and abortions are forbidden after only fourteen days gestation, the point after which a zygote can no longer be split into two individuals, (*Mindscan*, 261). No papers have mentioned this explicitly, and students do not bring up the topic in the class discussion, probably because of the volatility of the abortion debate in the US.

Mindscan treats the topic of consciousness studies superbly well, the scientists in the story do not all come out looking so good. To counter the mad scientist trope that comes out in *Mindscan*, I use Julie Czerneda's *Survival*, a story with a research scientist at the main point-of-view character. The biological themes the protagonist studies are central to the themes of the book.

The opening paragraphs of these themes very nicely.

"My Money's on the plant."

"The antique clay pot on the windowsill ignored Mac's comment, preoccupied with containing the immense aloe that folded its lower thick leaves over the pot's rim like grasping fingers and burst roots from beneath so the combination tilted in its saucer. There weren't cracks...yet.

But the plant would win. Time, toughness, and a single-minded refusal to accept barriers to its growth. Mac approved.” (*Survivor*, 5)

Dr Mackenzie Connor (Mac to her friends) is a salmon researcher in a future where the entire Pacific coast is kept as a nature preserve. Meanwhile, in the far reaches of the galaxy, whole worlds are being destroyed, all life vanishing, leaving nothing but rock behind. Mac doesn't care. She studies Salmon. Then an alien, Brymn, a member of the Dhrym species—large, blue, with many arms—shows up and asks for her help in studying the problem. When she asks Brymn why, we get this passage:

A low hooting sound. Frustrating, not knowing if it was laughter, a sob, or an alien flatulence. *She had to read more.* “Your interests are in a bigger question, is it not? What is the minimum genetic diversity required in a population to respond to evolutionary stress? What is that evolutionary unity for a species, a community? For a world?” (*Survival*, 78)

When I first read that passage, I was sure that I would be using this book in class.

The fundamental equation of Population biology, the Verhulst Equation, drove a lot of the science discussion for this book and we used it as the basis for some quantitative reasoning. The Verhulst equation is $\frac{dN}{dt} = rN \left(1 - \frac{N}{K}\right)$, where N is the number of individuals, r is the reproduction rate, and K is the carrying capacity—the maximum number of individuals an ecosystem can support without crashing. This equation lets us talk about two different reproductive strategies, K-strategy and r-strategy reproduction, which focus on the K and r terms in the Verhulst equation, respectively. In r-strategy reproduction, the organisms try to maximize the number of offspring, like frogs laying thousands of eggs at once. This strategy is most useful for small, fast-growing

creatures, or when the climate is in flux, and the large number of offspring will have a lot of variation among them, increasing the odds of survival. In K-strategy reproduction, the organism has a small number of offspring and takes care of them. This strategy works well for larger organisms, or in times of stable climate.

When Brymn says “Nie rugorath sa nie a nai.” A Dhrym is robust or a Dhrym is not. (*Survival*, 80) it is an explanation for why there is no Dhrym medicine or doctors, and why he needs her help for the biological questions. Later we meet the Dhrym progenitor, an enormous building-size creature with oomlings--baby Dhrym--pouring out of her body. Clearly the Dhrym are r-strategy reproducers, and do not spend a lot of time or energy caring for their young. This is a great example of how biological imperatives can influence a species' culture.

We gave the students in *Aliens and Alienation* some open ended questions (as well as a few more concrete ones) to help focus the class discussion.

- How do the political, personal and scientific intersect? Is this good?
- How does the author alienate the reader? That is, how does she make things seem foreign and unfamiliar? Why does she do this?
- What are some of the more alien aspects of Brymn's biology?

In the class discussions for this book, in all the sections I've taught, most students were eager participants and produced good insights. Population biology and human populations and conservation themes came up often. A few even said they couldn't wait to read the sequels.

Both *Mindscan* and *Survival* offer ample opportunities to meet the goals of a science General Education class of introducing the Scientific Method, including both

quantitative and qualitative analysis, showing the importance of lab and field work, and showing the interrelations between science, technology and society. While quantitative analysis is harder to do in *Mindscan*, it easily fits into a discussion of *Survival* with the Verhulst equation and population growth. The real strength of both these books, though, is showing the interrelation with science, society and technology, and letting students think about ideas in new ways.

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