

For more than a decade, researchers have considered the last major change in the Earth's magnetic field to have occurred 730,000 years ago – between the Brunhes and Matuyama geomagnetic periods. But recent experiments by Geophysicist Michael McWilliams of Stanford University, using the argon-argon technique, suggest that this transition occurred 50,000 years earlier ... causing changes in the rock-dating results reached on the basis of the 730,000 year yardstick. McWilliams used the argon-argon technique, a variation of the standard potassium-argon dating method, to arrive at the 780,000-year figure as the interval between the Brunhes-Matuyama transition and the present. His finding confirms results reported last year by oceanographers who redated the transition by counting the number of Earth's orbital oscillations in ocean sediments. **Science News** reports (Vol. 141, p. 14) that redating the Brunhes-Matuyama transition eliminates some of the problems faced by scientists studying the San Andreas fault. The new yardstick eliminates discrepancies between their precise measurements across the fault that suggest the Pacific plate moves past North America at a rate of 48mm per year and the 51mm-per-year speed arrived at by way of estimates based on magnetic lineations in the ocean.

Mt. Pinatubo's volcanic cloud seems to be playing havoc with the ozone over Boulder, Colo., according to **Science News** (Vol. 141, p. 14). The day a patch of Mt. Pinatubo's cloud passed overhead, balloon flights over Boulder measured the lowest December ozone values ever recorded at this site. David Hofmann of NASA in Boulder, said the low reading may in part reflect ozone destruction catalyzed by sulfuric acid particles in the cloud, and he predicts that when the cloud travels to the far south it may generate an "extra" ozone hole during the Antarctic fall. (The "usual" ozone hole appears during Antarctica's spring.)

A new research effort – the Task Force on Declining Amphibian Populations – has been established at Oregon State University in Corvallis, supported by the IUCN in collaboration with OSU's Center for Analysis of Environmental Change. James Vial, coordinator of the task force, says researchers around the world will document the extent of amphibian die-offs and study anything that might be causing it.

In Oregon's Cascade range, scientists have documented the unexplained die-off of millions of toad eggs in alpine lakes; the once common western spotted frog has become extinct in Western Oregon; in the Rocky Mountains, boreal toads that once clogged hiking trails are now scarce.

According to Professor Vial, the die-offs may be an early indicator of something seriously wrong in the global environment that later will affect a range of plant and animal life. "It's important," he said, "to determine whether it's a natural phenomenon or an indicator of some other environmental impact." Major research efforts underway include an \$800,000 3-year study in Costa Rica and the \$272,000 study at OSU.

"National Parks Fire Policy: Goals, Perceptions and Reality" is the title of a conference sponsored by Renewable Natural Resources Foundation and hosted by Utah State University's College of Natural Re-

sources last Nov. 15-16 at Snowbird, Utah. Participants included NPS Associate Director for Natural Resources Eugene Hester, NPS Research Scientists David J. Parsons and Jan van Wagtenonk, Yellowstone NP Chief of Research John Varley, and former NPS Fire Ecologist James Agee. Parsons moderated Session I: Goals of the National Parks – a discussion of the need for increasing specificity of natural resource goals for NPs, and of the real and perceived conflicts involved in managing national parks – between scenic values and ecological goals, in maintaining natural values in light of increasing visitation, and when policy only partially allows natural processes to play a role.

Given the long, checkered history of the search for sun-climate relations, many researchers will call it a statistical freak, but the "dazzling correlation" between solar activity and terrestrial temperature presented in the Nov. 1, 1991 issue of **Science** is "giving climatologists goose bumps." So says Richard Kerr in the magazine's Research News section, commenting on the findings presented on pages 698-700 by Eigil Friis-Christensen and Knud Lassen of the Danish Meteorological Institute. The graphic representation shows two curves, tightly intertwined: one representing the interval between peaks in sunspot abundance, the other tracing the annual rises and falls of earth's average temperature.

Among the off-fooled and thus wary body of climatologists, John Eddy of Boulder, Colo., and David Parker of England's Hadley Center for Climate Prediction and Research voiced a host of reservations, but admitted they were "mightily impressed" by the correlation coefficient of 0.95 – probably the highest ever found in this sort of work. The authors themselves suggest merely that variations in the solar cycle length appear to be "a possible indicator of long-term changes in the total energy output of the sun," and add:

"Estimation of the natural variability of the Earth's climate and its causes are needed before any firm conclusion regarding anthropogenic changes be made."

