Icy theory explains strange sliding stones

Any philosopher pondering the creator's character should pack a suitcase, gas up the car, and head out to California's Death Valley National Park. One look at the famous sliding stones there will convince most people of the divine sense of humor.

For decades, geologists have struggled to interpret strange trails etched into the surface of Racetrack Playa, a dry lake bed neighboring Death Valley. At the end of each track sits a stone, the obvious perpetrator. But no one has actually witnessed the rough boulders—measuring up to one-half meter across and weighing around 300 kilograms—sliding across the flat ground.

According to textbooks, strong winds push the rocks after infrequent rains cover the lake surface with a thin film of mud. But geologists from Hampshire College and the University of Massachusetts, both in Amherst, now challenge the established idea. Their measurements of friction on the playa surface suggest that winds can budge the boulders only with the help of ice.

"The concept you have when you stand out there is that the wind should be able to blow these things around with ease. In fact, the coefficient of friction for the biggest rock was about 0.8. It's a 700-pound rock; that means it would take a 600-pound force to move the thing. The wind can't possibly blow strong enough to do it," says Hampshire's John B. Reid Jr.

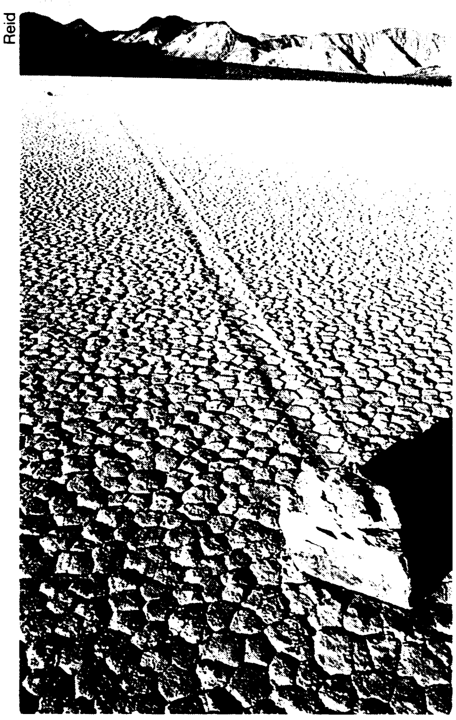
Reid and his coworkers wet the playa and measured how much force it took to move large and small blocks of dolomite. Since dolomite is rough, it doesn't move readily, even across slick mud, they report in the September GEOLOGY.

Individually, the stones do not provide enough surface area for the wind to push on, say the researchers. But when the lake surface freezes after a rain, wind passing over a large sheet of ice could generate enough force to drag several rocks embedded in the same ice, they suggest.

This theory, first proposed in 1955, was later rejected. But Reid's group found support for the idea while doing precise surveys of the trackways. Separate trails display exactly the same turns—which would be possible only if ice connected individual rocks.

Geologist John S. Shelton of La Jolla, Calif., however, suggests that some of the rocks move without ice. Shelton, who studied the problem on and off for 25 years, believes that winds can push the rocks when a thin layer of mud covers frozen ground, which Reid's group did not simulate. — *R. Monastersky*

Reid



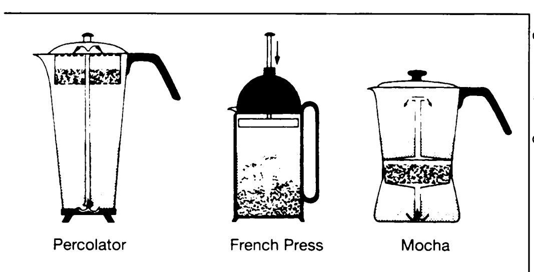
Stone trail on Racetrack Playa.

Coffee: Brewing's link to cholesterol

Last year, Dutch researchers identified two compounds in coffee oils that can raise cholesterol in the blood. The good news, the group reported earlier this year, is that paper filters virtually eliminate those diterpenes from drip-brewed coffee (SN: 2/4/95, p.72).

Now, the same team offers generally reassuring news for many millions of people who perk up each morning with coffee brewed in some other fashion.

Rob Urgert and his colleagues at the Agricultural University in Wageningen, the Netherlands, collected samples of brewed coffee from restaurants and households in Europe and North Africa. They also reconstituted 13 regular and 6 decaffeinated brands of instant coffee from five nations for analysis, and they brewed another 20 regular and 5 decaf brands from 10 countries. The latter included two U.S. brands each by Hills Brothers, Folgers, and Maxwell House.



Urgert *et al.*, J. Agric. Food Chem.

