in invertebrate animals including corals, echinoids, annelids, and millipedes. Soil samples collected in Japan, Nepal, and Taiwan yield 200–1000 ppb of mercury, and the feathers of seabirds may exceed 3000 ppb.

Environmental contamination by geothermal mercury has both long- and short-term consequences. The gradual increase of mercury levels in the biosphere is inevitable as lavas and other igneous extrusives break down, releasing their contents into existing, or forming, soils and sediments. Some of the mercury from primary sources has without doubt been cycled many times through sedimentary and metamorphic rocks as well. Thus we account for high mercury levels in vegetation now far removed from current centers of thermal activity.

Short-term effects depend upon atmospheric transport and deposition of gaseous mercury now being released at active sites. In this context, the most immediate biological consequences include the human hazard. Schroeder (*18*) considers prolonged exposure to atmospheric levels in excess of 0.1 $\mu g \times m^{-3}$ to be harmful. We have shown here that levels well in excess of 0.1 $\mu g \times m^{-3}$ exist even at distances of 350 km or more from the active site (in Hawaii). In proximity to thermal areas, where levels as high as 37–40 $\mu g \times m^{-3}$ may be found, the human (and general mammalian) hazard is commensurately greater.

Whatever may be the source of mercury, the capacity for bioconcentration among both terrestrial and aquatic organisms must enhance the penetration and distribution of mercury with and among ecosystems and food chains. In the marine milieu, the role of submarine vulcanism as a source of mercury in sea life has not been investigated.

Although no direct link has been established previously between trace element distribution and gaseous emissions at thermal sites, the situation described for mercury should be no less applicable to many more elements than those named above. We urge that suitable health and ecological monitoring programs be included in any plans for geothermal exploration.

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CORRESPONDENCE

SIR: Since the publication of "Piezoelectric Sensor for Mercury in Air" [Eugene P. Scheide and John K. Taylor, *Environ. Sci. Technol.,* **8,** (13), 1097 (1974)], previous work describing a similar technique has come to our attention ["An Evaluation of the Quartz Crystal Microbalance as a Mercury Vapor Sensor for Soil Gases," Q. Bristow, *J. Geochem. Explor.,* **1,** 55 (1972)]. We regret not acknowledging this work in our paper and the oversight of not picking it up in a literature survey.

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