trate on annuals and seedlings, and thus depend more on continuous regeneration of cropped land.

Bakker sees two major shifts in feeding behavior during dinosaur evolution. In the Late Triassic, prosauropod dinosaurs, with long necks, long hindlimbs and powerful tails, became predominant over the earlier short-necked, short-limbed, big herbivores. That shift from low browsing to high browsing corresponds with one major vegetation shift. Later, at the beginning of the Cretaceous period, there is fossil and footprint evidence for new groups of big, low-browsing ornithischian dinosaurs. Intense low browsing favors plants that can rapidly regenerate cropped foliage and colonize areas laid bare by herbivores, Bakker says in the Aug. 17 NATURE. Flowering plants fit that bill. Bakker says that, once acquired, the life-history strategy of flowering plants gave them a competitive advantage in many habitats, beyond those subjected to dinosaur feeding.

Thus, angiosperms prosper, although dinosaur feeding has not been a problem for 65 million years. The dinosaurs became extinct along with an estimated 75 percent of the animal species alive at that time. McLean suggests in the Aug. 4 SCIENCE that a slight, but critical, increase in temperature disrupted sperm production in those species.

In McLean's scenario shallow seas over the continents receded late in the Mesozoic, reducing the marine algae population. Because those organisms are major consumers of atmospheric carbon dioxide, the gas built up in the atmosphere and, in a "greenhouse" effect produced a warming of the earth. The warming, in turn, raised the temperature of the ocean, reducing the amount of dissolved carbon dioxide and further contributing to the temperature rise. Large animals have a low ratio of surface to volume, and thus the biggest suffered most from the warming trend.

McLean has assembled a variety of evidence for that explanation. Many marine algae species do disappear from fossil records at the end of the Mesozoic. Rocks of the period show isotope and carbonate compositions consistent with warming and carbon loss from the oceans. Dinosaur eggs became progressively thinner-shelled and fragile as the time of extinction neared. (Among some modern birds, elevated temperatures cause thin-shelled eggs.) Finally many eggs are found unhatched; thus they may never have been successfully fertilized.

Various climatic studies have claimed that current global temperature is on the upswing. McClean warns that the world may arrive inadvertantly at a critical threshold, triggering an accelerated warming beyond people's capacity to control it or adapt to it: "A sudden climatic warming could potentially impose on us conditions comparable to those that terminated a geologic era." □

# NAS: Soviet-American science in peril

Intensifying the crescendo of U.S. scientists' indignation over the recent political trials of their Soviet colleagues Yuri Orlov, Anatoly Shcharansky and Sergey Kovalev, the National Academy of Sciences' Committee on Human Rights last week urged "scientists the world over to petition Soviet authorities for the release of these three men." Although there are, of course, many others suffering similar plights globally, the committee observed in their formal statement, "these three have captured the attention of the world scientific community by their independence of thought, their courage in the face of inevitable adversity and their personal integrity."

Sentenced last May, to seven years in prison and five years' exile within the USSR, Orlov, who is a high energy physicist, was convicted of anti-Soviet agitation, a vague, catch-all charge often leveled at Soviet dissidents and refuseniks (persons who are refused a visa to Israel). Recently, Orlov's judicial appeal was rejected. Shcharansky, a cyberneticist who has made distinguished contributions to the theory of decision making, is planning to appeal his 13-year sentence (three years in prison plus ten at hard labor) for treason and espionage. His case in particular attracted the supportive but apparently vain efforts of President Carter and members of Congress. Sergey Kovalev, sentenced almost three years ago to seven years at hard labor plus three years' exile, was convicted of anti-Soviet agitation for illegally circulating THE CHRONICLE OF THE LITHUANIAN CATHOLIC CHURCH.