Popular nondrip brewing systems.

The instants contained only "minimal" diterpenes, Urgert's team reports in the newly released August JOURNAL OF AGRICULTURAL AND FOOD CHEMISTRY. Espresso, in contrast, contained the most—some 6 to 12 milligrams of the diterpene cafestol alone per 150 milliliters of coffee. However, because a typical serving of espresso is so small, a portion yielded only about one-quarter of the amount in a cup of such boiled brews as Scandinavian or Turkish and Greek coffees—types known to elevate cholesterol.

Urgert expressed surprise "that percolated coffee, though it's not paper-filtered, contained negligible amounts of [the diterpenes] cafestol and kahweol." He now suspects that the basket of grounds through which this brew repeatedly percolates serves as a filter for those compounds. Such filtering does not occur in a French press coffeemaker, whose plunger pushes grounds to the bottom of the pot after 5 or more minutes of brewing. This coffee met or exceeded the diterpene content of Scandinavian and Turkish or Greek brews.

The Dutch team concludes that drinking five cups of the increasingly popular French press coffee daily could raise cholesterol by 8 to 10 milligrams per deciliter of blood. It would take 15 or more servings of espresso or mocha to do the same. — *J. Raloff*

Widely used drug prevents strokes

A common anticlotting drug could be the key to preventing 40,000 strokes a year. Results from a government-sponsored study of patient records show that the anticoagulant warfarin—sold under the brand name Coumadin—successfully prevents strokes in people with rapid, irregular heartbeats.

While physicians have known that anticoagulant therapy helps to prevent some types of strokes, the finding, announced on Sept. 7 by the Agency for Health Care Policy and Research, an arm of the U.S. Public Health Service in Rockville, Md., emphasizes the drug's beneficial role for people suffering from a condition known as atrial fibrillation (AF).

"Warfarin can reduce a person's risk for stroke by 50 percent, yet fewer than half of the people who are eligible for anticoagulation therapy [receive it]," says study leader David B. Matchar of Duke University in Durham, N.C.

More than half a million Americans suffer strokes each year. A stroke occurs when narrowed blood vessels, blood clots, or bleeding in the brain deprives the brain of oxygen and nutrients. Strokes constitute the third leading cause of death in the United States, and survivors often suffer loss of vision, speech problems, and difficulties in walking.

Many strokes could be prevented, physicians agree, if people stopped smoking and took steps to control high blood pressure. However, nearly 5 percent of Americans over age 65 suffer from AF—a fast, erratic beat in the upper left chamber of the heart that causes blood to pool in the chamber and clot. People with AF run an increased risk of stroke from these clots.

Physicians have refrained from widespread use of warfarin to prevent stroke, Matchar says, because the drug can cause severe bleeding. Since there's no way to tell which patients will suffer strokes, many doctors questioned whether warfarin's ability to prevent stroke outweighed the risks of taking it. Moreover, each person requires an individual dosage schedule and monthly monitoring.

Matchar and his colleagues on the federal stroke prevention study examined records from eight centers across the country and found that "for every one person who suffers a serious bleeding complication, warfarin prevents 20 strokes and deaths," says Matchar.

The finding was so dramatic that the federal agency took the unusual step of announcing its results early. The warfarin work represents only one aspect of the overall study, which is designed to test a variety of methods for preventing strokes of all kinds.

Clifton R. Gaus, an administrator at the agency, says that caring for stroke victims costs an estimated $30 billion a year. Giving AF patients anticoagulants would reduce health care costs by some $600 million a year, he notes.

Roger L. Weir of Howard University College of Medicine in Washington, D.C., who represents the American Heart Association, points out that warfarin requires careful monitoring to prevent serious bleeding complications. Matchar agrees but notes that nurse practitioners, physician assistants, and nurses could provide appropriate monitoring under a physician's supervision.

— L. Seachrist

Carbon wires grow from tiny graphite tubes

Short chains of carbon sticking out from the ends of tiny tubes of graphite may one day form the ultimate in miniature electronic components—atom-sized sensors and probes. Scientists have found that when they send an electric charge across the graphite tubes, a more concentrated stream of electrons moves away from the carbon tails than from the tubes alone.

The graphite tubes—called carbon nanotubes because of their nanometer-scale dimensions (SN: 4/3/93, p.214)—actually consist of 10 to 20 concentric tubes nested inside one another. Because they conduct electricity well, the nanotubes sparked the interest of researchers who wanted to grow them into long wires.

