RANDOM SAMPLES

edited by CONSTANCE HOLDEN

Weighing the Atom

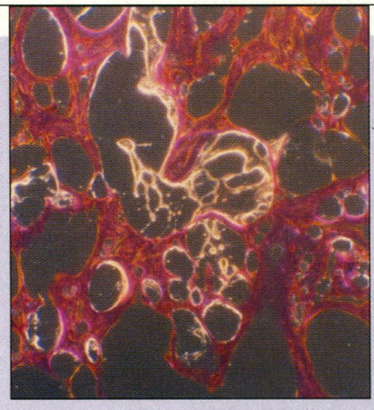
In deciding the world's weighty matters, final authority rests with a cylinder of platinum-iridium alloy, kept in an airtight chamber in Sèvres, France, that defines the kilogram. But Massachusetts Institute of Technology physicist David Pritchard thinks he has an even more precise alternative: the mass of an atom.

As Pritchard and his colleagues report in this week's *Physical Review Letters*, they have weighed nine elements and isotopes, from hydrogen on up the mass scale to argon, plus the neutron, to an accuracy of about 10 decimal places. That opens the way to using atomic mass itself as the basis for an external, unchanging kilogram standard, says Pritchard: one that is defined as a multiple of the atomic mass of, say, silicon.

The scientists exploited the uncanny sensitivity of a Penning trap to take the measure of the elements. This device uses electric and magnetic fields to trap ions—atoms or molecules carrying an electric charge—which oscillate around the lines of magnetic force. The heavier the ion, the slower the oscillation. The researchers achieved extremely precise frequency measurements by introducing single ions into the trap and watching each one oscillate for about a minute. By comparing the molecular frequencies of many different ions, with their different mixes of atoms, the group teased out the masses of the atoms relative to the atomic gold standard, carbon-12.

Many of the results improve on earlier figures, by factors of up to 1000, and they open the way to other feats of measurement. The isotope nitrogen-15, for example, differs from its parent, nitrogen-14, by the weight of one neutron minus the mass of the gamma ray emitted during the isotope's creation. Using their figures for the masses of both isotopes and the neutron, the group was able to put the gamma ray itself on the scales.

Now, says Pritchard, the group is hoping to leverage that feat into tests of some of the underpinnings of physics, such as the interchangeability of mass and energy expressed in $E=mc^2$, and the fine structure constant, a number that relates such basic quantities as an electron's charge and the speed of light. And eventually they hope to put that superannuated cylinder out of business for good.



JOSÉ CENTENO

Alien matter. Breast tissue with silicon vacuoles.

Tracking a Silicone Leak

Researchers have new evidence that the materials found in silicone breast implants are migrating to surrounding tissues. José Centeno, a chemist at the Armed Forces Institute of Pathology, used a tool not ordinarily employed in medicine—Raman spectroscopy—to make what he claims is the first positive identification of implant polymers that had leaked into breast tissue. But scientists have yet to determine if such leaks can be linked to health problems, such as autoimmune disease.

Using scanning electron microscopy and spectroscopic techniques, medical researchers have already detected the element silicon in the tissue of women with implants. But the investigators can't always prove that the silicon came from the implants, because small amounts of the element occur naturally, says Centeno. At the August meeting of the American Chemical Society, however, he reported that Raman spectroscopy can identify specific molecules through the characteristic pattern of vibrations in the bonds that hold them together. Thus researchers can tell whether silicon that is identified is naturally occurring or part of an implant.

Centeno studied 16 tissue samples from women who had had their implants removed. Twelve involved silicone. Of these, Centeno found evidence in six that the material had migrated to the tissue that forms around implants. In six cases he also observed migration of the polyurethane used to contain the silicone. With further study, he says, the technique may also identify degradation products of these materials. (Centeno found no materials shed from the four saline implants.)

