

Ethical discourse by science-in-fiction

It can be difficult to discuss ethical dilemmas in the academic environment. One way of doing it is through 'science-in-fiction'. The following 'science renga' shows how this is done with virtually total anonymity.

Carl Djerassi

"Ethical discourse through science-in-fiction" is the formal title of Medicine 256, a graduate course I have recently offered under the auspices of the Center for Biomedical Ethics of Stanford University's School of Medicine in California. Given the sudden proliferation in the United States of new courses on biomedical ethics, what is different about Medicine 256?

Scientists operate within a tribal culture, the rules, mores and idiosyncrasies of which are generally acquired through intellectual osmosis in a mentor-disciple relationship. Scientific 'street smarts' are absorbed by observing the mentor's self-interested concerns with publication practices and priorities, the order of the authors, the choice of journal, the striving for academic tenure, grantsmanship and even the Nobel prize. On their own, disciples discover the 'glass ceiling' for women in a male-dominated enterprise, the inherent collegiality of scientific research, and also the *Schadenfreude* generated by brutal competition. Most of these issues are related to the desire for personal recognition and even financial rewards, and each is coloured by ethical nuances.

An effective medium for illuminating such topics is the rarely used literary genre of 'science-in-fiction' (not to be confused with science fiction), in which all aspects of scientific behaviour and scientific facts are described accurately and plausibly. By disguising them in the cloak of fiction, science-in-fiction allows the illustration and discussion of ethical dilemmas that are frequently not raised for reasons of discretion, embarrassment, or fear of retribution.

As an experiment in using science-in-fiction as a didactic tool, I asked 14 graduate students and postdoctoral professionals from 12 different departments at Stanford to compose a short story of up to 10 pages, dealing with the ethical issues associated with relevant behavioural practices in science or medicine.

After I had discussed each with its author and it had been subsequently revised, the stories were distributed among all participants without the authors being identified, to allow unrestricted discourse. The rest of the course was made up of some in-depth and heated discussions of the ethical or behavioural problems raised by the stories.

As well as creating a forum for open discussion and debate, the course also addressed the question of how scientists might communicate better with their col-

leagues and the general public. This led to an attempt to use the Japanese form of renga (linked verse in which stanzas are composed by two or more poets in alternating sequence, often as a form of competition) to create a short story dealing with a scientific ethical dilemma. Each paragraph was composed by a different student who did not know the identity of any previous author. Each student then added a fifteenth paragraph to the 14-paragraph 'science renga', generating 14 new endings. The 'winner' was selected by closed ballot and lightly edited for length. Although it bears the names of all authors — a feature common among scientific papers but virtually unheard in literary publication — none knows who contributed which segment.

Japanese renga bears a resemblance to the process of scientific co-authorship, as it has collegial and competitive aspects, but our experiment is a 'purer' collaboration because each author is associated with the whole enterprise but no identifiable individual component. Further similarity to a scientific paper was pursued by one of the participants, E. Weber Hoen, who composed an abstract of the original 14-paragraph 'science renga' in the form of a 14-line sonnet called "Old goat".

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For further discussion of science-in-fiction see

<http://www.djerassi.com>

"Old Goat" by E. Weber Hoen

**Old goat, the kid who challenged you is dead
and the rain has clapped its hands of the affair.
And yet, your horny crown is filled with dread,
and your face exaggerates the weight of hair.
Suspicious of the genius in the stones,
you make a science of your steps, and climb,
negotiating past those ghostly bones,**

**which keep from you their insights into time.
It is height you desire, and with that, truth,
to shake your beard on an eternal view,
as if from there you might behold your youth.
The rain, though, has you blind. Below, like you,
the young conspire in fear against their king.
Goat, you are old. You have not learned a thing.**



MARK DOBSON



A science renga

Alfred N. Aldston Jr*, **Dina L. G. Borzekowski¹**, **Jonathan A. Eisen²**, **Sheri L. Fink³**, **E. Weber Hoen⁴**, **Dean Y. Hung⁵**, **Shirley Lin⁶**, **Cynthia T. M. H. Nguyen⁷**, **Julie E. Phillips⁵**, **Michelle Stohlmeyer⁶**, **Cenk Sumen⁸**, **Craig A. Swanson⁹**, **Noriko Takiguchi¹⁰**, **Yvonne Thorstenson¹¹** & **Harriet A. Washington¹²**

"Pall bearing is a young man's job," thought Mankiewitz as Dr Carlson's corner of the casket slipped lower. Mankiewitz was surprised by his advisor's struggle. The hairy billy goat had never appeared to lack vigour. But today, rain dripping from his clumsily cropped beard and the white tufts of hair on his wrists, he seemed a frailer, more tamed version of himself.

