orientation of Earth's flip-flopping magnetic field at the moment the crust was born. Now scientific history may be repeating itself on a close planetary neighbor: On pages 790 and 794 of this issue, researchers report magnetic stripes on Mars.

The data, gathered by the Mars Global Surveyor (MGS) spacecraft, suggest that in its early days, Earth's diminutive cousin resurfaced itself the way Earth does today, spreading freshly made crust away from long, narrow volcanic rifts. The martian magnetic stripes are "absolutely fascinating," says Frederick Vine, a professor emeritus at the University of East Anglia in Norwich, United Kingdom, whose work on magnetic stripes was instrumental to the plate tectonics revolution of the 1960s. That the martian examples are also the work of plate tectonics is "an eloquent hypothesis," he says, and indeed no one has a good idea what else could form such stripes. Yet the shape and pattern of the martian stripes are so different from Earth's that geophysicists are reserving judgment for the moment. The stripes point to some sort of interesting geodynamics on ancient Mars, says planetary geophysicist Maria Zuber of the Massachusetts Institute of Technology, but she's not sure what it was.

"[Crustal] spreading seems like the best guess at this time."

—Ronald Merrill

The finding has its origin in a catastrophe—the loss of the Mars Observer spacecraft as it approached the planet in 1993—say Mario Acuña and John Connerney of NASA's Goddard Space Flight Center (GSFC) in Greenbelt, Maryland, members of the MGS magnetometer team. For the Mars Observer's successors, NASA switched into a "faster, cheaper, better" mode. As a result, MGS did not carry enough rocket fuel to send it directly to its intended high, circular orbit when it arrived at Mars. Instead, it first entered a more fuel-efficient elliptical orbit that periodically dipped it into the upper martian atmosphere, where it experienced atmospheric drag that bit by bit nudged the spacecraft closer to the desired circular orbit. These aerobraking passes carried the spacecraft as low as 100 kilometers above the surface, low enough to detect magnetization of the rocks below.

MGS first detected patches of magnetic field embedded in the crust apparently at random, like so many bar magnets strewn on the surface (*Science*, 10 October 1997, p. 215). They had apparently formed when blobs of magma near the surface solidified and cooled earlier in martian history, locking in bits of the magnetic field that existed at the time. That meant that although the interior of Mars has cooled and produces no magnetic field today, it once had enough heat to churn the planet's molten iron core into a magnetic dynamo.

A month later, another problem led to even better observations. An apparent weakening of a solar panel arm meant that the spacecraft's orbit had to be adjusted more slowly, so that MGS made about 1000 aerobraking passes rather than 100. With the additional coverage, some of the magnetic patches began to coalesce into a pattern. Across a huge swath of the southern hemisphere, wrapping a quarter of the way around the planet, irregular stripes about 100 kilometers wide and up to 2000 kilometers long appeared. The half-dozen or more stripes are roughly parallel and appear to alternate in polarity, one having its "north pole" pointing vertically up and the next with its south pole up. The stripes peter out near the boundary with the northern lowlands.

The magnetometer team members, who are planetary scientists, tend to be more familiar with the magnetic field of Jupiter than with Earth's ocean crust, but even they saw the resemblance to terrestrial stripes. Back in the 1960s, researchers realized that when magma rises into the crest of a midocean ridge, cools, and solidifies, it records the current magnetic field. Magnetized crust continuously spreads away from the ridge in both directions like tapes in a tape recorder; when Earth's magnetic field reverses, a new pair of stripes appears, one on each side of the ridge.

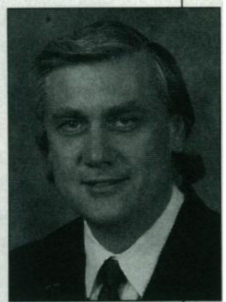
On Mars, the crustal tape machine turned on early but wound down quickly, according to Connerney and Acuña. The heavily cratered highlands that recorded the stripes date back to Mars's first half-billion years, when its interior might have been hot enough to support both an internal magnetic dynamo and the surface motions of plate tectonics. By 4 billion years ago, meteorites that crashed into the stripes left unmagnetized holes in the pattern, suggesting that the magnetic dynamo had shut down by then, says Acuña. But crustal spreading may have continued for a time; in the north, some process later produced the unmagnetized, thinner, and therefore lower crust of the lowlands.

