Johnson bill through Congress; of how he was foiled in this by some of the scientists; and of his embittered efforts to take revenge. Such a history will examine carefully whether these things were related to the doings of the House Committee on Un-American Activities in 1948 and 1949, which deprived this country of the services of so many brilliant young American scientists.

E. U. CONDON
Washington University,
St. Louis, Missouri

Radionuclides and Bone Cancer

A serious error exists in J. G. Kaplan's recent letter (*1*). It was stated that the Russians had observed bone cancers developing in dogs about 3 years after the injection of 0.1 microcurie of strontium-90 per kilogram. Actually, the radionuclide used in these Russian studies was not strontium-90, as erroneously reported by Engstrom *et al.* (*2*), but the much more dangerous thorium-228 (*3*).

The injected amounts of strontium-90 which it has been proved cause bone cancer are much higher than 0.1 μc/kg. Finkel (*4*) found that the incidence of osteogenic sarcomas in 90 mice injected with 44 μc of strontium-90 per kilogram was somewhat higher (6 percent) than that in 150 controls (2 percent), but the probability of this being due to chance occurrence was 20 to 30 percent. In a current study in our laboratory, 60 beagles have been injected with from 0.5 to 100 microcuries of strontium-90 per kilogram. Thus far only one dog, injected with 94 μc/kg, has developed a bone tumor. These results do not imply that lesser amounts of strontium-90 are without effect. However, they do illustrate the enormous difficulty in experimentally determining the consequences of very small injections of strontium-90, such as 0.1 μc/kg.

The maximum permissible body burdens of strontium-90 and radium-226 should be set so as to give the same probability (or improbability) of causing undesirable effects. If the ratio of these limits is based on the observed biological effects of strontium-90 and radium-226 in experimental animals, the maximum permissible body burdens, for occupational workers, of 2 microcuries of strontium-90 and 0.1 microcurie of radium-226 correspond fairly well.

In view of Kaplan's opinion of the "obvious impertinence" of physicists in biological questions, it seems strange that he would base the heart of his argument on the theoretical calculations of Rolf Björnerstedt, who is a physicist.

C. W. MAYS
Division of Radiobiology,
University of Utah, Salt Lake City

References

1. J. G. Kaplan, *Science* **130**, 728 (1959).
2. A. Engstrom, R. Björnerstedt, C. J. Clemedson, A. Nelson, *Bone and Radiostrontium* (Wiley, New York, 1957), p. 133.
3. R. Björnerstedt, in a letter (9 July 1959) citing results reported in *Conference on the Remote Consequences of Injuries Caused by the Action of Ionizing Radiation*, F. G. Krotkov *et al.*, Eds. (State Med. Lit. Press, Moscow, 1956).
4. M. P. Finkel, *Science* **128**, 637 (1958).

Meteorology for Non-Science Majors

There is general agreement that all college students should have an experience in science before they receive their diplomas. Very rarely, it seems, is meteorology recommended as one of the courses the student should take to satisfy his science requirement. This is regrettable in view of the fact that meteorology has within it all the ele-