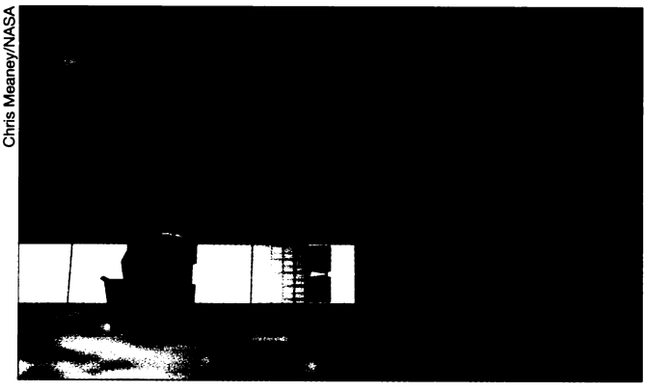
Chris Meaney/NASA

Red and blue colors represent reversals in magnetic field direction found in adjacent strips of the Martian crust in a region known as Terra Sirenum. The Mars Global Surveyor spacecraft passed over Terra Sirenum in January, as part of a maneuver to trim the craft's elliptical orbit into a circular one.

produced a map quite like this," he says.

Any magnetic map of Earth's crust, Connerney notes, must contend with our planet's still-active global magnetic field. That makes it difficult to determine whether a magnetic signal from the crust represents a permanent field—akin to a bar magnet embedded in the rock—or a field induced by Earth's still-active global magnetic field.

On Mars today, "there is no global magnetic field," he says. Consequently, measurements truly reflect a remnant field rather than an induced one. "Clearly, you can do things on Mars that a geophysicist can only dream of doing on Earth."

The younger, northern lowlands of Mars show no evidence of striping, and much less of the crust appears to be magnetized, Connerney says. These observations suggest that both the Martian magnetic field and plate tectonics had died away before volcanic activity melted and resurfaced this vast region of the planet.

It's possible that the fading of the global magnetic field and plate tectonics are intimately linked, Connerney speculates. When the interior lost so much heat that it could no longer power the dynamo, it may also have had too little energy to drive plate tectonics.

Schubert says he's skeptical about interpreting the magnetic field measurements as evidence of plate tectonics. He says that Connerney and his colleagues need to consider other models before concluding that Terra Sirenum is composed of elongated sheets of rock that have opposite polarity.

Moreover, Acuna argues that a process completely independent of plate tectonics could explain magnetic striping. He proposes that stresses or fractures in the crust may account for the pattern. Breaks in the crust could jumble the original magnetic signature and create a new, oppositely directed field. The process, he says, is similar to what happens when a bar magnet is cut in two. The cut ends generate a north pole and south pole opposite in direction to the field of the uncut magnet.

"These hypotheses are going to take a lot of testing," comments Zuber, who plans to look for signs of plate tectonic activity in gravity maps compiled from Surveyor data. "What I think is going to hold up is that there is evidence of a dynamo action really, really early in Mars' history, and then it appeared to shut off rapidly," she says.

If ancient Mars truly did undergo a period of plate tectonic activity, says Zuber "then it's a real home run." □

Astronomy

Black holes go middle class

Astronomers generally accept the existence of two kinds of objects that wield enormous gravitational pull: baby black holes just a few times more massive than the sun and giant black holes weighing as much as a billion suns.

Two groups of researchers now claim to have found a new, intermediate class of these bizarre beasts—black holes 100 to 10,000 times as massive as the sun.

"This is a new mass range that doesn't have a clear explanation," says study collaborator Edward J.M. Colbert of NASA's Goddard Space Flight Center in Greenbelt, Md.

One theory suggests that the midsize black holes arise from the merger of many smaller black holes. In another proposal, middleweights formed outright early in the universe and will ultimately pack on enough mass to become supermassive black holes, like the one believed to lurk at the core of our own galaxy.

The two teams studied X-ray emissions from galaxies suspected of harboring dense concentrations of matter near their cores. Both groups reported their results in mid-April at a meeting of the American Astronomical Society in Charleston, S.C.

As dust and gas disappear into a black hole, they emit a swan song of X rays. Studying the X-ray spectra with the Japanese satellite ASCA, Colbert and Richard Mushotzky of Goddard found that 10 of 17 nearby spiral galaxies emit a pattern of radiation expected from middleweight black holes. Colbert says that half of all spirals may contain midsize black holes. The team's survey of elliptical galaxies proved inconclusive.

Andrew Ptak and Richard Griffiths of Carnegie Mellon University in Pittsburgh found the same X-ray signature in the starburst galaxy M82. Starburst galaxies contain many massive stars, which provide the raw material for black holes.

Ramesh Narayan of the Harvard-Smithsonian Center for Astrophysics in Cambridge, Mass., says that the findings are intriguing. However, he cautions that determining the mass of a black hole by studying its X rays is not nearly as accurate as inferring its weight from its tug on neighboring objects. —*R.C.*

Life on Mars: Take two

They're at it again. The same team that 3 years ago made the controversial suggestion that a 4.5-billion-year-old Martian meteorite contains fossils of tiny bacteria has now announced finding similar fossils in two much younger rocks from Mars.

Using electron microscopy, researchers from NASA's Johnson Space Center in Houston and their colleagues identified minute spherical and rod-shaped features suggestive of fossils in the Martian meteorites Nakhla, about 1.3 billion years old, and Shergotty, about 180 million years old.

"Because we are finding evidence for fossilized organisms in meteorites with such young ages, it is conceivable that there could still be life somewhere on Mars at the present time," says study collaborator Kathie Thomas-Keptra of Lockheed Martin Corp. in Houston. Her team announced the findings in March at the annual Lunar and Planetary Science Conference in Houston.

Thomas-Keptra says the possible fossils have much in common with mineralized bacteria found in terrestrial rock known as Columbia River basalt. The spherical and rod-shaped features in the Martian samples are rare but occur in patches, a pattern "highly suggestive of biological activity," she notes. "Inorganic chemical precipitation, for example, would not likely occur in sporadic, random, colonylike patches."

John P. Bradley of MVA in Norcross, Ga., and the Georgia Institute of Technology in Atlanta says it's best to keep an open mind. However, he says that there's no compelling evidence that these features must be fossils. "The absolutely key prerequisite is to look inside these objects to see if you can see cellular structure," he says. "In the absence of that, [the scientists are] going to spin their wheels." —*R.C.*