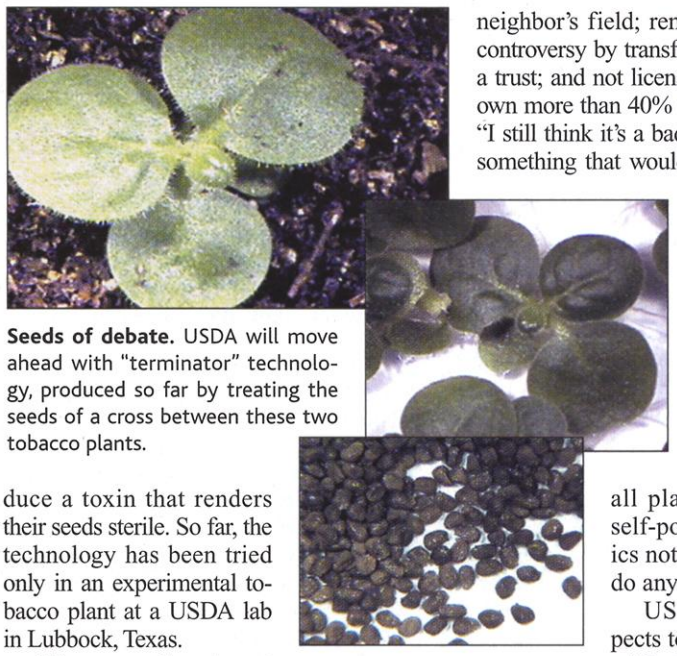


Seeds of debate. USDA will move ahead with "terminator" technology, produced so far by treating the seeds of a cross between these two tobacco plants.

duce a toxin that renders their seeds sterile. So far, the technology has been tried only in an experimental tobacco plant at a USDA lab in Lubbock, Texas.

When word got out about the first patent in 1998, the Rural Advancement Foundation International (RAFI) and others launched a highly visible campaign against the technology (*Science*, 30 October 1998, p. 850). Critics charged that it would prevent subsistence farmers from saving seeds and that pollen from the plants might sterilize neighboring fields as well. Soon after, the world's largest nonprofit agricultural research group, the Consultative Group on International Agricultural Research, pledged never to use the technology in its crops. Faced with heated opposition, Monsanto (now part of Pharmacia) also declared a moratorium on using the technology last October when it was considering buying DPL.

Meanwhile, away from the fray, some scientists inside and outside USDA have been arguing that the technology is too promising for the department to abandon. "There's so much good science to come from it," says James Cook, a plant pathologist at Washington State University in Pullman. The patent could be used to turn any gene on and off—"a goal of all plant breeding," said USDA tech transfer official Richard M. Parry Jr. at a meeting last week of USDA's new biotech advisory panel. He adds that "there are many other beneficial applications," including preventing the spread of genes from genetically modified crops to wild plants. These benefits persuaded USDA to pursue its patent and its agreement with DPL, despite vociferous opposition.

The opponents were well represented at the panel meeting, where USDA sought advice on what conditions it should include in the licensing agreement with DPL—not, as some expected, on whether it should proceed with the agreement at all. The diverse panelists offered several, such as making DPL legally liable should the plants damage a neighbor's field; removing USDA from the controversy by transferring its patent rights to a trust; and not licensing it to companies that own more than 40% of the market for a seed. "I still think it's a bad idea. I'm signing on to something that would make it a tiny bit better," said Margaret Mellon of the Union of Concerned Scientists.

By the meeting's end, the panelists had reached consensus on just one recommendation: USDA should ban the technology's use on existing varieties and on all plants that aren't highly self-pollinating—which, critics note, is what DPL plans to do anyway.

USDA's decision—it expects to finalize the agreement with DPL in the next few months—is unlikely to satisfy groups such as RAFI, which issued a press release calling the advisory board discussion "a giant charade." But in the larger scheme, what USDA does will not determine the fate of "terminator" technology; several companies are pursuing patents on similar technologies—and they will probably not be inviting critics to the table. **–JOCELYN KAISER**

GEOPHYSICS

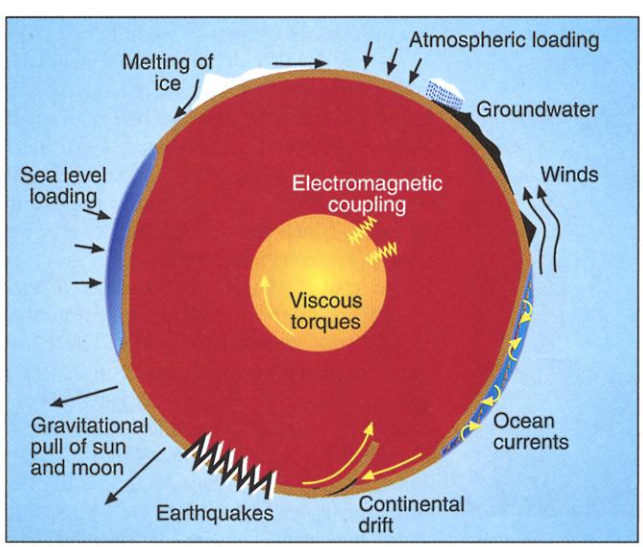
Atmosphere Drives Earth's Tipsiness

For more than a century, geophysicists who track Earth's rotation have sensed a rhythmic unsteadiness about the planet, an ever-so-slight wobbling whose source remained frustratingly mysterious. But researchers have been homing in on the roots of the so-called Chandler wobble, and now a report in the 1 August issue of *Geophysical Research Letters* fingers the shifting pressures of the deep sea and ultimately the fickle winds of the atmosphere.

Although the 18th century Swiss mathematician Leonhard Euler predicted that Earth should wobble on its axis at a pace of around once a year, it wasn't until 1891 that American businessman and amateur scientist Seth Carlo Chandler Jr. detected this wobble through analysis of stellar observations. Once every 14 months, Chandler found, Earth's spin axis wanders near the geographic pole within a rough circle anywhere from 3 to 6 meters across. If the off-kilter motion resulted from a single nudge to the tilted spinning top that is Earth, calculations showed it would have faded away in a few decades. Something must keep pumping energy into the wobble, researchers knew—but what?

Candidates abounded, but most eventually fell short. The jolts of great earthquakes come too infrequently. Wind blowing on mountains proved too feeble. That seemed to leave something in the ocean as the most likely possibility. To pin it down, geophysicist Richard Gross of the Jet Propulsion Laboratory in Pasadena, California, compared how Earth actually wobbled between 1985 and 1996 with how strongly the ocean and atmosphere, as simulated in the latest computer models, could have driven the Chandler wobble. Winds and currents proved far too weak in themselves, but the varying pressure that water pushed around by the wind exerted on the sea floor accounted for two-thirds of the wobble. Shifts in atmospheric pressure explained the other third.

Gross "has found the two biggest contributors" to the Chandler wobble, says geophysicist Clark Wilson of the University of Texas, Austin. And only one of these is in charge. "The oceans are mainly wind-driven, so you have the atmosphere driving the whole thing," Wilson explains. Aside from satisfying geophysical curiosity, that insight could help fly spacecraft to the planets. Gauging a spacecraft's precise location is tricky from an unsteady platform like Earth, but it may be easier now that scientists know what's rocking the boat. **–RICHARD A. KERR**



Battered planet. Many forces affect Earth's rotation, but the atmosphere alone drives the 14-month wobble.

CREDITS: (TOP TO BOTTOM) M. OLIVER/USDA-ARS (SEEDLINGS AND SEEDS); MODIFIED FROM K. LAMBECK, *NATURE* 286 (10 JULY 1980)