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LETTERS

Sedimentology of the K-T Boundary

Gerta Keller, in her letter of 29 April (p. 641), takes Richard A. Kerr to task for perceived inaccuracies in his report on the conference "New Developments Regarding the KT Event and Other Catastrophes in Earth History" and an associated field trip to northeastern Mexico (Research News, 11 Mar., p. 1371). Among her criticisms is the charge that Kerr misrepresented the opinions of sedimentologists, five of whom had been invited by Robert Ginsburg under auspices of the Global Sedimentary Geology Program of the International Union of Geological Sciences to be neutral participants in the field trip. As two of the latter group quoted by Kerr, we write to clarify several points misrepresented by Keller, which we believe were accurately reported by Kerr.

Why would sedimentologists all regard Cretaceous-Tertiary (K-T) boundary sandstones 1 to 7 meters thick as unusual? Because of a zone (about 1 meter thick) of peculiar spherules at the base together with the position of the sandstones between fine, thoroughly burrowed mudstones, which Keller interprets as having accumulated about 400 meters below sea level. Deposition of sand at such depths requires unusual currents, such as previously postulated episodic, gravity-driven turbidity currents, which flow downslope. We rejected this mechanism because the deposits do not closely resemble familiar products of turbidity currents and (especially) because we observed evidence of upslope as well as downslope transport. Further, the lack of animal burrows, together with planar lamination through most of the succession, suggested rapid accumulation from strong currents. Final deposition by waning currents or waves was indicated by rippled lamination in the top centimeters, which also display postdepositional burrows indicative of a return to normal, tranquil conditions. Finally, the boundary sandstones are relatively thin but geographically widespread and lack any transitional thin, sandy laminae within either the adjacent underlying or overlying mudstones; apparently, sand deposition both began and ended very abruptly.

There was, as Kerr reported, consensus that the boundary strata reflect a brief (hours to days), exceptionally energetic, discrete event requiring unusual conditions for the accepted environment of deposition. We believe that, although some details of genesis remain obscure, the preponderance of evidence is consistent with accumulation of these strata under the influence of exceptional tsunami-generated processes. Furthermore, their position at the K-T boundary, their similarity to other unusual boundary deposits around the Gulf of Mexico, and their geographic proximity to the giant Chicxulub crater are compelling reasons for neutral observers to endorse an impact-related cause.

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Dioxin Effects

Is dioxin a human carcinogen? In his letter of 18 March (p. 1545), Stephen S. Sternberg expresses fear that we will wait in vain for the definitive epidemiological study that answers this question. Admittedly, the observational epidemiologist's approach has limitations that affect its value, especially for cancers such as soft tissue sarcoma and malignant lymphoma, whose incidence and mortality have been rising steadily and rapidly in both sexes in most parts of Europe, particularly in the countries of the European Union (*1*), since 1960. In Italy, the number of deaths caused by soft tissue sarcoma rose in 15 years from 0.09% to 0.23% of all cancer deaths. The incidence of and mortality from non-Hodgkins lymphoma increased by 35% between 1970 and 1985 (*2*).

One could reasonably argue whether this trend of cancer patterns is the result of increased exposure to chemical carcinogens or of improved diagnosis and registration rates. I believe, however, that a comprehensive study of the population involved in the accident in Seveso, Italy (*3*), could overcome the disadvantages of the small size of the exposed populations and further considerably our knowledge of this matter.

Bertazzi *et al.* (*4*) have reported an excess of some cancers, among them soft tissue sarcoma and non-Hodgkins lymphoma, in