The death of Alan Stilwell had shocked Carlson. Yet he could not have hoped for a tidier solution. Alan had been his best postdoc, and a good friend. But when Alan stole his idea their friendship unravelled into bitter competition. Thoughts of Alan's betrayal and its ironic, unpredictable consequences strengthened Carlson.

"Angry at the fates, Professor Carlson? Or just frustrated with their whimsical nature?" Mankiewitz disrupted the silence as the opposite corner of the casket rose. "I always told him not to drive his Miata so fast." Carlson checked his stride, "I guess he'll live

through his publications." As they returned to their positions for the eulogy, Carlson leaned toward Mankiewitz, "Come to my office tomorrow so we can go over the last few weeks of Alan's notes. You were closest to his work." Mankiewitz steadied himself. "Professor," he whispered back, "screw yourself."

After the service, Carlson, Mankiewitz, and a few others lingered by the grave before trudging to their cars. Carlson noticed Mankiewitz entering a limousine with Jesse Stilwell, Alan Stilwell's father. Jesse was a highly decorated member of the National Academy of Sciences, a superstar. It was Jesse who had persuaded Carlson to take Alan into his lab.

As Carlson drove towards his office, his thoughts were paced by the wipers' frenetic beat: Man-kie-witz, Stil-well, Man-. He wondered why Jesse had offered his limo to Mankiewitz. He chided himself for worry-

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ing. Jesse was a trusted colleague, his recent call had assured him of that. Carlson approached his office ready to use his key when he noticed the door was cracked open. His computer screen glowed, outlining the head and neck of the body sitting before it.

This apparition reminded Carlson of his last image of Alan. He had been working with his mouse, deftly clicking his way through the Cambridge Crystallographic Database. A tri-folded smartly headed letter stuck out of his back pocket. Carlson neither would have noticed the letter, nor known what it contained had his editor friend at *Science* not just called. Indeed, the rumours were true. Eldorex Corporation's scientists had just confirmed that untransformed, normal cells could live indefinitely if they expressed telomerase. As Carlson had predicted, senescence could be surpassed. The call also confirmed another of his suspicions that had grown out of Alan's persistent questions about inventors' rights, the seemingly irrelevant articles about the intercalation of hydrophobic and hydrophilic polymers into cell membranes piled on his desk, and those inaccessible conversations with Mankiewitz. The call was the final piece explaining that Alan was neatly bypassing his advisor and the university by licensing to Eldorex the technology necessary to deliver telomerase into specific cells in the body. Carlson thrust the door open.

The person sitting at the computer jumped up and grabbed a small tote bag. Racing out of the office, he shoved Carlson aside. As he grabbed the doorjamb for support, Carlson registered the man's face, especially his hazel eyes; they would not be forgotten. Carlson watched in disbelief as the interloper scrambled down the hall. He thought first to call the police, but embarrassment and fear dissuaded him. He assessed the office. Disks were strewn about, and on the screen were files containing data from Alan's polymer experiments. He wondered how the intruder knew to look on his computer, not Alan's.

Mankiewitz rode in the limousine uneasily, thoughts of the cold cemetery affixed in his mind. A day like today makes one consider cremation, he thought, and shuddered. Alan's silent father sat on the side-facing seat to his left, staring out the window. The day after the accident, Mankiewitz had received a call from him. His manner had been abrupt but not unlike what Mankiewitz expected from busy scientists. "This is Jesse Stilwell," he had said, "Tell me what you know about Alan and the Eldorex Corporation." Too shocked to deny his knowledge, Mankiewitz had simply hedged, "I would feel more comfortable speaking with you in person."

