



Cloning reality into fiction

The Experiment

By John Darnton

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The body on the slab had been relieved of nearly every vital organ, its fingertips had been burned to disguise fingerprints, an identifying mark had been gouged from the thigh. The teeth were perfect. DNA tests confirmed it as the body of a judge across town. A judge several years older, and still very much alive. The body was that of the judge's double, or "Gemini," who spent his entire life in The Lab, on balmy Crab Island off the coast of Georgia. He and his cohorts there were in the best of health, cared for, or imprisoned, by a team of physicians and orderlies. No one left the island, no one knew what was on the Other Side. Sometimes, someone vanished.

John Darnton's novel, *The Experiment*, explores the inner workings of a group so determined to achieve immortality that their diabolical plan makes a mockery of the very moral fiber of human society.

Biology stands between us and immortality. Our organs fail due to age or disease. We have accidents. Our minds fail. If we could replace each damaged organ with a healthy one, we might extend life. To do so, we'd need a ready source of compatible organs, ideally from an identical twin. Unfortunately, not many of us have a twin, and a twin can spare a kidney or some skin, but not a heart or a liver, or a second kidney. In Darnton's book, an organization known as "The Group" solves this problem by rearing "clones" born only to serve as a source of replacement parts for their elder prototypes. And lest those clones fail, another cohort of clones is started every five years or so. It is the ultimate form of slavery, and embodies the very darkest of the fears about how cloning might be misused.

Organ transplantation can't enable us to live forever, even with an infinite supply of suitable organs. Cell division itself reaches a limit. One of the likely reasons is the deterioration of telomeres or the loss of telomerase activity. The Group developed a system for injecting telomerase into cells.

As technology advanced, they tested a gene-therapy approach, inserting the telomerase gene into cells so that the cells would continue making their own telomerase indefinitely.

Unfortunately, the telomerase seemed to have been altered in the production process (a minor glitch in PCR) such that it inter-

fered with telomere maintenance. The result was an accelerated aging process that threatens The Group, the founding parents and the prototypes. The treatment was sold to the rich and famous on the black market, and the older members of The Group, as well as the youngest clones, were also treated. The children would have a lifespan of less than 12 years, and the elders were on a collision course with death.

Born in the very fury of the cloning age, *The Experiment*

is a masterly effort at describing the exciting science of life extension, and the ethical implications of this undertaking. Explanations of the science involved cover telomere shortening with age, organ transplantation, cloning, embryo splitting, gene therapy, twin studies, nature versus nurture and the genetics of behavior. Author John Darnton did his homework. Then London Bureau Chief for the *New York Times*, he interviewed Keith Campbell, one of the Roslin pioneers who made Dolly possible, in the very days following Dolly's birth.

The Experiment is "hard" science fiction—grounded firmly in fact, but stretching significantly beyond the known. Tizzie, with one glance at an unknown specimen under the microscope, knows that the cells were flooded with telomerase that had been introduced using a plasmid, and that the copy of the telomerase gene used was defective, damaging instead of rebuilding telomeres. Short of her cleverness and a lot of improbable events leading to the discovery of The Group, I'm hard pressed to find any idea that isn't at least plausible. Darnton recognized that technology and science would change rapidly. If the

prototypes were in their 30s, then obviously the technology used to create them had to exist 30 years ago. When the first Gemini were born, that technology would have been embryo splitting, not cloning by somatic nuclear transfer. Concurrent with science's discovery of the possible role of telomere shortening in cellular aging, members were treated with telomerase-enhancing drugs, then by direct transfection of telomerase genes. Life extension by cloning from adult somatic cells was used in still later experiments. Many pages of the book read like excerpts from my own lectures in genetics and developmental biology, although somewhat more eloquent. There is even a hint that Darnton recognized the potential complication in uniparental offspring due to genomic imprinting. There are a few outright errors in the text, but they can be attributed to simple slips rather than a serious misunderstanding, or misrepresentation, of the facts.

But what does a science fiction work do for (or against) science? One of my colleagues was livid after seeing *Jurassic Park*. How could they portray scientists as monsters? The thought hadn't even crossed my mind. Considering only entertainment value, I can imagine what a sleeper *The Experiment* would be if everyone lived happily forever after. Good uses of science just don't make very exciting fiction, and should be confined to the pages of *Nature Genetics*. Classic science fiction showed us what we might expect if we were to travel to other worlds, or if other worlds were to travel here to find us. It was never very pretty. But it wasn't science fiction that devastated our space program. That was efficiently done by a few hasty decisions contrived to make NASA look good. The film *Gattaca* didn't paralyze our efforts at gene therapy. Errors in judgment, motivated by the need to demonstrate success, accompanied by slipshod reporting and inadequate screening of candidates, did that. Fiction gives the public a chance to absorb tantalizing tidbits of our science in a very palatable and entertaining way. After they have taken the bait, we, as scientists and educators, should follow with a more accurate, if less amusing, rendition of the facts.

The Experiment is thoroughly entertaining and a thought-provoking read. Darnton has joined a string of thrilling scientific findings and perplexing ethical conundrums into one very lucid piece of work. More fast-paced than Darnton's previous novel, *Neanderthal*, and more accurate with regard to the science, it keeps the reader guessing. Yet on every page are the ethical questions our children will face every day, and the science that will drive medicine into the next millennium. □

