

merous new micro-species emerged after what we calculated as a 10-50 thousand year development period. From our finds we conclude that whatever occurred at the end of the Cretaceous seems to have been abrupt and severe."

"Too much attention has been given the dinosaurs," says Kenneth Hsü, scientist at the Geologisches Institut of Zurich, "when the planktonic extinctions are so much more significant. Whatever the cause, sudden elimination of oceanic phytoplankton severed the food chain, leaving the larger life forms without sustenance. Our deep sea core samples allowed us to pinpoint changes in the biota to within 300-year periods. These results exhibited a cutting off of the life forms coincident with those found by Smit. Elimination of ocean plankton while leaving most fresh water life intact indicates to me collision with a comet rather than an asteroid. An icy body, possibly carrying cyanides, entering the ocean could have altered the ocean chemistry, and poisoned the biosphere for a period, before stability returned several thousand years later. An oceanic impact would account for the atmospheric temperature rise that seems to typify the period. We still need more information on smaller life forms in order to clarify the record. Even after extensive work over many years the picture remains muddy."

Mud clouds the picture in other ways and offers a stumbling block to the Alvarez thesis. Although the iridium findings, which appear to be universal, point to an extraterrestrial visitor, they fail to establish its character or itinerary. Did it strike the land or sea? Walter Alvarez confesses that crater evidence for the asteroid does not exist. "However, the earth is a big, old place," he notes, "and the oceans cover most of it. An asteroid entering the ocean would provide us today with little record, especially if it struck near a tectonic subduction zone and was carried into the mantle." A 10-km asteroid striking the ocean would produce immense waves in the world's seas, stirring the bottom muds as if by a gigantic soup ladle. Stirred mud exhibits turbidity effects when it ages and hardens — evidence undetected by either Smit's or Hsü's detailed investigations. Nor is there any evidence that drifting continental blocks exhibit seismic activity that would result from such an impact.

Faced with the clues of a sudden infusion of noble metals and abrupt extinction of fossil records, but lacking the impact evidence of an asteroid, some earth scientists require more data. Some researchers argue the evidence for abrupt termination is misleading. These "gradualist" school researchers suggest the record itself was truncated. Dewey McLean, paleogeologist of the Virginia Polytechnic Institute, reminds us "our sole source of information are rocks and the fossils

they contain. To understand what happened at the end of the Cretaceous, we

Drs. Dale Russell and David Jarzen of the National Museum of Natural Sciences begin exploration of a Cretaceous-Tertiary boundary site. Tertiary period rocks form the outcropping above them. (D. Shackleton)

Les Drs Dale Russell et David Jarzen, du Musée national des sciences naturelles, s'apprentent à explorer la couche géologique qui sépare le Crétacé du Tertiaire. Les roches qui forment l'affleurement rocheux au-dessus d'eux appartiennent à l'ère tertiaire. (D. Shackleton)