"Now we have direct proof that the material is leaking out into the body," says Reed Panos, a collaborator with Centeno and a plastic surgeon at the Uniformed Services University of the Health Sciences in Bethesda, Maryland. "We've suspected this for a long time." But scientists have yet to determine whether the leaks cause health problems. That will require large-scale epidemiologic studies, says plastic surgeon Bruce L. Cunningham at the University of Minnesota. It's "interesting to know" the silicone is there, he says, "but it's not as interesting as knowing what effect it's having there."

New Head for Kinsey?

The troubled Kinsey Institute, without a director since last year, may be getting a new cheif. British psychiatrist and sexologist John H. J. Bancroft has been nominated to run the renowned sex research center, filling a post left vacant since the departure of psychologist June Reinisch last year.

Controversy has dogged the institute, founded by zoologist Alfred Kinsey at Indiana University (IU) in 1947, for the past few years. IU administrators asked Reinisch to resign in 1988, charging that she was doing a poor job of handling funds and conducting research. Reinisch, backed by Kinsey's board, held fast. She then filed suit against IU. In early 1993 the university dropped its demand, but Reinisch left soon after.

In December, the university and the institute formed a search committee for a new director (*Science*, 7 January, p. 19), and early this month it made its choice. Bancroft, a researcher with the reproductive biology unit of the Medical Research Council and a lecturer at the University of Edinburgh, is known internationally for his work on impotence, menstruation, and menopause. "This would be a major catch for both the institute and for the university," says Kinsey interim director Stephanie Sanders.

IU, which cut its payment to the institute in half in 1993, will likely restore some funding now that Reinisch is out, Sanders says. But the financial picture is still unclear. Bancroft will visit IU this month to negotiate the terms of his position.

Interferon With Infertility

Interferon (IFN), used to treat leukemia and hepatitis B, so enlivened the sperm of two infertile men that after 2 months' treatment they were able to impregnate their wives, Japanese researchers report in a letter published in the 27 August issue of *The Lancet*.

Puzzled by evidence that IFN seemed to inhibit fertility in male patients, urologists Masanori Yamamoto and Koji Miyake at Nagoya Medical School were studying how daily injections of IFN-alpha would affect sperm production in rats. To their surprise, it upped some rats' sperm counts. So they tried the same thing on four healthy men with low to nonexistent sperm counts who had been infertile for 1.5 to 3

years. They were given high doses of IFN-alpha 5 days a week for 8 to 12 weeks. The result: Sperm counts had risen to normal in three of them, and the wives of two were pregnant. "The response is fast," says Yamamoto.

It's also baffling. The researchers say, "We can offer no pharmacological mechanism to explain our results." Among its various effects, though, IFN interferes with replication of viruses. One theory holds that some cases of infertility are caused by a tiny obstruction—possibly created by an infection—in the tubules that carry sperm out of the testes. Andrologist Anthony Hirsh of the London Women's Clinic says the anti-viral action of IFN might clear up the infection, thus allowing sperm back into the semen.

Although the researchers had ruled out most causes of infertility in their subjects, they don't know if blockages were the problem because they didn't do biopsies. Yamamoto hopes that further research will justify moving on to a clinical trial.

Meanwhile, other researchers are treating the finding only as a tantalizing clue. "It's a very interesting observation, but it's very difficult to draw any conclusions from it," says John Aitken, a gamete biologist at the Medical Research Council's Reproductive Biology Unit in Edinburgh.

Alcoholic Brain Waves

Alcoholism researchers have long sought some sort of biological marker that can predict who is most likely to develop the disease. Some of the most promising leads have come from brain-wave research—in particular, studies showing that one neurological oscillation, the P300 wave, has an abnormally low amplitude in "at-risk" people (children and families of alcoholics).

Now neuroscientist Bernice Porjesz at the State University of New York Health Science Center at Brooklyn, working in the same lab where the P300 findings were generated, has come up with another candidate, the N400. A waveform associated with language processing, it is evoked when the brain is presented with unexpected information.

