

## Polar-equatorial climate link reported

The more scientists delve into the history of the earth and its climate, the more they appreciate how intimately connected different parts of the planet can be. During the recent Leg 108 of the Ocean Drilling Program (ODP), researchers discovered evidence for a strong climatic link over the last few million years between the polar regions and lower-latitude areas. If this polar-equatorial connection holds, says the leg's co-chief scientist William Ruddiman, it will be a finding of major importance.

Between February and April, ODP's research ship the *JOIDES Resolution* drilled at 12 sites off the coast of northwest Africa. The result was 3,841 meters of core — the most core ever retrieved on a drilling leg and the most continuous record of sediments ever obtained in this region. This core material revealed that the natural fluctuations between glacial and warmer periods became more pronounced starting about 3 million to 2.5 million years ago and lasting until about 500,000 years ago. During that time, increases in the content of organic carbon, diatoms (algae with silicified skeletons) and cold-water planktonic fossils mark a progressive intensification of the trade-wind-driven upwelling of nutrient-rich colder waters in the region. The increases may also reflect greater movement of cool ocean water toward the equator from higher latitudes.

In recent climate history, 2.5 million years ago is something of a magic number because that is about the time when the northern ice sheets began to grow with increasing vigor. And 2.7 to 2.6 million years ago is also the time when scientists think the cyclical northward expansion of the Antarctic polar front, the boundary of very cold water and sea ice, began to intensify. So the Leg 108 shipboard scientists think they have found a clear link between the polar and equatorial climates, but what causes this link is still obscure.

Researchers believe that the cyclic changes in the earth's orbit cause climate changes known as Milankovitch cycles. Orbital changes have been implicated in the growth of ice sheets in the Northern Hemisphere. Leg 108 scientists suspect that changes in the polar regions affect the equatorial areas. But they are not yet certain if, through winds and surface currents, the northern ice sheets directly cool the equatorial regions or instead first cool Antarctica, which then cools the equator.

"Our guess right now," says Ruddiman, a paleoclimatologist at Lamont-Doherty Geological Observatory in Palisades, N.Y., "is that the ice sheets in the Northern Hemisphere are controlling the upwelling off of west Africa," whereas the Antarctic Sea ice controls the behavior of

the equatorial ocean to the south.

Leg 108 scientists think they see evidence for Milankovitch cycles with periods of 20,000 to 40,000 years. But "it will take a couple of years to find the real answers about linkages as we look at the rhythms [in the record] in much greater detail," says Ruddiman.

The *JOIDES Resolution*, now in the middle of Leg 109, is currently deepening a hole started at the Mid-Atlantic Ridge during Leg 106 last fall. Scientists are ex-

cited about this site because it may hold important clues to how new seafloor is created.

The Ocean Drilling Program has also recently celebrated the addition of a new member. A consortium of 12 countries (Belgium, Denmark, Finland, Greece, Iceland, Italy, the Netherlands, Norway, Spain, Sweden, Switzerland and Turkey) represented by the European Science Foundation signed up on April 29. The newly added nations join Canada, France, West Germany, Japan, the United Kingdom and the United States.

— S. Weisburd

## Professors minding their own business

University biotechnology researchers whose work is supported by private industry do not, as has been feared, abandon their faculty duties to chase after commercial success, according to a survey published in the June 13 *SCIENCE*. On the contrary, researchers with industry ties publish more journal articles, participate in more professional associations and activities and teach as many hours as those with no industry support.

Specifically, the survey reports that biotechnology researchers with industry ties publish an average of 14.6 journal articles in a three-year period, compared with about 11.3 for those without industry support; they are involved in an average of 14 professional and university activities, compared with 1.1 for their colleagues; and they spend about 22.2 hours per week teaching class or supervising students in the laboratory, compared with 20.3 hours per week for professors not supported by industry.

"This was a pleasant surprise in that some people thought we might find evidence of these faculty members doing less [academic work]," says Michael Gluck, a research assistant at the Center for Health Policy and Management at Harvard University's John F. Kennedy School of Government. Gluck was one of five Massachusetts researchers who in the winter of 1985 conducted the nationwide survey of 800 university biotechnology researchers and 438 faculty scientists in other fields.

On the other hand, the survey shows some evidence that confirms long-held fears about university-industry relations. For instance, biotechnology researchers with industry ties, according to their own admissions on the survey questionnaires, are four times more likely than their colleagues to keep their research secret, at least temporarily, in order to protect their sponsors' proprietary interests. Such behavior could compromise standards of open communication among faculty, the survey team reports.

The survey also indicates that researchers with industry support are four

times more likely to let commercial potential color their choice of research projects. This could damage the universities' traditional commitment to basic research, the report states.

For the most part, however, the report casts a favorable light on university-industry relations.

Secrecy and commercialism may be problems, the researchers note, but they are problems of which the professors themselves are aware. Seventy percent of the researchers with industry ties report being concerned about the risk of shifting too much emphasis to applied research; 68 percent fear a trend toward spending too much time on commercial activities; and 44 percent worry that secrecy will "undermine intellectual exchange and cooperative activities" among faculty, according to the report. "These figures offer some evidence that, at least at current levels of involvement with industry, faculty remain sensitive and committed to traditional university values and practices," the report states.

The survey found that about 8 percent of biotechnology faculty hold equity in companies that produce products based on the faculty members' research, but only 0.5 percent, "a tiny minority," receive research grants from companies in which they hold equity, according to the report. The survey conductors call this finding "reassuring."

In addition, the survey shows that biotechnology researchers with industry ties are more than twice as likely as their colleagues to come up with practical, marketable applications for their research — a potential financial benefit for universities, according to the report.

Although the survey report is, for the most part, reassuring, Gluck says, "we still think [industry support for university research] is a serious enough issue that it warrants attention and monitoring." In order to lessen the risks of secrecy and commercialism, the survey team suggests that university administrators make it clear that they are opposed to protecting trade secrets.

— M. Murray