The crust: A myth debunked, a model proved

In the 12 years since the research vessel *Glomar Challenger* began drilling the floor of the deep sea, a lore has developed among scientists. Existing technology, it seemed, prohibited the drill from penetrating deeper than 600 meters into the oceanic crust. Now scientists aboard the *Challenger* during Leg 83 of the Deep Sea Drilling Project jubilantly report they have drilled 1,076 meters into the basaltic crust flanking the Costa Rica Rift. The achievement nearly doubles the depth of the existing Hole 504B, and debunks the "600 meter" myth.

Using the borehole as a window into the crust, scientists are able to confirm much of the ophiolite model, a widely accepted analogy for the crust's structure and composition. In the model, oceanic crust is compared to ophiolites, land-based features believed to be ancient slivers of layered ocean basins. The ophiolites apparently formed at mid-ocean spreading centers and later were thrust up onto land when two continents, aboard moving crustal plates, collided.

An objective of the DSDP has been to obtain a complete section of oceanic crust and compare it to ophiolites on land. Leg 83 offered a critical bit of evidence for the validity of the model. At about 700 meters, the drill broke through the pillow lavas and rubble that characterize the young, 6.2-million-year-old crust, and in a sharp transition hit a sequence of sheeted dikes, fingers of rock that in a molten state intruded into the surrounding crust.

"We were not even sure that dikes exist in the crust. The only evidence we had was from ophiolites," said Jose Honnorez of the University of Miami in Coral Gables, Fla., "Now we have proved they do exist. Within 40 to 50 meters everything—physical properties, mineralogy, the primary nature of the rock forming the crust — changes." The transition, Honnorez explains, confirms that the crust is layered. He and Roger Anderson of Lamont-Doherty Geological Observatory in Palisades, N.Y., were co-chief scientists aboard the vessel.

Some surprises embedded in the core sample contradict the model and promise to send geologists back to the ophiolites for another look. The model predicts that the amount of material altered by the heat of fluids circulating in the crust increases with depth. In fact, the process is not that simple. The Leg 83 core shows that some of the least altered rocks and some altered at the lowest temperatures are found in the deepest core of the dike complex.

Ophiolites and their origins are of keen interest in part because they are often rich in mineral ores. The name "copper," for instance, derives from the island of Cyprus, once the site of the world's foremost copper mine. That historic copper vein was part of a suite of ophiolitic rock. The zinc sulfides, iron sulfides and, possibly, copper sulfides found on Leg 83 formed at 600 meters depth under intense heating by hydrothermal fluids. The buried ores were never exposed to large amounts of seawater, and thus were protected from the decay it causes to sulfides on the seafloor surface. The veins may have fed surface features such as "black smokers" where sulfide-rich water is emitted from vents at the spreading ridges along plate margins in the Pacific.

Two factors contributed to the cruise's spectacular success, Honnorez told SCIENCE NEWS. First, the research plan simply allowed more time than usual for drilling in a single hole. Nearly two months were allocated to the hole, one that also had been drilled on two previous DSDP voyages (SN: 2/9/80, p. 84; 12/15/79, p. 413). Second, the ore veins made it possible for the drill to penetrate so deeply into young crust, which usually crumbles when drilled. The ores act as cement, filling in cracks, fissures and pore spaces in much the way that scar tissue heals a wound.

—*C. Simon*

Belt-tightening for a longer life

Dietary restriction imposed early in life is the only strategy known to increase life span in warm-blooded animals. It also inhibits or delays many diseases that occur in later life and also retards aging of the body's immune system. Such a restriction, however, is impractical for humans because it would interfere with growth and disrupt the onset of puberty.

But how about dietary restriction imposed in mid-life? Is it a practical way to extend human life span? The answer is yes, according to animal research conducted by Richard Weindruch, Susan R.S. Gottesman and Roy L. Walford of the University of California at Los Angeles School of Medicine. The research is reported in the February PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES and in press with SCIENCE.

The UCLA scientists gradually restricted the diets of mice starting at 12 months of age or older (comparable to 30 to 35 years in humans) until their diets contained 60 percent of the calories of control mice's but were enriched with vitamins, brewer's yeast and other nutrients. Compared to control mice, these mice were found to live 10 to 20 percent longer, to have fewer spontaneous tumors and to experience retarded aging of T cells (major components of the immune system).

These results, Walford told SCIENCE NEWS, suggest that "it is a feasible option for humans to start dietary restriction at mid-life if they elected to do so..... Then you could increase life span, lower tumor incidence." Before people cut their dietary calories 60 percent, though, Walford cautions that it would also be crucial to increase one's intake of nutrients. "If you [only] cut back the normal American diet 60 percent," he says, "you would probably get malnutrition." Definitive evidence that dietary restriction in mid-life increases the human life span, of course, will only come from clinical studies. Walford and his co-workers hope to get one underway within the next several years. Walford's book *Maximum Life Span* (soon to be published by W. W. Norton) discusses the type of trial they are planning.

When asked whether 1980 study results —showing that excessively thin people as well as excessively fat people die sooner (SN: 5/10/80, p. 294) — conflicted with his and his colleagues' findings, Walford replied: "I don't disagree with the results but with their interpretation — that it is okay to be slightly obese and that it is bad to be thin." The reason, he contends, is that the markedly thin people in the 1980 study were thin not because they ate sparingly but because of their metabolisms or because of illnesses. —*J.A. Treichel*

Science panel forms

A 13-man White House Science Council, appointed to advise George Keyworth, the President's own science adviser, is slated to hold its first meeting March 8. In six meetings over the next year — some of which may be open to the public — the council will give selected representatives of the science and engineering community a voice in identifying what constitute crucial issues. The council agenda will be set by its members, except when Keyworth convenes special sessions. Should Keyworth request formation of task forces to study specific issues, outside specialists would be enlisted to work with council members.

Solomon J. Buchsbaum of Bell Laboratories will serve as council chairman. Edward Frieman of Science Applications, Inc., has been appointed vice chairman. Remaining members, also appointed for one year, include: Harold Agnew of General Atomic Co.; John Bardeen, professor emeritus, University of Illinois-Urbana; D. Allan Bromley, Ford Professor of Physics, Yale University; George Cowan Sr., fellow, Los Alamos National Laboratory; Edward David Jr. of Exxon Research and Engineering Co.; Ronald S. Fredrickson, scholar in residence, National Academy of Sciences; Paul Gray, president, Massachusetts Institute of Technology; Robert Hunter Jr. of Western Research Co.; Arthur Kerman, director, Center for Theoretical Physics, MIT; David Packard of Hewlett-Packard Co.; and Edward Teller, Hoover Institution, Stanford University. □