When he entered grad school a dozen years ago, Mankiewitz had piously denied the motivation of money. But as friends purchased homes, cars, and fancy vacations, his ideals tarnished. Now wiser and less idealistic, he stayed in academic science only to network and discover potentially profitable biotech ideas. The other graduate students and postdocs knew Mankiewitz was older, but never questioned his work. He was good at deflecting their curiosity by focusing on their interests. When the younger Stilwell began speaking to him about telomerase, Mankiewitz knew he had found gold. With effort he had convinced Alan to ignore the university stipulations that all discoveries and a portion of any patent royalties were considered University property. Mankiewitz arranged Eldorex's licensing agreement for Alan, not disclosing his finder's fee. He made sure Carlson and the University remained unaware of the arrangements and maintained the pose of a hard-working postdoc. But as the surreptitious project neared completion, Alan had expressed concern and fear.

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Now that Alan could never proclaim these fears again, Mankiewitz wondered how much and what to reveal to Alan's father.

Jesse Stilwell began the conversation. "I'm the one who sent him to Carlson's lab to work on telomerase. Yet my own son avoided me after he became involved with Eldorex." Mankiewitz had long ago learned that lies were dangerous; one had to remember exactly what had been said. Partial truths were easier; one only said what one wanted to say. "The original idea was Carlson's, and Alan was excited," Mankiewitz responded slowly. "He felt it could be a blockbuster. But he wanted to get the technology to the public as soon as possible." He gauged Jesse Stilwell's reaction carefully. "Alan felt Professor Carlson was stalling, so he went directly to Eldorex. He realized this was dangerous, but felt he had no other options. And I assisted in the agreement with Eldorex." Stilwell looked out the window. "I knew that someone close to Alan must have lured him away from me. I thought it had been Carlson." He paused. "I prefer to learn that it was you."

Carlson sat at his desk, staring at the computer, reliving the bitter experience of having lost telomerase to outside licensing. He had suspected Alan's industrial connection, but had not been willing to confront him. Instead, he had capitalized on Alan's ignorant use of lab computers to collect Alan's data on his own computer in an attempt to reclaim his original idea. Alan's death had given him the impetus he needed to absorb that material. Before the intrusion he was slow, too distracted to be productive. But as he urgently reviewed the data, he began to grasp the extent of his ignorance of Alan's work.

A few days after the funeral, the phone startled him. A woman's voice said briskly. "I'm May Turner, vice-president of one of Eldorex's competitors. You don't know me or the company. Dr Jesse Stilwell, our principal scientific advisor, thought you might be willing to meet... and soon."

They met that evening. Instead of the expected Stilwell, the burglar who had rifled his files accompanied Ms Turner. They were not introduced. Carlson offered his hand to the tall, lithe woman. "Let me get right to the point." Her eyes widened as she tendered a quick smile. "As a lawyer, I'm an observer of human nature. It's been twenty years since your seminal work on cell death was anticipated by a similar publication in *Nature*. I suspect you're disappointed not having received the rewards you expected from your career. I can't return two decades of frustration but I can offer a degree of financial security that academia cannot match." Turner looked him fully in the face. "Alan Stilwell's unfortunate death had for us the advantageous effect of interrupting his work for another lab, work rightfully covered by the university contract. We want you to help us develop that work. This move breaks the possibly incriminating chain of custody, as you have no prior knowledge". "It was my idea," blurted Carlson. "Of course," she said, "but every lawyer knows that reduction to practice is as important as conception."

Soon, it became clear to Carlson that Turner and the intruder had reached the same conclusion as he: the treasures of Alan's work were not revealed in the computer data, but were hidden in the procedural details — the cornerstone of experimental and financial viability. They agreed to meet again. Carlson returned to the lab, to Alan Stilwell's bay. He began scanning through his student's ordered notebooks, flipping the pages. Pictures, gels, text... one blur after the other. Procedure, Results, Ideas, Brainstorm... the labels spun by. He searched for keywords: intercalating, polymer, hydrophobic, telomerase, senescence, cell cycle, cycle. Nothing. As the details blurred, he recalled the police accident report: "Personal items were recovered... but not identifiable because of fire damage... cause unknown."

"You won't find it there." Startled from his whirlwind of thought, Carlson spun toward the door. Mankiewitz stood there, smiling tensely. "I've already looked," he said. "Even before his death. But I've come with a proposition. May I sit down?" He pointed to the lab stool. "Mankiewitz," growled the professor, "I quote: 'screw yourself.'" □

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