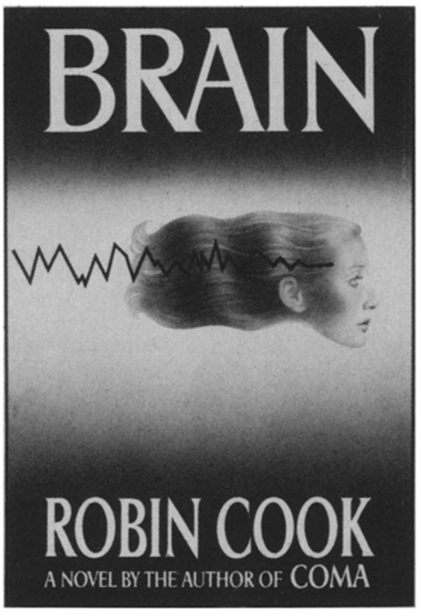
OFF THE BEAT

Beyond Brain Scan: Science Fact vs. Fiction



Strange seizures, mysterious disappearances and agonizing deaths are in store for young women who get routine gynecological exams at the Hobson University Medical Center. Assistant Chief of Neuroradiology Martin Philips stumbles onto this gruesome mystery after being frustrated in attempts to obtain X-ray scans of the women's brains for his research project. Pursued by agents after his life, he makes a last desperate attempt to solve the horrible puzzle. He gains entrance to the hospital by posing as a drunken bum stricken with a heart attack, disguises himself as a staff member and begins scouring the gynecology clinic with a radiation detector. There, in a false bottom of a laundry hamper, he finds two shielded lead boxes. One is labeled 2-[18F] fluoro-2-deoxy-D-glucose; the label of the other has been partially scraped off, but Philips deduces the contents are another radioactively labeled deoxyglucose compound. This latter box makes Philips's radiation counter go crazy.

"2-[18F] fluoro-2-deoxy-D-glucose!" I exclaim, bolting upright in bed. This novel was beginning to read like the last brain research article I had written for SCIENCE NEWS. My article had been about research results from the use of radioactively labeled deoxyglucose, including the fluorine form, as a tool to map brain functions in animals and humans (SN: 1/31/81, p. 76). Now in my bedtime reading — a new "techno-horror" called *Brain* — a fictional neuroradiologist is on the road to solving a mystery because he " ... remembered enough to realize that if a compound like deoxyglucose was made sufficiently radioactive, it could be injected into people and used to study its absorption in the brain." Surgeon-author Robin Cook uses a fictional variation of the technique that has been exciting brain researchers to draw a horrifying picture of what can happen when scientists disregard medical ethics.

As the story continues, the hero learns that ruthless scientists have been administering radioactive deoxyglucose to unsuspecting patients, then exposing them to a pattern disguised as a vision test. The nerve cells that absorb the chemical are killed and thus reveal the pathways involved in information processing. "We were encouraged to give huge doses to delineate the final associative areas of the brain," one of the ruthless scientists explains. But the large doses cause noticeable symptoms and the patients have to be "brought in." The final horror scene begs for projection on a movie screen; it might equal the impact of the suspended bodies in the movie based on Cook's earlier novel *Coma*.

Amusement, anger and dismay were the reactions I received when I described the book to some of the real-life scientists who use the deoxyglucose technique in their research. "I hope he didn't get the idea from us," chuckled Louis Sokoloff when I began recounting the plot to him. Sokoloff is the National Institutes of Health chemist who developed the strategy for using deoxyglucose as a marker of brain cells. On hearing more of the details, however, he agreed that the story was based in large part on his work. "But it extrapolates enormously beyond reality," was his analysis.

More upset about the fictionalization of the technique were the researchers who have been mapping brain functions in volunteers. "It's a pity to take a promising technique in its infancy and prostitute it like that," says Michael Phelps of the University of California at Los Angeles. "That's really poor form." He says that such a story can be offered as fiction, but many people may regard the technical details as true. He worries that the book, which already has been listed as the No. 2 bestseller at two national bookstore chains, will make people afraid to participate in experiments using deoxyglucose. Alfred Wolf of Brookhaven National Laboratory, who developed the radioactive fluorine-deoxyglucose and now supplies it to most of the projects and collaborates in much of the work, shares Phelps's concern. He says, "If this gets blown out of proportion, I don't know what the impact will be."

Just in case *Brain* leaves readers confused about exactly what is fact and what is fantasy, let me sort through some of the technical points. (It may be nit-picking to separate the possible from the impossible in a work of science fiction, but in this instance I can't resist.) At least two major premises of the plot do not jibe with current research experience.

The first is the manner in which neuroradiologist Philips becomes interested in the immoral experiment's unwitting subjects. A high-powered computer program that he is testing notices a density variation in CAT scan X-ray images that turns out to be caused by radiation accumulated in the women's brains. Both Wolf and Phelps say that the amount of radioactivity that could be injected without destroying a person's brain would not provide enough contrast against the X-ray beam to show up on such a scan.

Another contribution of Cook's imagination is the extremely radioactive derivative of deoxyglucose in the lead box with the conveniently scraped off label. Increasing the intensity of radioactivity (measured as millicuries per milligram) would not increase the amount of radioactivity that would accumulate in the brain, Wolf says. The only isotopes now used to tag deoxyglucose are carbon-14, tritium, fluorine-18 and carbon-11. The radioactivity functions as a marker that can be picked up on photographic film or detected by scanning devices. It is at far too low a level to kill cells.

Stepping back from the details, imaginary or factual, one is left with the problem of evaluating the safety of a research technique. "We stay well within the federal guidelines for safe use of radioactive material," Wolf says. All the experiments are run with the permission of the Food and Drug Administration under the provisions for investigative new drug applications. Wolf stresses that there is nothing unique about the deoxyglucose compounds. Like all radioactive material, or all drugs for that matter, they can do damage to cells at high enough concentrations. "But that is not the same as saying they cause trauma that will affect the life of a human being," he emphasizes. "There is no evidence that fluoro-deoxyglucose at the levels given does any damage to individuals."

The researchers do agree with Cook that brain research aided by such techniques is about to blossom. They stress the benefits that new diagnoses and treatments could have for patients of such diseases as epilepsy, Huntington's disease, stroke and schizophrenia. "Psychiatrists think it's the hottest thing since the wheel," Wolf says. Phelps agrees: "There is no question that in the next twenty years this will be the most important technique in neuroscience. It's unfortunate to take some of the brightness out of it with a silly thing like this book."

Julie Ann Miller