The potential magnitude of future vegetation change in Eastern North America is described by a paleontologist, a geographer and a geologist in **Science** Vol. 254:692-695 and their predictions could spell a vegetative nightmare for natural resource managers.

J.T. Overpeck, P.J. Bartlein, and T. Webb III provide a model-based assessment of how the natural vegetation of Eastern North America may change over the next 2 to 5 centuries in response to trace gas-induced climate change. They used pollen data and response surfaces to model the equilibrium response of vegetation to the climate change simulated by atmospheric general circulation models (GCMs) and found that increases in atmospheric trace gas concentrations could warm the global average temperature 1.5 degrees to 4.5 degrees Centigrade by the end of the next century. Application of climate-pollen response surfaces to 3 climate model simulations of doubled preindustrial atmospheric CO₂ levels shows the change in the equilibrium distribution of natural vegetation over the next 200 to 500 years could be larger than the overall change during the past 7,000 to 10,000 years and equivalent to the change that took place over the 1,000- to 3,000-year period of most rapid deglaciation. Some plant ranges and abundance maxima could shift as much as 500 to 1000 km in the next 200 to 500 years.

The Florida DNR Newsletter, **Resource Management Notes**, January 1992, contains (pp. 16-17) an item about Ant Surveys in Florida's State Parks, by Dr. Mark Deyrup of the Archbold Biological Station (813) 465-2571, excerpts from which are herewith reproduced.

"It is no news to Florida naturalists that the state is richly, even extravagantly, endowed with ants. With about 180 species, Florida is the ant capitol of the country ... Such a significant group deserves its own guidebook, and for the last 8 years I have been looking at ants throughout the state in preparation for a book on identification and natural history of Florida ants ...

"My last printout of state park ants, about a year old, contains about 500 entries from 30 state parks. Unfortunately, lists of ant species are not very informative to most people and I am trying to devise a system that will allow me to print up lists of species with a little information blurb on each species ... information on whether the species is native, its origin if exotic, its size, nest site, habitat, and any interactions with humans (normal humans, not ant people).

"A survey that shows that ants abound in Florida's state parks might appear to have been commissioned by the Florida Calamity Calendar or by some obscure religious sect that believes picnicking to be a sin. Even I find it difficult to imagine how an impressively long ant list for a particular park could be used in any positive publicity. The list could be accompanied by a statement that most of these ants are tiny, secretive, benign creatures that will never be seen by park visitors, but even this statement resembles damage control more than it does positive publicity.

"Eventually, of course, the public will come to the enlightened view that arthropod diversity is one of the most spectacular and fascinating features of the natural world. Pending that happy day, one may want to use the information with some caution. For example, one could lump the 68 ant species known from a park with the 19 butterfly species, and say 'There are 87 species of butterflies and other insects known from this park.' ... Perhaps Florida state parks have a role to play in ushering in the Age of Ant Appreciation."

Perhaps even more distressing as environmental news than the decline of amphibians on the world scene is the catastrophic decline of mushroom populations throughout Europe. "Mass extinction" is the term used by John Jaenike, University of Rochester ecologist, who is concerned that fungi also may be vanishing from the United States.

The findings (or rather, the no-longer-findings) of Eef Arnolds – a fungal ecologist at the Agricultural University of the Netherlands, are described by Jeremy Cherfas on page 1458 of the Dec. 6, 1991 issue of **Science**. The scale of loss is shown by comparing surveys carried out in the Netherlands between 1912 and 1954, when an average of 71 species of fungus was found per foray, with the period between 1973 and 1982, when a matched series of 15 surveys could turn up only 38 species per foray.

Both occurrence and size of mushrooms have plummeted. It took 50 times as many chanterelles to make up a kilogram in 1975 as it did in 1958. Arnolds rules out overpicking and forest management prac-

tices, because both edible and inedible mushrooms have declined and all types of mature forests show similar drops. The villain appears to be air pollution. Throughout Europe there is a negative correlation between abundance and diversity of fungi and levels of nitrogen, sulfur, and ozone in the air. The main offender appears to be farming.

