

### Tree rings date Pacific Northwest quake

Historical documents in the northwestern United States reach back less than 200 years—not long enough to tell whether the region occasionally suffers great earthquakes—so scientists have turned to trees for a record of prehistoric events. A pair of tree ring studies now provides evidence that the Pacific Northwest coastline unleashed a great quake in January 1700.

Previous analyses of marsh sediments had shown that the coast subsided in either one giant quake or a series of smaller jolts about 300 years ago. These geologic studies, however, could not pinpoint the exact date or determine whether the entire coastline moved at once—a sign of a magnitude 9 tremor.

Gordon C. Jacoby of the Lamont-Doherty Earth Observatory in Palisades, N.Y., and his colleagues examined living Sitka spruce trees, whose roots were partially submerged when the ground dropped 3 centuries ago. By looking at the growth year by year, the researchers determined that the land subsided in a quake between the growing seasons of 1699 and 1700. The quake occurred along at least 100 kilometers of coastline, they report in the November *GEOLOGY*. David K. Yamaguchi of the University of Washington in Seattle and his colleagues studied dead red cedars and reached a similar conclusion, which they describe in the Oct. 30 *NATURE*.

The findings corroborate Japanese records of damage from a large tsunami that struck in the predawn hours of Jan. 28, 1700 (SN: 4/8/95, p. 223). Geophysicists have determined that the giant wave came from a magnitude 9 earthquake, probably centered on the northwestern coast of North America.

The tree ring studies also hold implications for the future. Various measurements indicate that geologic stress is building along the coastline from northern California to southern British Columbia—the boundary of a piece of seafloor squeezing beneath the North American continent. The tree data indicate that the stress can trigger giant quakes. —R.M.

### Delaying cuts in greenhouse emissions

When negotiators from 150 nations meet in Kyoto, Japan, next week to hammer out international limits on greenhouse gas pollution, advocates of a wait-and-see approach can point to some new research to strengthen their position. A study of different policy options suggests that industrialized and developing countries can delay cutting emissions for a decade or more and still stabilize greenhouse gas concentrations at an oft-cited target—double the value seen before the Industrial Revolution.

Tom M.L. Wigley of the National Center for Atmospheric Research in Boulder, Colo., used a computer model of the global carbon cycle to analyze how various emissions options would affect concentrations of greenhouse gases in the atmosphere. One case assumed that industrialized countries decrease their emissions by 1 percent a year, starting in 2000. A more restrictive scenario assumed a 2 percent annual drop after 2000. The least restrictive case let industrialized emissions grow until the year 2010, remain constant until 2020, and then decline by 1 percent per year thereafter.

In the Nov. 20 *NATURE*, Wigley reports that even the most permissive of these options will lead to stabilization of greenhouse gases at double the preindustrial amount, provided developing countries begin to reduce emissions by 2030.

Kilaparti Ramakrishna of the Woods Hole (Mass.) Research Center argues in the same issue that negotiators should not use Wigley's work to justify a delay in curbing emissions. Ramakrishna cites studies that suggest greenhouse gas concentrations must be stabilized well below twice the preindustrial amount to avoid dangerous climate change. Furthermore, taking early action provides a better chance of successfully stabilizing emissions and may actually save money in the long run, he argues. —R.M.

### Teasing out tea's heart benefits

Epidemiological studies have found that tea drinkers face a lower risk of heart attacks than people who eschew the brew (SN: 10/30/93, p. 278). Curious to know why, researchers have begun focusing on flavonoids—tea's natural antioxidants.

Cholesterol-carrying low-density lipoproteins (LDLs) in the blood can be oxidized by naturally occurring molecular fragments known as free radicals. Such oxidized LDLs may eventually become part of artery-clogging plaque. The antioxidant potential of flavonoids has fostered a suspicion that tea's heart benefits come from its quenching of free radicals.

Data presented 2 months ago by Lester A. Mitscher of the University of Kansas in Lawrence fueled these suspicions. At the American Chemical Society national meeting in Las Vegas, he reported finding that when it comes to inhibiting oxidation, some of green tea's flavonoids are up to 25 times as powerful as vitamin E and 100 times as powerful as vitamin C.

Now, a Dutch study questions whether flavonoids actually deliver this kind of antioxidant protection to LDLs.

Forty-five healthy men and women drank 6 cups of water, green tea, or black tea daily for 4 weeks. Then Karin H. van het Hof and her colleagues at Unilever Research Laboratory in Vlaardingen extracted LDLs from samples of the volunteers' blood and subjected these fatty particles to oxidants. To their surprise, all of the LDLs proved equally vulnerable to oxidation.

When the LDLs were extracted from the blood, the water-soluble flavonoids stayed behind. This suggests that flavonoids do not enter LDLs to guard their cholesterol, the Unilever team reports in the November *AMERICAN JOURNAL OF CLINICAL NUTRITION*. However, van het Hof notes, flavonoids might protect LDL cholesterol by quenching free radicals in the blood or vessel walls. It's even possible, she observes, that flavonoids protect the heart through a totally independent means, such as by acting on enzymes that play a role in the formation of blood clots. —J.R.

### The heart-healthy side of lycopene

Can't stomach tea? Then try pink grapefruit, watermelon, or a tomato-based spaghetti sauce: All are rich sources of lycopene, a plant pigment and potent antioxidant. A new international study finds that diets rich in this carotenoid appear to reduce a person's risk of heart attack.

Four years ago, the nine-country EURAMIC study compared antioxidant concentrations in the fat of 683 men who had just experienced a first heart attack and 727 others who had never had one. It concluded that the men who ate lots of beta-carotene appeared to face a lower risk of heart attack than those who ate little of this well-known antioxidant.

When subsequent studies didn't confirm the link, Lenore Kohlmeier of the University of North Carolina at Chapel Hill and her colleagues decided to reanalyze EURAMIC's data, looking at other individual carotenoids, the three most common carotenoids in combination, and a host of other potentially confounding risk factors, such as smoking, weight, and age.

In the Oct. 15 *AMERICAN JOURNAL OF EPIDEMIOLOGY*, they now report that among carotenoids, only lycopene seems to be beneficial. Moreover, its protective effect increased as the amount of polyunsaturated fat in the diet rose—it was most beneficial in people whose body fat contained more than 16 percent polyunsaturated fat.

Though tomatoes are one of the richest sources of lycopene, a study in the July *AMERICAN JOURNAL OF CLINICAL NUTRITION* found that for enriching one's antioxidant defenses, tomato paste works better than the fresh fruit—and both are considerably better than tomato juice, which contains the most lycopene of the three. The processing of tomatoes into paste appears to make the lycopene easier for the body to absorb. —J.R.