

Making a date with light

To measure the age of a layer of sediment, geologists most often rely on radiocarbon dating of the organic matter mixed in with the earth. But carbon-14 is not always abundant in sediment samples, and ages greater than 70,000 years are beyond the range of this technique. Now David Huntley, Dorothy Godfrey-Smith and Michael Thewalt at Simon Fraser University in Burnaby, British Columbia, have sidestepped these problems with a new method that dates the mineral grains of sediment directly.

Their technique is based on the ability of radiation, produced in the decay of naturally occurring isotopes, to ionize electrons from atoms in the mineral crystal. These electrons then fall into traps or defects in the crystal. They can escape the traps if the grains are exposed to light. But once the sediment is buried there is no escape and electrons pile up in the traps. The number of captured electrons is, therefore, a measure of the time elapsed since the last exposure to light, and presumably the deposition age of the sediment.

As discussed in the Jan. 10 NATURE, the researchers used an argon-ion laser to excite the electrons from traps in sediment samples. The amount of luminescence given off when these electrons return to crystal atoms can be related to the amount of ionizing radiation the grains received over time. Combining this with the radiation dose rate, measured by other means, results in an age for the grains.

The main drawback of the new method is that samples must be taken in the dark. Nonetheless, the researchers have shown that electron luminescence increases with sample age. They also report an age of 62 ± 8 thousand years for a silt sample dated at 58.8 ± 0.3 thousand years with the carbon-14 method.

The times for tsunamis

Geoscientists love to hunt for the pulse beats of the earth, from the monthly patterns in rainfall to periodicities in comet impacts (SN: 1/12/85, p. 24). But there are some things—such as tsunamis, the giant waves generated by seafloor earthquakes—for which no rhythms are expected. However, after analyzing data on 322 tsunamis that occurred in the Pacific Ocean from A.D. 83 to 1967, a scientist at the Institute of Ocean Sciences in Sidney, British Columbia, suggests that there may be a pattern in the frequency of tsunamis too.

Tad S. Murty reports in TSUNAMI NEWSLETTER (Vol. XVII, No. 1) that the months of November, August and March showed an unusually high number of tsunamis relative to the monthly average of 26.8; July and April had a low number. Murty calculates that the probability of obtaining this distribution purely by chance is only 1 in 40. He concludes that his results can only suggest, not prove, a month-related dependence for tsunamis.

Urban methane

The primary source of methane released into the atmosphere is biological; methane comes from swamps, rice fields and cattle. Cities, too, contribute to methane emission, mainly through the leakage of natural gas. In the past, researchers have estimated that this nonbiological source accounts for 25 to 100 megatons of methane per year. However, these estimates were made with little quantitative measurement of atmospheric methane levels.

So Donald Blake and co-workers at the University of California at Irvine analyzed urban air samples for methane during a six-year study of methane concentrations worldwide. By tempering their calculations with data collected on trichloromethane, a gas emitted only in urban environments, the researchers estimate that the urban release of methane is about 30 to 60 megatons per year. They note in GEOPHYSICAL RESEARCH LETTERS (Vol. II, No. 12) that this amounts to about 8 to 15 percent of the total methane emitted into the atmosphere.

Cottonseed flour retards rancidity

Rancid meat results largely from lipid oxidation (fat spoilage), a process that occurs most rapidly once meat has been cooked, according to Texas A&M meat scientist Ki Soon Rhee in College Station. Since this process is induced by oxygen and not by microbes, freezing won't prevent it, which explains why fighting rancidity has become one of the leading problems facing purveyors of frozen, precooked meats. But research by Rhee indicates there's a natural antioxidant food ingredient that will retard development of those objectionable "off" flavors associated with rancidity—even in leftovers or long-warmed cafeteria offerings. It's cottonseed flour.

Seeds of normal cotton plants have pigment glands containing gossypol, a chemical toxic to humans. The high-protein flour Rhee uses comes instead from a glandless variety, and has been defatted to reduce both its high oil content and its susceptibility to rancidity. Initially Rhee mixed the flour with fresh uncooked ground beef. Though it slowed development of rancidity after cooking, Rhee suspected many consumers would object to having any additive in their otherwise pure beef. So now she's concentrating on slipping some cottonseed flour into the coatings on breaded and batter-dipped meat products.

In recent experiments, Rhee coated half her ground beef patties with batter made solely of wheat flour, and the rest in batter made from a 50/50 mix of wheat and cottonseed flours. After refrigerating these cooked "chicken-fried steaks" for five days, she found that those in wheat batter registered a thiobarbituric acid (TBA) test value of 10.5 to 10.9—unquestionably and very objectionably rancid. (TBA tests are the leading chemical tests for rancidity.) By contrast, 50/50 batter-dipped patties developed a TBA value of just 2.7 in the first test and 4.3 in a second. Rhee attributes the second, higher rancidity score to using meat that had been frozen before cooking, rather than using fresh meat.

Postcooking refrigeration was used to accelerate the rate of deterioration that would occur in the freezer. "Refrigerated [cooked] meat won't last even a day before it becomes unacceptable to sensitive people," says Rhee, noting that she is among the more sensitive, finding unpalatable the rancidity corresponding to a TBA value of just 1.2.

Even cafeterias can benefit from Rhee's studies. Though rancidity can occur at room temperature in just two hours, hamburgers or roast beef slices can be held warm for hours or be stored as leftovers—without a taste change—if immersed in a gravy or *au jus* solution containing cottonseed flour.

Court orders HHS to rule on raw milk

When the Food and Drug Administration (FDA) banned interstate sales of raw, or unpasteurized, milk in 1974, a temporary exemption was granted for "certified" raw milk, pending hearings to assess whether its special processing made it safer. (Certified raw milk is pumped from cows using special vacuum hoses designed to prevent hoses or milk from touching sources of possible bacterial contamination.) In 10 years, no such hearings to resolve the milk's status have been convened.

Meanwhile, the Centers for Disease Control in Atlanta has received what its director has described as a "wealth of evidence" linking consumption of this milk with serious diarrheal diseases that can result in death—most notably, campylobacteriosis and a virulent form of salmonellosis. Responding to a suit filed last year by the Washington, D.C.-based Public Citizen Health Research Group, U.S. District Court Judge Gerhard Gesell has ordered the Department of Health and Human Services (HHS) to stop its foot-dragging. Calling HHS's justification for inaction "lame at best and irresponsible at worst," Gesell gave the agency 60 days to publish a proposed rule settling the milk's regulatory status in both interstate and intrastate sales.