Perceiving these and many other cases like it in the USSR and other countries as unmerciful abuses of human justice, many U.S. scientists pointedly expressed their sentiments last week by refusing to attend the 14th International Congress of Genetics. Of those Americans specifically invited to participate, more than 60 percent declined to go, according to Mark S. Mellman, director of the Committee of Concerned Scientists, headquartered in New York. This organization of about 4,000 American scientists has views on this issue essentially identical to those expressed by the NAS committee, Mellman told SCIENCE NEWS.

Besides decrying the fates of the three Soviet scientists, the two committees stress that their attempts to incite scientists' support stop short of advocating a uniform, collective boycott of the USSR. This is in recognition, Mellman said, "that [continued] interactions themselves can be helpful to the refusenik and dissident scientists." Furthermore, as the NAS Committee on Human Rights statement reads, "It is precisely because the response of U.S. scientists is so individualistic that continued Soviet-American scientific relations are in peril. Scientific exchange programs can be negotiated and organized, but individual participation cannot be commanded." □

# Seeking the ocean crust in Iceland

Iceland is one of the few spots where the Mid-Atlantic Ridge, the birthing place of the Atlantic Ocean floor, reveals itself above water. Seismic profiles of Iceland differ radically from those of continental masses, resembling instead the seismic reflections characteristic of the ocean crust. Molten lava churning beneath Iceland's surface, which stokes the furnace of the country's geothermal energy resources, inflicts physical and chemical wounds on surrounding deep volcanic rock much like those changes occurring beneath the ocean floor.

Drilling into the ocean floor may reveal much about the composition, evolution and movement of the basaltic layers of the crust. Drilling into Iceland's analogous crust may reveal some of the same information. And Iceland is several thousand meters, and hundreds of thousands of dollars, more accessible.

During the past two months, 26 researchers from Iceland, Great Britain, Canada, Germany, Denmark and the United States have drilled 1,920 meters into the Icelandic crust near Reydarfjordur, about three times deeper than the *Glomar Challenger* has penetrated the ocean crust. Combined with samples from a 1,300-meter-high cliff near the drill site, researchers have a continuous core record more than 3,000 meters deep, representing the past 12 million years. In addition, the cores show 100 percent recovery of the rock drilled; 50 to 70 percent is par for deep sea drilling.

The project, coordinated by Jim Hall of Dalhousie University in Halifax, means "the day of land drilling is dawning," according to University of Washington researcher Roy Wilkens. "We hope this can be a bridge between what the *Challenger* is able to do and deeper drilling." Though Wilkens cautions that strict comparisons to the ocean crust must be made cautiously because the Icelandic crust was not formed under the same conditions as oceanic crust, the Icelandic borehole is already answering many questions.

For example, preliminary studies indicate that the abrupt change in seismic velocity between the two volcanic layers of the crust represents changes which occurred in the lower layer after its formation, rather than a difference in the way the two layers were formed. Such direct comparisons between geological and geophys-


*Samples from drill site and cliff in foreground yield 3,220-meter continuous core.*

ical data have never before been available, Wilkens said. Data about the layer responsible for magnetic anomalies and the effects of depth on magnetism indicate depth has some effect on the intensity of magnetism, Shaul Levi of Oregon State University told SCIENCE NEWS. Temperatures of 72°C recorded at 1,600 meters indicate the possibility of economically feasible geothermal energy for eastern Iceland.

Preliminary data from the core samples, which will be kept at Dalhousie University for two years and then returned to Iceland, will be published in March. But at least two years' more research is needed, according to Levi. At a total cost of $250,000 for the drilling, it's "a great deal," Wilkens says. □

# New data put quasars sky-high

To determine the distance to any object beyond, roughly, the remote boundary of our so-called local group of galaxies — about 100 billion billion kilometers away — astronomers must rely on an ingenious technique involving redshifts. That is, the faster an object is departing from you, the lower will appear the frequency of its radiation (thus visible light is shifted toward the red end — the low frequency end — of the spectrum and hence the term "redshift"). Furthermore, it has been observed that the distance to a galaxy is proportional to its speed of recession. Redshifts are therefore a form of yardstick.

