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letters

common cancers of spontaneous origin; yet no increase in incidence has ever been demonstrated in any irradiated population. Conversely, thyroid carcinoma rarely occurs spontaneously, but is among the most common of tumors in irradiated populations."

I believe Gibbs has chosen a poor example to criticize Gofman's book. BEIR-III in Table V-14 gives values of age-weighted average of dose coefficients (cancers/10⁶ persons per year per rad) for a number of common malignancies for the period 1969-71. I plotted these BEIR-III values against the crude rate of spontaneous cancer incidence in the US for the period 1973-77 as published by the National Cancer Institute and observed there is a scattering of points as noted by Gibbs. However, for most of the cancers there is strong support for Goffman's generalization. All but 8 of 22 points on the two plots (1 for males and 1 for females) follow very closely Gofman's General Law. The 8 that are exceptions are, for males: cancers of the thyroid, stomach, liver and prostate, and, for females: cancers of the thyroid, intestine, cervix and lymphoma.

Surely Gibbs does not demand that a general law have no exceptions. Variations from a generalization often serve as a clue, suggesting where we should look for new ideas, important discoveries and errors in our data. For example, stomach cancer has a much higher natural incidence in men in Japan than in the US and so there it would not be an exception to Gofman's Law as it is in the US. Why? Why is the thyroid gland so radiosensitive—or why are the prostate and cervix so insensitive—to radiation-induced cancer. Had the BEIR-III report given stronger weight to the hepatic tumors per rem (using a quality factor of 20 for the alpha radiation of Th²³²), liver cancer among the males would not be an exception. I believe this generalization of Gofman is a plus to his credit and not a minus as Gibbs suggests.

KARL Z. MORGAN

8/83

Appalachian State University

Directed-energy weapon

President Reagan's appeal to American scientists to help develop weapons to nullify nuclear weapons has induced controversy in the mass media as well as in the scientific community. Arguments, both pro and con, have been based on political, technical and even emotional reasons. However, few arguments have been based on principles. I, as a scientist, support the President's

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Appendix I

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Appendix II

Institutions by Highest Physics Program and Total Number of Physics Faculty

- United States
- Canada
- Mexico
- Central America

Appendix III

Institutions by Highest Astronomy Program and Total Number of Astronomy Faculty

- United States
- Canada
- Mexico
- Central America

Appendix IV

Number of U.S. Institutions by State, Type of Institution & Source of Support

Appendix V

- U.S. Institutions Which Granted the Largest Number of Physics Doctorates in 1978-79
- U.S. Institutions Which Granted the Largest Number of Physics Baccalaureates in 1978-79
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letters

idea on the basis of the following principles with which most scientists would agree:

► Because the speed of light is 4 to 5 orders of magnitude larger than the speed needed to transport nuclear weapons, the beam weapon concept is basically a valid one.

► Beam weapons are useful almost exclusively for defensive purposes. They are benign weapons against organisms, being practically useless in the biosphere (due to the presence of air) and having no explosive capabilities.

► Nuclear weapons are a product of our fellow scientists, although they are now out of our control. Scientists, having no political power, can only regain control of the nuclear weapons by scientific means. Equally important, only scientists can conceive a nonpolitical means to nullify nuclear weapons. Scientists have a responsibility to human beings to correct the earlier mistake, and this is the best opportunity to do so.

A. HASEGAWA

Summit, New Jersey

8/83

Clustering of Nobels

With respect to the clustering of Nobel laureates (February, page 53; June, page 15), perhaps the record goes to the town of Condon in eastern Oregon. In the years around 1906 William P. Murphy (Medicine, 1934) and I (Chemistry, 1954; Peace, 1962) were attending school in that town, which then had a population of about 1000, and has a somewhat smaller population now.

LINUS PAULING

Palo Alto, California

8/83

Frequency measurements

In the history of the new, unified time-length measurement system, based on a frequency standard together with a defined value of the speed of light in meters/second as presented by Kenneth M. Baird (January, page 52), two corrections are in order.

The first is his omission of the contributions of Zoltan Bay and his coworkers. Bay has advocated this system ever since 1965 in many publications and lectures. At the 1969 meeting of the Optical Society in Chicago, he urged assigning a defined value to the speed of light, made possible by his method of measuring optical frequencies by electro-optic modulation.¹ Although Bay's argument was based on experimental and aes-