

## Verdict: U.S. Deceived Court in Fallout Case

A U.S. District Court judge in Salt Lake City withdrew judgments for a case he first tried in 1956 and ordered the case, *Bulloch et al. v. The United States*, to be retried. The reason, explains Judge A. Sherman Christensen in his August 4 opinion, is because the plaintiffs unveiled evidence at a trial in May demonstrating how the government had "perpetrated a fraud upon the court" during the 1956 proceedings.

At issue was whether Utah sheep ranchers were entitled to government compensation for the deaths of 4,390 sheep. The suit charged that the sheep had been poisoned by fallout from nuclear weapons detonated at the Nevada Test Site.

The case is notable for several reasons. First, it sets a powerful precedent for retrying legal cases when fraud can be proved, regardless of how long it takes to acquire that proof. It also provides a window through which the public can observe a lesson in political science as rarely taught in textbooks. Finally, it shows that science and its ostensibly objective practitioners are subject to political persuasion.

The drama began unfolding in the spring of 1953. A series of 11 atmospheric nuclear tests, code-named Upshot-Knothole, spewed 252 kilotons (kt) of fission products as fallout. In a region from 40 miles north to 160 miles east of the test site, 11,710 sheep, many of them pregnant ewes, grazed that season. The tests contributing the greatest fallout to the area were the 14.4 kt "Nancy" blast on March 24, and "Harry," a 32.4 kt shot fired on May 19. Local residents were assured by federal authorities that despite the Forest Rangers' account of heavy fallout in the area, there was no danger.

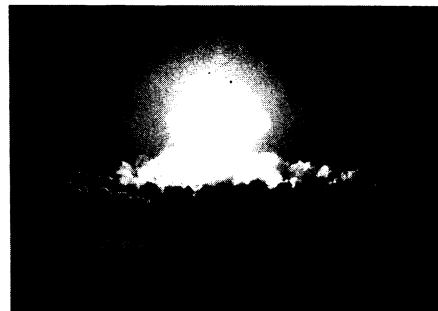
But it didn't look that way. Horses and cattle were found with classic "beta [radiation] burns" on their backs — typical of what had been witnessed after earlier "Trinity" nuclear tests. Hardest hit were sheep. Veterinarians brought in by the Atomic Energy Commission investigated strange blistering and pus-filled lesions developing on the face and skin of sheep. Many lambs were stillborn; others born apparently healthy but weak were only half the normal weight. Near-milkless ewes and lambs so weak they couldn't stand were common complaints. Some animals exhibited hemorrhaging, others wool so loose it fell from their bodies in clumps. In all, 12.1 percent of the lambing ewes and 25.4 percent of the new lambs died. Not surprisingly, ranchers attributed the plague to fallout.

In 1956 they took their claim to court. But since virtually all data on fallout patterns, readings and health-effects had been classified secret, there weren't many data to support their claims. Representa-

tives of the AEC, however, marshaled numerous reports and experts who testified that not only did all data point to there being no sheep exposures above negligible levels, but also that the sheep's symptoms had been unlike any exhibited by radiation-exposed livestock in laboratory tests. Veterinarians who initially reported on sheep losses to the AEC that they considered indicative of radiation poisoning had by the trial recanted in favor of disease and malnutrition as plague factors. In the end, Judge Christensen ruled there was insufficient evidence to indict fallout for sheep losses.

The drama lay dormant until 1979 when two congressional committees opened an investigation into fallout studies (SN: 4/28/79, p. 278). While the hearings focused on human exposures, a wealth of formerly classified AEC documents were wrested from obscurity by congressional subpoenas of their authors and Freedom of Information Act inquiries.

With documents and transcripts from the hearings, Dan Bushnell, the ranchers' attorney, pieced together evidence documenting how the AEC had deliberately misled the court in 1956. Later, he visited a federal radiation-data archive in Las Vegas. Additional data turned up a model letter drafted by an army veterinarian to be signed by other veterinarians explaining why the signatory was recanting his view that radiation was involved in the 1953 sheep deaths. Correspondence showed not all signatories to the model



Defense Nuclear Agency

Did fallout from "Harry" (above) and "Nancy" kill 4,390 sheep?

letter in fact changed their minds.

But most useful was an association struck up after the 1979 hearings between Bushnell and Harold Knapp, a former AEC fallout researcher. In a report he prepared for the hearings, Knapp described why he thought the deaths of adult sheep could be attributed to irradiation of their gastrointestinal tract by fission products ingested with forage materials. Using 1950s AEC data, he calculated potential sheep exposures ranging from 6 to 25 times that given by the agency in 1956. And as an expert witness for the plaintiffs, Knapp has identified discrepancies in other AEC sheep studies that influenced the May trial.

Fraud, not science, was the issue at the trial litigated in May, explains Bruce Findlay, an attorney assisting Bushnell. Still to be decided is whether there were sufficient data in 1956 to show the U.S. responsible for the sheep deaths. —J. Raloff

## Smoking out blood biochemistry

While the ills suffered by cigarette smokers have been extensively categorized, there is comparatively little information on the underlying biochemistry. Now Dennis K. Galanakis and colleagues report that cigarette smoke contains at least two factors that inhibit reactions involved in blood clotting. Such factors may play a role in vascular and lung diseases.

"The idea is that at the microscopic level in the body, especially in the lungs, there is normally ongoing healing," Galanakis says. "If the inhibitors work in the body, they may create a problem with this healing." He stresses that he is not speaking of major wound healing. "There is no evidence that smokers do not heal well after surgery," he says.

The recent biochemical experiments were reported in the Aug. 13 *SCIENCE* by Galanakis, Phillip Laurent and Aaron Janoff of the State University of New York at Stony Brook and Soo I. Chung of the National Institute of Dental Research. They

bubbled smoke from a cigarette through a small volume of water and applied that extract to solutions containing two of the types of molecules involved in blood clotting. They found that one factor in the smoke extract slows and disturbs the aggregation of fibrin, the insoluble protein that forms the structure of a blood clot. A second factor prevents the fibrin aggregate from forming cross links, which protect a clot from attack by protein-degrading enzymes. Galanakis says that this second inhibition is probably the more important. The cross-linking enzyme it inactivates, called factor XIIIa, is found not just in the blood but in most body tissues where it can act on several proteins.

The smoke extract inhibits clotting in whole blood, as well as in a simpler solution, the scientists report. "This suggests the inhibitors may act in the body, assuming they get to the blood," Galanakis says. "We suspect they are important in the link between smoking and disease."

—J. A. Miller