The stripes are "convincing evidence that there was a [magnetic] dynamo early on Mars and it reversed," says paleomagnetist Ronald Merrill of the University of Washington, Seattle. And as an explanation for the overall pattern, crustal "spreading seems like the best guess at this time," he says, especially because there's no persuasive alternative.

But the pattern doesn't exactly match

ScienceScope

New Marching Orders Chastened by an inquiry that uncovered multiple violations of its code of research ethics, the Veterans Administration (VA) is adopting a new plan to ensure that its clinical studies follow orders. VA undersecretary for health Kenneth Kizer (right) told Congress last week that the agency's research centers will soon undergo review and accreditation from a new independent authority. Once established, the agency might also act to protect patients' rights at all federal facilities and even private clinics, according to government officials.



CREDIT: U.S. DEPARTMENT OF VETERANS AFFAIRS

The decision follows the VA's shutdown last month of research at its West Los Angeles Medical Center, prompted by the discovery that a cardiologist had performed an invasive research procedure on a patient who had refused consent (*Science*, 2 April, p. 18). To prevent future lapses, Kizer told members of the House Veterans Affairs Committee on 21 April that he is creating a new headquarters office to enforce guidelines. And to fill a "vacuum" in monitoring human studies, he says the VA will hire a private group to certify, every 3 years, that patient safeguards are in place at research institutions.

Worldly Scientists It's time for global leaders to have an esteemed body they can turn to for independent scientific advice, according to U.S. National Academy of Sciences (NAS) head Bruce Alberts. "The world badly needs an impartial mechanism, based only on science, to promote smarter decision-making" on everything from climate change to water policy, he said last week.

To fill that gap, Alberts announced plans to create a new international group—modeled on the academy's National Research Council—that could assemble expert panels to advise the United Nations, the World Bank, and other global institutions. Members could come from the NAS's 80-odd sister academies around the world, Alberts said.

The concept is a good one, says Roland Schmitt, president emeritus of Rensselaer Polytechnic Institute in Troy, New York, noting that other scientific societies have expressed a similar need. But NAS may be the first to move from words to action: Officials plan to meet with potential partners at a science summit in Budapest, Hungary, in June.

probe, which then channels them to a detector. "The probe can take two electrons if the [island] contains one extra electron pair, but zero electrons if the [island] doesn't have the electron pair," says Nakamura. "That's why we can distinguish the two electron states."

Still, Nakamura acknowledges that this simple demonstration remains far from a useful quantum computer. The main problem is that the paired electrons oscillate back and forth for only about 2 nanoseconds before they are torn apart and siphoned off by the probe electrode. "That's not enough to do any computation," says Nakamura. To be useful, researchers would like their qubits to be stable indefinitely. Efforts around the globe are now likely to focus on that goal, as well as on stringing a number of electronic qubits together to construct the first electrically controlled quantum computer.

–ROBERT F. SERVICE

CANCER RESEARCH

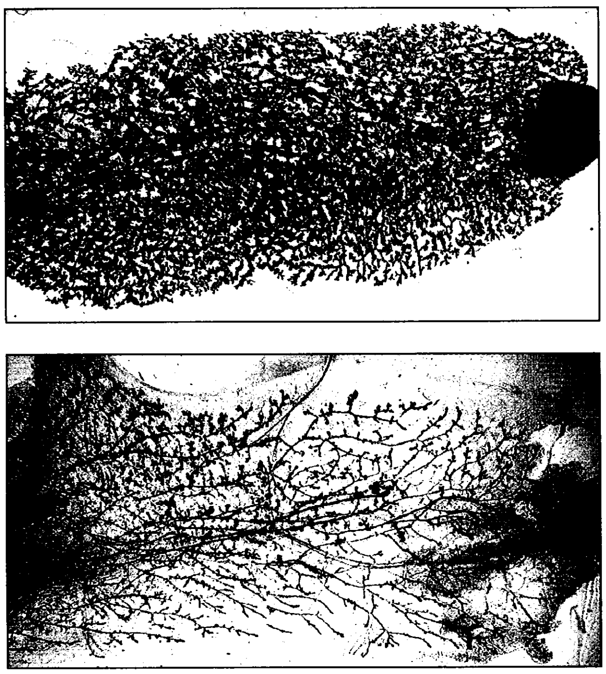
New Model for Hereditary Breast Cancer

Breast cancer strikes about one out of nine Western women in their lifetime and is second only to lung cancer as a cause of cancer deaths in women. For women who have mutations in *BRCA1*, one of two genes linked to the 5% or so of the cases that are hereditary, the disease is even more fearsome. They have a 70% chance of getting it. Now, researchers have an important new clue about how breast cancer develops, at least in these women.

