investigators to publish results of research, whether favorable or unfavorable to the tobacco industry" contradicts my personal experience when the CTR, through Robert Hocket, then its director of research, and E. Jacob, then its lawyer, came to call on me and threatened that "we would never get another penny from CTR" if we published a paper, submitted for their approval, reporting that inhaling cigarette smoke caused laryngeal cancer in a certain inbred Syrian hamster. This happened in the early 1970s after our research at Tufts University and at the Bio-Research Institute in Cambridge, Massachusetts, had received continuous support since the early 1950s from CTR totaling more than $800,000.

As a witness in the U.S. District Court for the District of New Jersey, I have stated in detail and under oath what happened (*1*). When I presented our results at a conference in Atlantic City, New Jersey, before our paper appeared, a scheduled press conference to follow my paper was sabotaged (according to a later boast by a CTR public relations person in an internal memorandum of a tobacco company). We never received another penny from CTR after we published our paper in the *Journal of the National Cancer Institute* in October 1974 (*2*).

Continued research was made possible by support from a British consortium of the Celanese Company and British tobacco companies, as well as the British Hunter Committee, which found our method useful to evaluate the relative carcinogenicity of cigarette smoke.

Glenn's statement may be true for the more recent phases of CTR activity, but studies implicating cigarette smoke as a health hazard have not been getting support from CTR or are limited to projects with predictably negative outcome, such as having mice inhale cigarette smoke that kills them because of their sensitivity to nicotine before carcinogenic doses are reached.

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References

1. U.S. District Court of New Jersey, Civil Action No. 83-2864(SA), *A. Cipollone* vs. *Tobacco Companies*, Litigation Document 3.6 TPLR 3.431–3.467, Newark, NJ, 19 January 1987.
2. P. Bernfeld, F. Homburger, A. B. Russfield, *J. Natl. Cancer Inst.* **53**, 1141 (1974).

Chernobyl Analysis

I would like to comment on Richard Stone's fine article of 19 April (Special News Report, p. 352). My visits to Chernobyl to conduct the research for and prepare "The Chornobyl 4 Accident Sequence: Update—April 1995" (*1*) and the work reported on was supported by the Ukrainian Academy of Sciences, foundation grants, and me. The background to the report is contained in the introduction by Academician V. G. Baryakhtar, Vice President of the Ukrainian Academy of Sciences (UNAS).

The report (*1*) provided and discussed estimates of the fuel in the lava. The source of most of the lava information contained in the report was Edward Pazukhin of UNAS's Intersectorial Scientific and Technical Center and the Khlopin Radium Institute. Current estimates of the fuel in the lava range from about 27 tons to more than 130 tons [the referenced paper (*2*) was presented at "Sarcophagus Safety '94" by C. Gotovchits (head of the Ukrainian MinChernobyl) and N. Steinberg (chairman of the Ukrainian State Committee for Nuclear and Radiation Safety)]. The wide range of the estimates is cited in the report as a key uncertainty. Although I told Stone

that in my opinion the amount of fuel in the lava was toward the low end of the estimates rather than the upper end, neither I nor the publication (*1*) took a hard and fast position on the actual amount. More work needs to be done to map the lava, particularly in the region of the reactor hall floor and in some unexamined rooms.

No new views were expressed about the amount of fuel released from the reactor structure. The issue is the distribution of the fuel in the building. Stone's article states, "If Purvis is correct, much of the missing fuel would have been ejected in the initial explosion and deposited in the surrounding countryside." But the forensic analysis, photographs, data, and discussions in the report (*1*) only provide information about what was found on the roof and the local area immediately around the reactor. My belief is that when examinations are made of the floor of the reactor hall, and the regions immediately under this floor, more lava will be found, leading to a resolution of the current large uncertainties. Gotovchits and Steinberg state that "[c]onsiderable amounts of fuel are supposedly concentrated in the unit 4 central hall" (*2*, section 5.1).

A very small percentage of the core would have been fragmented into very small particles and distributed across a wide area. This is what was found. Data were presented concerning this release. A suggestion made is that there be an international effort to analyze "hot particle" data collected by many nations. Such extensive collections exist. There is an extensive technological base for examining such "hot particles" developed during the era of atmospheric nuclear testing. Some of the experts are still available. The data available [referenced in the report (*1*)] support the mechanism proposed, that is, that the released steam lifted the entire reactor assembly into the air at least 14.6 meters above the operating floor, where the large reactivity insertion resulting from the water leaving the core resulted in a fuel vapor expansion. A report (*3*) by the Russian ministry MINATOM set forth a similar mechanism, but had the explosion taking place about 30 meters over the floor of the central hall. [(*1*) is cited in (*3*)]. Fuel vapor expansion was the mechanism for providing the destructive energy discussed in detail in the U.S. Department of Energy report on the accident sequence (*4*) and numerous other papers about the accident.

An analysis, discussed by Stone, concluding that the release of radioactivity to the environment was 150 million curies, has been rebutted, and the U.S. Nuclear Regulatory Commission (*4*) stated that this was in error and that corrections would halve the estimated total release, making the correct value not too far from the revised Soviet estimate. The report (*1*) did address problems in the nonmechanistic method of performing this type of analysis, suggesting that the calculations should be mechanistic and consistent with the data.

My hope is that there will be more interest in use of the data collected and that analysts will no longer need to make assumptions and rehash outdated opinions. Why can there not be increased study of the data and information now available?

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References

1. Ukrainian Academy of Sciences Intersectorial Scientific and Technical Center and E. E. Purvis III, *The Chornobyl 4 Accident Sequence: Update–April 1995* (Ukrainian Academy of Sciences, Chernobyl Town, Ukraine, 1995).
2. C. Gotovchits and N. Steinberg, *Memorandum Symposiuym "Sarcophagus Safety '94,"* Zelyong Mys, Ukraine, 18 March 1994 (Ukrainian State Committee for Nuclear and Radiation Safety, Kiev, 1994).
3. NIKYET; Russian Scientific Center, Kurchatov Institute; VIINUS, *Causes of the Accident at the Chernobyl Nuclear Power Plant: Review of Research over 10 Years* (submitted by MINATOM to the International Atomic Energy Agency, Vienna, Austria, 1996).
4. *Report of the U.S. Department of Energy's Team Analyses of the Chernobyl-4 Atomic Energy Station Accident Sequence* (Rep. NE/0076, U.S. Department of Energy, Washington, DC, November 1986).