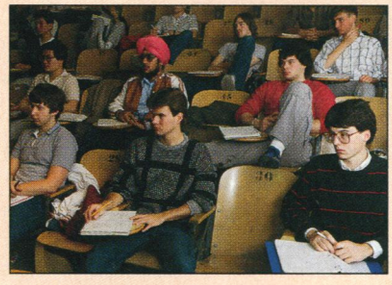
Porjesz has found that in tasks involving electrophysiological responses to word stimuli, the N400s evoked in the at-risk group look more like those of alcoholics. For example, the average person will show a strong N400 in response to an unfamiliar pairing (like "cream and socks") but not to a familiar one ("cream and sugar"). But, says Porjesz, "We're finding in alcoholics and at-risk subjects that they don't differentiate between matching and nonmatching stimuli—they respond to all stimuli as if it's the first time they've seen them."

Porjesz suggests that these findings, together with the P300 data first generated by her lab chief psychiatrist Henri Begleiter, could be put together to come up with a "phenotypic marker" for vulnerability to alcoholism. Porjesz has not yet published her findings, which she presented this summer at a meeting in Hawaii of the Research Society on Alcoholism, but other researchers say they sound interesting. Scripps Institute neuropharmacologist Floyd Bloom says that scientists value "any potential clue of a way of predicting what's different in the brains of people at risk."

Site Visits to "Chilly Climates"

As the weather changes this fall, teams of women scientists will be traveling the country, sampling the "chilly climate" for women in academe and offering suggestions for ways to warm universities up. The Association for Women in Science (AWIS), with the aid of $200,000 from the Alfred P. Sloan Foundation, will send teams to departments of chemistry, biology, and mathematics, at perhaps a dozen institutions, following the model of a previous program of site visits by women physicists (*Science*, 11 March, p. 1393).

AWIS executive director Catherine Didion calls the project "a 2-year intervention program." A visit will take about a week, but teams will track each school over 2 years. Teams will offer advice on policies that seem to foster women's participation in science, including practical suggestions, such as flexible hours or parental leave, as well as measures to facilitate "free-flowing communication." Ironically, says Didion, male faculty members have told her that sensitivity about women's issues has inhibited informal communication, making them "very circumspect in their relations with their women colleagues."



PAUL CONKLIN/UNIPHOTO

Cold company? Mostly male class at the University of Texas.

The site visit teams will be made up of women members of the National Academy of Sciences. Mildred Dresselhaus, an engineering professor at the Massachusetts Institute of Technology, who has been involved in the physics site visits, says: "You have to have high-level people doing the site visit; otherwise they don't pay any attention to you."

THE GRANGER COLLECTION

Minoan beauty. Women have been using cosmetics since the beginning of civilization.

Making Up the Ancients

"Lead has been eroding European women's skin for at least 3000 years," claims a team of archaeologists who recently discovered 50 grams of toxic face powder in a 3000-year-old tomb in a Mycenean cemetery in Greece.

The team, which published its finding in the current issue of *The Lancet*, believes the entombed powder was intended for cosmetic use because of its small volume, and because its composition —80% calcium carbonate and 20% lead sulfate hydrate—is similar to that of preparations used as cosmetics throughout history.

The new findings "push back by half a millennium the date of lead-containing cosmetic use in Europe," says physician-archaeologist Athanasios Diamandopoulos of the XI Archaeological Department of Prehistoric and Classical Antiquities in Patras. The women of yore may have paid a steep price for their beauty, he says—the lead compound can trigger vomiting, constipation, headache, and even personality changes.

Until this finding, it was believed that Europeans didn't resort to lead-based cosmetics until the 6th century B.C., when Greek women used lead-based face creams to lighten their skin. And during the Roman Empire, says Diamandopoulos, triumphant generals beautified themselves with lead face powders before victory parades.

Vanity has proved resistant to the health warnings about lead cosmetics that have been issued since at least the Hellenistic period, according to Diamandopoulos. And, he says, lead hair dyes are still in use.