The clue, in the form of an animal model for the disease, comes from the joint effort of two teams led by Chu-Xia Deng and Lothar Hennighausen at the National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK). In a paper in the May issue of *Nature Genetics*, the researchers report that they have inactivated, or knocked out, the *BRCA1* gene in mice exclusively in the cells where breast cancer normally originates—the epithelial cells lining the milk ducts.

Previous efforts in which genetic tinkers knocked out one or both copies of the gene in all mouse tissues produced disappointing results. Women with *BRCA1* mutations are born with one inactive copy, while the other becomes inactivated later. But the animals with one inactivated copy did not get tumors at all, and those with two inactivated copies from the beginning died before birth. In contrast, the NIDDK team found that their animals do develop breast cancers, starting when they are about 10 months old. "This is quite exciting. Such an animal model is invaluable for understanding the role of *BRCA1* in familial breast cancer," says Andrew Futreal of Duke University Medical Center in Durham, North Carolina, a *BRCA1* co-discoverer.

In keeping with previous work indicating that *BRCA1* is involved in repairing defective genes, Deng, Hennighausen, and their colleagues have found that breast cells lacking an active *BRCA1* gene are prone to accumulating additional defects—most prominently the loss of the *p53* tumor suppressor gene—that might be crucial contributors to cancer development. What's more, Futreal says, the new animals could prove useful in evaluating new treatments or chemopreventive drugs that might delay or even block the onset of breast tumors.



Duct reducer. Mammary tissue from a normal mouse *(top)* shows a dense network of ducts, whereas tissue from a *BRCA1* conditional knockout *(bottom)* has far fewer ducts.

CREDITS: (LEFT PAIR) XU *ET AL.*; (RIGHT) USGS

To knock out the gene specifically in breast tissue, Deng and Hennighausen engineered a so-called conditional mutant mouse strain. They first created mice with a genetic tag, called a loxP sequence, at two different spots within the *BRCA1* gene. Then the team crossed the loxP mice with another transgenic strain carrying the gene for a molecular scissors, an enzyme called Cre recombinase. To make sure that the *Cre* gene is active only in the mammary epithelial cells, the researchers combined it with the regulatory DNA elements of a milk protein produced only in this tissue. The Cre recombinase recognizes the

ScienceScope

Earth to NASA Researchers continue to have concerns about NASA's blueprint for a new generation of Earth-observing missions. Echoing earlier reviews, a National Research Council (NRC) panel last week said that although the space agency is on the right track with plans to launch a new group of smaller, cheaper, and more sophisticated probes starting in 2003, NASA still needs a science strategy to make sure it gets the most out of its orbiting fleet, which will monitor everything from land uses (right) to ocean temperatures.

The NRC group, led by atmospheric scientist Marvin Geller of the State University of New York, Stony Brook, also warned the agency against relying on a proposed polar orbiting satellite system to collect long-term climate data after an array of current instruments expire early next decade. "There is skepticism about putting all the eggs in that basket," says one academic. NASA earth science chief Ghassem Asrar was unavailable for comment, but one colleague predicts he "will be able to live with these recommendations."

New Blood Infusion Europe's top fusion research center is getting a change in leadership. After 18 years at the helm, Klaus Pinkau will step down on 1 May as scientific director of the Max Planck Institute for Plasma Physics in Garching and Greifswald, Germany. The new boss will be Alexander Bradshaw, director of the Fritz Haber Institute in Berlin and president of the German Physical Society.

Bradshaw, a chemist who switched to synchrotron studies of matter, inherits one of the continent's most active fusion programs. It is the European headquarters for the International Thermonuclear Experimental Reactor (ITER) project and is building Wendelstein 7-X, an experimental reactor, in Greifswald.

Pinkau—who will stay on as an ITER adviser through the end of the year—will be a hard act to follow, says Martin Keilhacker, director of the Joint European Torus in Abingdon, Britain. But he says Bradshaw is "a very good scientist and administrator."

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