## Strontium-90 from Fallout

In two letters in *Science* (*1*, *2*) reference was made to our work described in *Bone and Radiostrontium* (*3*).

Commoner (*1*) states that a contradiction exists between our finding "that microscopic regions of the bone may receive a radiation dose about 40 times the average" and the heterogeneity factor of 5 suggested in the U.N. report (*4*). This is not necessarily a contradiction, for our figure is applicable to acute intake conditions, while the U.N. report considers intake over a number of years. That the existence of chronic intake conditions decreases the heterogeneity of the strontium distribution has already been pointed out (see, for example, *5* and *6*). In addition, it might be pointed out that the method of calculation used by Eisenbud (*7*) and criticized by Commoner (*1*) is correct in our opinion. It is, according to the U.N. report (*4*, p. 42, Table 2, note *c*), sufficient to consider the average dose if the corresponding maximum dose does not exceed the average by a factor of more than 80.

Kaplan (*2*) takes our recommendation of 0.1 $\mu$c of $Sr^{90}$ as the body burden after acute intake and applies it directly to the fallout situation. This is not in correspondence with the view expressed in (*5*): [The $Sr^{90}$ contamination] "corresponds to a situation with aspects that lie somewhere between those of acute and chronic $Sr^{90}$ poisoning. Children in the 0- to 5-year age group are examples of individuals with chronic poisoning conditions. Adults above 20 years of age are more likely to be examples of acute poisoning."

A figure of 0.0001 $\mu$c of $Sr^{90}$ per gram as a level at which bone cancers were produced in dogs was cited in *Bone and Radiostrontium* (*3*) and cited again by Kaplan. This figure refers to radiothorium, however, and not to $Sr^{90}$. Although the figure cited is much too low in comparison with other experimental data, it seems to have caused confusion in the discussion of the biological effects of $Sr^{90}$, and this we sincerely regret.

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**References**

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2. J. G. Kaplan, *ibid.* **130**, 728 (1959).
3. A. Engström, R. Björnerstedt, C. J. Clemedson, A. Nelson, *Bone and Radiostrontium* (Wiley, New York, 1958).
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6. ———, *Radioisotopes in the Biosphere* (Univ. of Minnesota Press, Minneapolis, in press).
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## "Next Question" and K. E. Tsiolkovsky

The editorial "Next question" [*Science* **130**, 1733 (25 Dec. 1959)] on attempts to pick up possible radio signals from the nearest stars (the project directed by Frank D. Drake) reminded me of analogous thoughts of Konstantin E. Tsiolkovsky, a Russian pioneer in rocketry. Tsiolkovsky's name is now well known to the American scientific public. His book *Exploration of Space by means of Reactive Apparatus* was published in Russia in 1896, and his name was given to one of the craters on the far side of the moon. In his little book *Monism of the Universe*, published many years ago in Kaluga, Russia, as well as in his letters to me (1933–35), he postulated the existence of highly developed intellectual societies in other worlds. Tsiolkovsky suggested, also, that such beings colonized many other planets by means of interstellar ships, painlessly destroying the products of unsuccessful biological evolution on other planetary bodies. The main objective of these intelligent beings is probably "humane colonization versus painful evolution," the evolutionary