The loss of a gourmet item of human food is not nearly so consequential as the loss of the network of fungal filaments that live in close symbiotic association with trees, providing water and minerals in exchange for carbohydrates. The resulting lowered resistance of trees to stress could lead to a mass dying of trees in time of severe frost or drought, Arnolds warns.

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From Wildlife Ecologist Doug Houston, at Olympic NP, comes an article by Paul Beier in the *Wildlife Society Bulletin* (19:403-412, 1991), titled "Cougar Attacks on Humans in the United States and Canada." The author attempted to document all attacks from Jan. 1, 1890 through Dec. 31, 1990 and describes his very conservative criteria for deciding whether the verified reports constituted "attacks" or "near-attacks." He documented 9 fatal attacks and 44 nonfatal attacks resulting in 10 human deaths and 48 nonfatal injuries. (The greater number of victims occurred because there were 2 victims in each of 5 attacks.) He deduced that cougar attacks "have clearly increased during the last 2 decades" and describes the victims (37 of 58 victims were children), their companions (or lack of), their positioning with regard to human habitation, and general deportment.

He describes behaviors that invite attack, behaviors that might prevent attack, and concludes that yearlings and underweight cougars are most likely to attack humans. Aggressive responses on the part of intended

victims may avert an impending attack and repel attacks in progress, he found.

Houston notes that the article is "a good and timely summary" and adds that "we seem to be experiencing an increase in 'near-attacks' here at Olympic, but sample size is very small (thankfully)."

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An article titled "Plight of the Plover" by Kathy Fackelmann, in the Dec. 7, 1991 issue of *Science News*, describes the continuing stress under which the piping plovers (now on the threatened species list) must conduct their foraging and nesting practices. Both sanderlings and plovers are increasingly restricted in their foraging attempts by having to flee from humans — thus cutting their food intake. These birds cannot transfer their feeding to salt marshes or mud flats as many other shorebirds have done under human pressure. They have no alternative but to continue their efforts to feed in the same waves as recreational bathers and try to escape the plover predators who are attracted to plover habitat by human garbage left on the beaches. Fackelmann concludes the average citizen can have a big impact. "People can help protect the birds from predators by keeping beaches clean and pets leashed. And joggers, for their part, can maintain a respectful distance from these highly flappable foragers."

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The Dec. 6, 1991 *Science* "News and Comments" section carries a discussion of the worldwide impact of invasive exotic species, written by Elizabeth Culotta. The article is built around the October 1991 gathering sponsored by the Indiana Academy of Sciences to discuss "the homogenization of the world" and the biological threats thus imposed. The article describes the havoc wrought in many places in terms of lost crops and expensive control programs, and then discusses the

"less visible ecological damage on a grand scale" that such invaders can inflict.

"When ecosystems are already under stress, as they now are in most parts of the world, a biological invader can deliver the coup de grace to native species by predation, competition, or by transforming landscapes," Culotta notes.

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A special issue of *Water Resources Research* on Western U.S. Alpine Watershed Studies (WRR 27:1537-1588, July 1991) contains 5 papers that discuss the Emerald Lake Watershed Study, an intensive site investigation of the biogeochemistry of a headwater system at 2800 m in Sequoia NP. Kathy Tonnessen of the Air Quality Division in Denver provides the introduction and discusses the cooperative program between NPS and the California Air Resources Board to determine impacts of acid deposition on watersheds and surface water quality. This study, conducted from 1983-1989, demonstrated the importance of snow chemistry and snow melt processes to the episodic acidification of dilute lakes and streams in the Sierra Nevada.

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William Smith, Yale University, presents an excellent review of "Air Pollution and Forest Damage" in *Chemical and Engineering News* (69:30-43, Nov. 11, 1991). He recaps conclusions of the NAPA Program's conclusions regarding impacts of ozone and acid deposition on terrestrial ecosystems and then ranks regional air pollution stresses to vegetation as: ozone, heavy metals, and acid deposition. He stresses that the future of this research lies with long-term programs that document the health of forests and that attempt to distinguish negative effects of air pollution when compared to other natural (pests, disease) and anthropogenic stresses.