Using this strategy, astronomers infer that quasars are very far away — approaching the very edge of our universe. This property of quasars coupled with their other eccentricities, however, has disquieted astronomers so that some have even suggested and made notably successful efforts toward proving that in some instances, at least, redshifts should not be trusted in the ordinary way. Now, Alan Stockton of the University of Hawaii has reported results that he concludes make "virtually certain" the conventional belief that most quasars are at immense distances from the earth.

First discovered in 1960 by Allan Sandage with the 200-inch Palomar telescope, quasars (quasi-stellar objects; also called QSO's) look deceptively like stars. But unlike stars, some emit huge quantities of radiation in the radio frequencies; others have luminosities that vary wildly (by factors of twenty-five and greater) within periods only weeks long; and most typically are extraordinarily bright — that is, if their redshift distances from us are to be believed. If these were unreliable for some reason, then quasars might actually be closer to us and therefore less anomalously bright.

This prospect and others that would follow from learning that quasars were in reality close by, seem to have been dealt a serious blow by Stockton's research. Inspecting the immediate celestial neighborhoods of 27 exceptionally bright quasars, Stockton found that in each of eight cases there is at least one ordinary galaxy with a redshift not too unlike that of the neighborhood's resident quasar. Because the odds, as Stockton calculated, are overwhelmingly against these being simply chance coincidences or illusory companionships due to an accidental superposition of remote objects along a common line-of-sight, there is reason to surmise that the quasars are indeed associated with the galaxies. And since astronomers are quite convinced for a history of reasons that the redshift technique is valid for galaxies, then by association it must be valid for these quasars. It remains unclear due to other studies' conflicting data, however, just how generally true for all quasars are Stockton's findings, which appear in the Aug. 1 ASTROPHYSICAL JOURNAL. □

# The South: A resource greater than oil

In the 1930s, President Franklin Roosevelt declared that the South was the nation's number one socioeconomic problem. He was right. It was rampant with tenant farming, racial segregation, a dearth of industry and a poor educational system. During the past 40 years, however, the South has made dramatic strides in eradicating these deficiencies. What's more, the South today has two other major bonuses that other areas of the United States cannot necessarily claim — valuable untapped natural resources and a largely uncontaminated natural environment so crucial for a high quality of life.

So declared Eugene P. Odum last week at the annual meeting of the American Institute of Biological Sciences, held at the University of Georgia in Athens. In addition to being a professor at the University of Georgia and one of the nation's leading ecologists, Odum was also the meeting's keynote speaker. The title of his talk was "The Nature of the Southeast in Transition."

Georgia, Odum explained, is a good ecological microcosm for the rest of the Southeast of the United States. The finest ground water in the world lies under this state, and ground water is indispensable for cooling power plants, farm irrigation and various industrial and municipal purposes. There will probably be a scramble for ground water in the years to come. Thus the South is "better off with water than with oil," he concluded, especially as oil is replaced by alternative power sources. Georgia also has a largely uncontaminated natural environment, consisting of rich farm and grazing lands, hundreds of swamps, coastal marshes and exquisite islands lining the coast and protected by the state, Odum continued.

But Georgia and other Southeastern states must be careful to preserve their natural resources and their natural ecosystems, Odum warns. A prime example of an omission in this area is the Copper Hill, Tenn., smelter, whose sulfuric acid fumes have carved out a 25-mile-square desert that is virtually devoid of vegetation and almost impossible to rehabilitate even 40 years later. Today Southeastern cities, he suggests, should learn from "Bo-Wash" — the strip of cities and industries that extend from Boston to Washington — and be sure to leave green "life belts" around themselves as they expand. That way people's quality of life can be maintained. So far, all Southeastern cities are surrounded by such belts with the exception of coastal Florida.

The construction industry in the Southeast must become more conscious of the dangers of erosion, because construction sites lose a lot of soil, Odum advises. Forests can help prevent erosion. So can