

What to give your new graduate student as a house-warming gift

A joint review of "Cantor's Dilemma" by Carl Djerassi (230 pp, Doubleday, 1989) and "Intuition" by Allegra Goodman (344 pp; The Dial Press, 2006).

If there were no grants to write, no classes to teach, and no meetings to attend, and you had time to organize your thoughts, imagine what you might say to your new graduate student as he/she enters your lab? You'd want to prepare them for the extraordinary pressure of the work when deadlines are looming but also counsel them against cutting any corners. You'd want to explain that they will be expected to work independently, but since you already laid the groundwork for them, you will be a co-author on every paper. You'd want to tell them that working fast and publishing early is good for one's career but publishing too early can be fatal. You'd stress the centrality of the lab book and good record-keeping in lab culture. Above all, you'd preach the importance of safeguarding trust and openness among collaborators; that science is based on trust. That we must all be able to trust the published literature as we must be able to trust the work of our immediate colleagues – and that includes graduate students. Without trust there is nothing.

Now imagine how such a speech would be received. The Far Side cartoon of what a master says to his dog, "Now Ginger, don't eat the daisies...", and what the dog hears, "Blah, Ginger, blah, blah, blah, blah..." comes to mind.

There may be a more enjoyable and more effective way to broach these and other important ethical issues: give each entering student copies of "Cantor's Dilemma" (1989) by Carl Djerassi and

"Intuition" (2006) by Allegra Goodman. Encourage them to read them and talk about what they've read.

The two books, both novels that revolve around possible instances of scientific fraud, cover a host of ethics-in-science issues that every student -and every principal investigator- should consider. "Cantor's Dilemma", the less literary of the two (it was Djerassi's first effort in what has since become a tetralogy of "science in fiction" novels) is no less enjoyable and no less a valuable teaching tool than "Intuition". The dialogue in the older book is a bit stilted, but Djerassi's story may pack the higher ethical-issues-per-page quotient over Goodman's.

Isidore Cantor is a well-known cell biologist who proposes a new theory of tumorigenesis in a guest seminar he is giving at Harvard as the story opens. His Harvard-based rival and sometimes tormentor, Krauss, acknowledges that Cantor's talk, "Will go down in history." But first Cantor must devise an experiment to support the theory and now that the theory has been stated in public, time is of the essence. When he comes up with a very complicated experiment to prove his idea, he hands the difficult bench-work off to his most promising post-doc, Jerry Stafford, with the heavy-handed admonition, "its an experiment that's *going* to work. I feel it in my bones." From there, it's off to the races. Races for proof, publication, publicity, and prizes. In the first 60 pages, Djerassi manages to weave

together not only the overbearing expectations of the PI on his underling, but questions of authorship, priority, intellectual property, gender discrimination, superfluous publishing, mentorship, and questionable romantic relationships between unequals (read, students and faculty.) One of Jerry's roommates, Leah, an English major, is charming in her irreverence and plays the important role of foil to the cast of scientists. As a non-scientist, she can ask the naïve questions (that your graduate student may want answered). Learning that a third roommate's paper would be co-authored by the student and her faculty adviser, Leah confronts the adviser, Jean Ardley, directly,

“Why does your name even appear on the paper?” she continued full steam. Wasn't Celly the one who did all the work? My adviser suggested the topic for my Ph.D. thesis but she isn't going to put her name on my articles. Why do you people do that in science?”

Perhaps the reader has had the same conversation and will be interested to compare responses with the one given by the fictional Professor Ardley. Although the story is fictional, the author, an accomplished chemist and recipient of many national awards for science and technology, salts it throughout with real science and real scientists – many of whom are his personal friends and acquaintances.

Goodman's first foray into the world of science is not her first novel. An accomplished author and the recipient of many national awards for fiction, her novel is inspired by a real event. The so-called Baltimore case, named or

misnamed, for the Nobel-winning co-author on an article published in Cell in the 1980s whose contents were questioned by a post-doc working in the lab of the senior author, Imanishi-Kari. Goodman's story is not historical fiction, per se, but it retains some of the more notorious aspects of the real event, particularly the ultimate involvement of the NIH Office of Scientific Integrity in the inquiry.

Unlike Djerassi's work whose main purpose is to construct hypotheticals with ethical implications, Goodman tries to bore into each of her characters' backgrounds and uncover the motivation for their actions. She fills in a complete and compelling back-story to what the reader may know from press accounts of the real case. After an accusation of wrong-doing has been made against Cliff Banaker, a hot-shot post-doc, the PI asks a trusted senior post-doc, Feng, to comment on the quality of the Cliff's work. When Feng - who also happens to be a Chinese national - replies simply, “He worked very hard” his reticence is mistaken by the PI for a statement of support. But thanks to the author's full exploration of the characters, we learn what the PI does not. Feng,

“had a well-earned abhorrence of this scenario – one researcher pulled out to inform on another. His father had been denounced by his own colleagues, and forced to wear a dunce cap painted with his crimes. His father had been paraded up and down and forced to recapitulate the errors of his ways. At that time, Feng's mother had taught him to lie... The two of them practiced until the lies were second nature.”

The "Intuition" of the title refers to the gut-feeling on the part of the accuser that a prominent publication presents a selective (and thus fraudulent) representation of the experimental results. As in the real affair, the accusation –willingly helped along by the lay press - unleashes a Pandora's box of reactions that reverberate beyond science into politics and back again. The climactic confrontation between politician and scientist is worthy of the courtroom confrontation between Tom Cruise and Jack Nicholson in "A Few Good Men" ("You can't handle the truth!") In "Intuition", Goodman shows the reader each issue from many people's perspectives but in the end, she takes a definite stand as to who are the villains and who are merely flawed human beings. You'll have to read the book to find out who is who. Along the way, she captures the culture and the mindset of research surprisingly well for a non-scientist. As most of us will admit, sometimes the mindset is one of pure despair, as Cliff laments,

Research, which had once been dreary, and then addictive, now seemed a tragic enterprise, one false hope yielding to another, progress shattered by bad luck and the greatest expectations doomed to disappointment.

What both novels do quite successfully is to bring to life the intense pressures on scientists to produce positive results. Good results are needed to power high profile papers and grant proposals. Without these things funding cannot be procured and even a bright career may be extinguished. The attendant pressures are easily (and sometimes inappropriately) transmitted from PIs to

students and post-docs. Under pressure – and if not sufficiently inculcated in the rules of science - trainees may not yet possess the self-confidence or maturity to stand their ground when results are negative. It may seem to them that the quickest way to relieve the pressure would be to select the best data or help the reaction along a bit by adding extra reagent. Unfortunately, in both stories, as in life, even a hint of data-fudging can evaporate the trust between senior and junior colleagues irreparably.

So the next time you induct a new graduate student into your lab, you can give her that dry lecture on all the possible ethical pitfalls of the job. You can set him to reading a heavy textbook about proper and improper behavior of a scientist. But how much more fun and long-lasting to let the student experience some ethical quandaries with Djerassi's and Goodman's characters. If these books help to make your students more conscious of the potential for conflicts, more alert to the corrosive influence of intense pressure, more aware of their obligations as scientists to the scientific community, they will have served a useful purpose beyond the immediate enjoyment they will give in the reading.

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