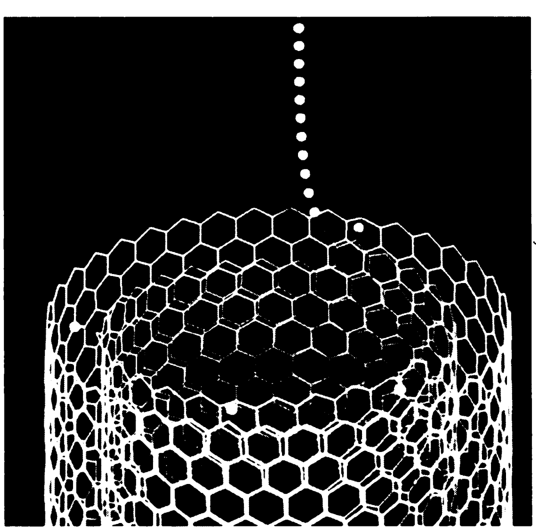
In the Sept. 15 SCIENCE, Richard E. Smalley of Rice University in Houston and his colleagues describe the carbon chains pulling away from the nanotubes "in a process that resembles unraveling the sleeve of a sweater." Heating the closed, dome-shaped ends of the nanotubes with a laser caused them to open and made the edges jagged and sharp. As the tubes cooled back to room temperature, carbon chains came away from the ends like loose threads pulled taut by the electric field.

Although the researchers cannot observe the chains directly, they believe the chains can be only 10 to 100 atoms long, says coauthor Andrew G. Rinzler of Rice. After unraveling a bit, each chain essentially hits a snag—a carbon atom that bridges adjacent layers of the nanotube. As a chain unravels from one layer, it eventually hits one of these "spot welds" and stops.

Rice's group found that the intensity of the electric current coming off the carbon chains on a nanotube was a million times greater than that from a nanotube alone. They now plan to measure the energy of the emitted electrons. Because the tips of the chains are so sharp—only one atom wide—Rice thinks the electron energies should also peak sharply. This could open the way to "laser beams of electrons," Rinzler says.

Though that application is far in the future, just being able to handle and manipulate the nanotubes "represents a step forward," says Hongjie Dai of Harvard University.

— C. Wu



Daniel T. Colbert/Rice University

Computer model shows two layers of a carbon nanotube with a linear carbon chain extending out from the inner layer. Carbon atom spot welds connect one layer to the other.

Steps up the ladder to superconductivity

Ladder compounds—chains of atoms connected by atomic rungs—have a simplicity and symmetry that make them useful structures for studying how the spins of atoms in a material interact to produce an electric conductor or even a superconductor.

More often than not, however, such handy arrangements of atoms are just hypothetical structures created by theorists to clarify their ideas and make predictions. Now, researchers have synthesized a particular ladder structure made of copper, oxygen, and lanthanum atoms—key components of high-temperature superconductors—to check their theories.

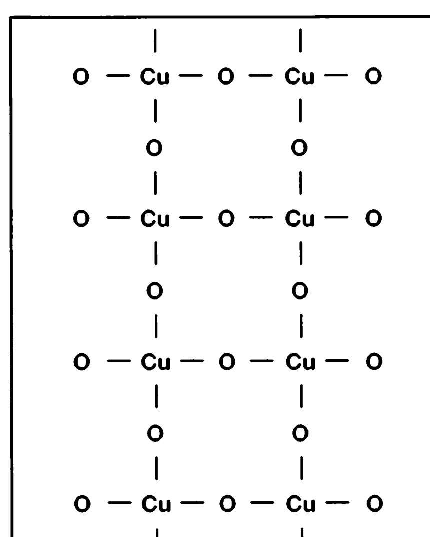
Z. Hiroi and M. Takano of the Institute for Chemical Research at Kyoto University in Japan describe their findings in the Sept. 7 NATURE.

The researchers produced a material consisting of two-leg ladders made of oxygen and copper atoms (see diagram). Lanthanum atoms occupy sites between adjacent ladders.

This lanthanum copper oxide compound is an electric insulator. Replacing some of the lanthanum atoms with strontium atoms modifies the spin interactions between copper atoms to turn the material into an electric conductor. But contrary to predictions by some theorists, the researchers observed no transition to superconductivity.

"In addition to the intrinsic interest in ladder compounds, there is also the more general hope that studies of such systems can provide new insights into the nature of the mechanism responsible for [superconductivity in high-temperature superconductors]," comments Douglas J. Scalapino of the University of California, Santa Barbara, in the same issue of NATURE.

— I. Peterson



Adapted from NATURE

Atomic ladder compound.