Indiana: Wrong Answers—But No Right Ones

For 2 years, cell biologist Alvin Tesler helped run a course on research ethics for second-year graduate students in biology at the Chicago campus of Northwestern University that Tesler admits was lackluster. Researchers and administrators delivered lectures on the usual topics—authorship, intellectual property, conflict of interest, and the like. Not surprisingly, attendance hovered around 50%. This year, however, Tesler reports that attendance is up to at least 90%.

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Yes, you can! Indiana's Ken Pimple says his course, Teaching Research Ethics, aims to convince scientists in a week that they can teach ethics themselves.

He credits the turnaround to a seminar called Teaching Research Ethics he attended at Indiana University's (IU's) Poynter Center for the Study of Ethics and American Institutions. Tesler says the seminar exposed him "to different ways of teaching research ethics and different ways of thinking about it." When he returned to Chicago, he helped reshape the Northwestern research ethics course into one aimed at promoting the lively discussion of case studies.

Teaching Research Ethics, or TRE, is a week-long workshop for graduate science faculty at Big Ten schools, as well as the University of Chicago. It's led by the Poynter Center's Ken Pimple, who has a Ph.D. in anthropology, and David Smith, a professor in IU's religion department and director of the center. The motivation for TRE, says Pimple, is simple: Although the National Institutes of Health mandated in 1989 that institutions receiving NIH training grants had to provide instruction in research ethics to their young researchers, that did not necessarily mean that the scientists themselves would be prepared to teach courses in the subject. The goal of TRE, says Pimple, is to "convince scientists by the end of a week that they have enough training and life experiences as scientists that they can teach ethics, that it doesn't have to be taught by a philosopher, and then to convince them that it's worth their while to teach it."

The course runs for 5 days in May and includes 30 participants nominated by research deans of the participating universities. The deans are requested to look for respected research scientists who are fairly well established (although not necessarily tenured), credible in their departments, and able to act as leaders to disseminate what they learn.

The course weaves practical sessions on specific ethical issues in research—the use of human and animal subjects, for instance—with pedagogical sessions on the nitty-gritty of teaching ethics. This year Pimple is doing four sessions on teaching, including the use of short writing assignments and small group assignments; one on a software package he helped design that creates interactive case studies; and one he calls "Our Favorite Teaching Techniques," an open forum to allow the participants to discuss their own ideas and techniques. Special attention is given to teaching the participants how to assess student learning in ethics, with a series of lectures by Murial Bebeau of the Center for the Study of Ethical Development at the University of Minnesota.

Pimple and Smith also bring in outside researchers to lecture on issues in scientific conduct, including scientists who have designed well-regarded research ethics courses, to give the TRE participants "some models to work from," says Smith. For instance, Michael Zigmond of the University of Pittsburgh does a lecture on his ethics curriculum (see p. 1709). These researchers convey an important message just in being there, says Pimple: that research ethics should not be taught only by ethicists or philosophers.

What TRE does not try to do is teach the scientists specific rules and regulations or rights and wrongs in issues such as authorship, intellectual property, or misconduct. Instead, they provide a list of professional societies that have codes of ethics they can use. "Our assumption," says Pimple, "is that these are fairly good and responsible people, and they need a little bit of help getting started. ... What we try to do is show them that they can communicate to their students that there may be no absolute right answers, but there are certainly wrong answers—ones that are universally, indisputably accepted as wrong."

–Gary Taubes

The perplexity was deepened by data from Sayeeda Zain, also in Roberts' lab, who did not find the 11-mer on the adenovirus DNA where the mRNA predicted it should have been. Two other CSHL researchers, Ashley Dunn and John Hassell, had also found that fragments of adenovirus DNA from one region of the viral genome hybridized to mRNA that seem to come from a different region. Additional puzzling data were contributed by CSHL's James Lewis, Carl Anderson, and John Atkins.

All of these findings contradicted the dogma that genes are continuous, with each mRNA corresponding to one smooth strip of DNA. While paradoxes were piling up at CSHL, Sharp's lab at MIT was focusing on a similar mind-teaser unearthed by postdoc Susan Berget. Berget had been making electron micrographs (EMs) of adenovirus DNA hybridized to mRNA and had found pieces of mRNA inexplicably flapping at one end, unhybridized to any DNA.

In March 1977, CSHL was buzzing with the rumor that Sharp's lab had made an important discovery related to adenovirus genes. Roberts believed it might be related to the puzzle of the 11-nucleotide sequence that wasn't hybridizing where he expected it to on the DNA. Spurred by his fear that he was about to be scooped by Sharp, Roberts hit on an EM experiment he hoped would explain the origin of the baffling 11-mer. Fortunately, CSHL's Louise Chow and her husband Tom Broker were world-class EM researchers who were very experienced in determining the location of adenovirus mRNAs on the DNA. Roberts gave his idea to the wife-husband team, who refined the concept, worked out the details of the experiment, and carried it out during the next few weeks.

The EMs revealed that Roberts' main hypothesis of how the 11-mer originated was wrong. But he wasn't disappointed, because the experiment was so fruitful: It confirmed that the beginning of the mRNA thought to contain the 11-nucleotide segment bound to a different part of the DNA from the rest of the mRNA. Even more startling, the DNA bound to this segment of mRNA had two loops of DNA extending outward, indicating that those portions of the DNA did not correspond to anything in the mRNA.

Somehow, the CSHL team concluded,