more reliable than *The New York Times*? My explanation is that Kapitsa's words quoted above express the attitude of many Soviet scientists. Perhaps our top scientists should also write reports for *The New York Times* and not just for *Physical Review Letters*!

▷ Zuzak says that we "agree that the 'professionals' . . . have been ignoring . . . the consequences of the Chernobyl disaster." I think he should speak for himself only. In fact, the report of the International Chernobyl Project contradicts Zuzak in his interpretations of the aftermath of the Chernobyl accident.

▷ I do not see anything "absurd" in locating an international center for radiation-induced health problems in Obninsk. There is a first-class scientific and professional infrastructure in Obninsk. Surely it is more important to have good computers and programmers at hand than to be close to the heavily contaminated areas.

▷ I have discussed the physics of the Chernobyl explosion already[3] and do not have much to add, except that I was told by a Soviet legal expert that the court records of the Chernobyl trial are not classified and could be made available for inspection and study upon request. I do not know if that is indeed correct.

I disagree that I have been "trivializing" the consequences of the accident. From the very beginning, I have been trying to understand the accident, put it into proper perspective by comparing it with negative effects of other technologies and explain whatever I learned about it to laymen[4] (I take Kapitsa's words seriously) and to physicists.[3]

In conclusion, I would say that Chernobyl was the most misinterpreted accident in the world. Thus I believe that we physicists should make a sincere effort to understand it, not to misinterpret it.

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7/91

Radon: History Notes from the Underground

We take exception to Harvey M. Sachs's statement, in his December 1989 letter (page 13) on Anthony V. Nero Jr's article "Earth, Air, Radon and Home" (April 1989, page 32) that "geologists built on the serendipitous discovery of predominant external sources" of radon.

The relationship between radon (^{222}Rn), a daughter in the ^{238}U series, and the geology of bedrock (or soils derived therefrom) has long been known. For example, Lord Rayleigh,[1] in 1906–07, and Harold Jeffreys,[2] in 1927, detailed the close linkage of ^{238}U, ^{235}U, ^{232}Th and their daughter products with granitic crustal rocks. By 1964 workers had studied the distribution of radioactivity (including that from ^{222}Rn) in rocks and soils,[3] and very few major breakthroughs have occurred since then. The uranium in granites is typically concentrated in accessory minerals (zircon, monazite or allanite). The distribution of these minerals determines to a considerable extent the concentrations of ^{238}U-series radionuclides, heat flow[4] and ^{222}Rn emanation to groundwater and soil air. The association of high concentrations of secondarily enriched uranium with reduced zones in sedimentary rocks has also been exhaustively studied in connection with the exploitation of the Colorado plateau area for fissionable uranium.[5] The immobilization of uranium by organic matter in conditions like those in the shallow part of the Earth's crust is also exemplified by the common high concentrations of uranium in coal, black organic-rich shales and even at the bases of peat deposits.

Concentrations of ^{222}Rn were known to be high in Maine due to pioneering work by Werner N. Grune and his colleagues[6] in 1960 and by Donald C. Hoxie[7] in 1966. This knowledge enabled several of us to characterize the natural distribution of ^{222}Rn in groundwaters in Maine, explicitly linking geology, hydrology, health and ^{222}Rn air quality.[8] These studies predate those published by the so-called Princeton group, which Sachs cites as the probable first studies linking geology and ^{222}Rn.

In fact, our studies are also not the earliest. Moreover, much of the work on the relationships among house structure, source strengths and ^{222}Rn concentrations in air predates that cited by Sachs as early (first?). Sachs writes that he hopes Nero "will recall that not all the pioneers are at Lawrence Berkeley Laboratory,"

where Nero works. We hope that Sachs understands that not all the pioneers are at Princeton *or* LBL. There is (and in this case, has been for a long time) plenty of good work around and plenty of credit to share. Good work is not done only by "groups" with the names of distinguished universities attached to them. Clearly, the relationships between geology and ^{222}Rn were discovered by a previous generation, and hardly "serendipitously."

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2/91

SACHS REPLIES: I thank Stephen A. Norton and his coauthors for bringing out an omission by both Anthony V. Nero Jr and myself, I am saddened that they misunderstood one point of my letter, and I am pleased that we share an important value.

The omission: Nero's article "Earth, Air, Radon and Home" deals only with radon in air in houses. Norton and his colleagues—"the Maine group"—established both the correlation of radon concentrations in potable water with increasing granitization of the groundwater source and the regional importance of water as a source of radon in houses. Nero's text, illustrations and references ignore water as a radon source. I confined my comments to Nero's content.

The misunderstanding: Norton and his coauthors complete a quote from my letter by adding "of radon." In the context of a letter on Nero's article, I assumed the sentence would be read with the implicit ending "of radon in air in houses." My comments did not treat the distribution of radionuclides in rocks and soils. I am pleased to have this work called to the attention of PHYSICS TODAY's readers.

Most radon-in-buildings investigators a decade ago focused on ventilation rates in buildings or the emanation of radon from building materials.[1] The Maine group's work on radon in water pioneered studies of regional context. My colleagues and I showed that there was a correlation between geology and high radon concentrations in the air in houses,[2] and that many houses had very large radon source strengths, suggesting that the coupling of the building to its substrate was a key to understanding radon concentrations in houses.[3]

A shared value: My earlier letter noted that many workers contributed to our present understanding of radon in houses, but that few were cited in Nero's review. For example, I named Andreas George (who suggested looking at geology as a control of radon in air) and Arthur G. Scott (who developed subslab depressurization for mitigation of household radon). Norton and his coauthors obviously share my concern about crediting pioneers for their contributions. I am sorry that I did not broaden my comments on Nero's paper to include his omission of radon in water and the work of the Maine group. I particularly want to thank Charles T. Hess for his help and encouragement as I learned about radon.

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5/91

Correction

July, page 52—Contrary to the report on J. Robert Schrieffer's appointment as University Professor at the University of Florida and Florida State University, Schrieffer continues to consult for IBM Almaden. ■

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