



Harris (left) and excavator working at what may be the oldest human campsite.

sity in Cleveland, because of the political situation in Ethiopia. But the dating team did gain access to the site last January, and they have since been able to complete their work. Aronson says he and the others are fairly confident of the dates they got, which range from 2.9 to 2.7 million years old. Also involved in the dating project were Taieb, Robert Walker of the University of Toronto, Jean-Jacques Tiercelin of the Center for Scientific Research in Marseille and Michel Beden of the University of Poitiers in France.

If the dating holds up as it is expected to, these tools will be the oldest known human artifacts. They will, however, fall into a gap in the story of human evolution as we know it. The Afar region has yielded fossil hominids (*Australopithecus afarensis*) that roamed eastern Africa between approximately 3 and 4 million years ago (SN: 1/20/79, p. 36). Many researchers feel that *A. afarensis* was on the direct line of human evolution, but it was a small-brained creature that probably was not

capable of manufacturing tools. Hominids with larger brains have been dated back to 2 million years ago, as have stone tools, but that leaves nothing between 3 and 2 million years ago—until now. "That's why this thing is exciting and intriguing," says Isaac. "It opens the possibility that perhaps the first use of stone tools preceded the development of a significantly enlarged brain and were part of the behavior or way of life that helped to induce, or influence, the enlargement of the brain." That's one possibility. The other, he says, "is that the trend toward brain enlargement began earlier than the oldest fossils we yet have."

The question posed by these possibilities will not be answered until the tool-maker is found. In the meantime, the tools themselves are likely to create some excitement. Elwin L. Simons of Duke University (who also knew of the find) puts it this way: "The oldest documentation of stone tools is the beginning of archaeology; it's the beginning of cultural history." □

Reflecting X-rays normally

Textbooks of optics will tell you that X-rays cannot be reflected by a mirror at normal (near perpendicular) incidence as visible light and radio waves can be. The difference between the indices of refraction for air and for most solid substances is too small at X-ray wavelengths to cause much reflection. (At visible and radio wavelengths the difference is big enough.) For the same reason there will not be any appreciable refraction in a lens.

X-rays can be reflected at grazing incidence. Reflection depends on the angle the incident beam makes to the perpendicular and the difference in refraction index. Here the large angle from the perpendicular compensates for the small index difference. Most of the devices used to

reflect and focus X-rays up to now have been based on grazing reflection.

Now the alternative of normal reflection, since Isaac Newton's day the preferred method of focusing light with mirrors, seems likely to become available for X-rays. A group of scientists including Eberhard Spiller and Armin Segmüller of the International Business Machines Corporation Research Division, in Yorktown Heights, N.Y., Jack Rife of the National Bureau of Standards (now at the Naval Research Laboratory) and Rolf-Peter Haeblich of the University of Hamburg and the Deutsches Elektronen Synchrotron (DESY) have developed and tested a multilayer mirror coating that will reflect up to 10 percent of X-rays incident from a near

normal direction. The work is reported in the latest issue of *APPLIED PHYSICS LETTERS*.

Multiple layer coatings of this sort have been used for some time for the best visible-light mirrors. They alternate layers of a transparent and an opaque material. If a single pair of layers is one-half a wavelength thick (for whatever radiation one wants to reflect), the alternation of transparency and opacity will set up a standing-wave condition. A standing wave has components going both forward and backward. The backward component contributes a certain amount of reflection.

Extending the multilayer technique to X-rays was something of a problem in close tolerance fabrication. The boundaries of the layers must be smooth to within 1/20 of a wavelength. For visible light at, say, 5,000 angstroms that means 250 angstroms tolerance, for X-rays at 200 angstroms that yields about 10 angstroms leeway. The X-ray coatings have to be laid down to about the accuracy of a single layer of atoms. The group developed a way to do it that can lay down 200 layers with a cumulative thickness error of only 5 angstroms, they report. The mirrors were tested at the National Bureau of Standards and at DESY.

With this technique spherical mirrors for X-rays can be manufactured. This means more flexibility in the design of X-ray telescopes. It also means better resolution, the researchers point out. The grazing-incidence mirrors used up to now in X-ray telescopes have to be curved as sections of paraboloids or hyperboloids. These are harder to machine to true shape than spheres. So they tend to focus less well.

Combined with the extremely intense X-ray beams that come as synchrotron radiation from some of the world's largest electron accelerators, spherical mirrors



Spiller watches deposition of layers.

could make an X-ray microscope capable of resolving structures as small as 200 angstroms in living biological specimens. Electron microscopes have a resolution of a few angstroms, but the specimens have to be put through special preparation which may alter their structures. Light microscopes will take living specimens, but their resolution is limited to about 2,000 angstroms.

Further progress, the announcement says, will depend on improvements in the shaping of the mirror blanks on which these layers are deposited. These have been manufactured to visible light tolerances. X-rays will require a factor of 10 improvement. □

Toxic shock declines, as does tampon use

The saga of toxic shock syndrome has taken an unexpected turn. Just when publicity about the rare, sometimes fatal, disease was expected to boost the number of reported cases, the incidence of the syndrome appears to have dropped dramatically. In August 1980, the peak month, 119 cases were reported to the Centers for Disease Control but, after a steady decline, only 37 cases were tallied in December.

The most likely explanation for the sudden decrease in toxic shock incidence is that women have changed their tampon-wearing habits, says the CDC's MORBIDITY AND MORTALITY WEEKLY REPORT. The syndrome was reported last summer to be associated with tampon use (SN: 7/5/80, p. 6). Telephone interviews by tampon manufacturers indicate that from July 1980 to December tampon use dropped from 70 percent to 55 percent. In addition, Rely brand tampons, which were associated with an increased risk of toxic shock syndrome (SN: 9/27/80, p. 198), were removed from the market in September. The tampon manufacturers also report no decrease since September in the proportion of tampon users who choose highly absorbent tampons, which have been suspected of increasing risk of the syndrome.

Several possible explanations for the drop in toxic shock incidence have been discounted by the CDC. Seasonal variation is an unlikely cause because in 1979 the number of reported cases climbed steadily from fewer than 10 per month in August and September to 28 in December. Another explanation, this one stressed by Procter and Gamble (the manufacturers of Rely) in a press release, is that a change in the reporting system in September makes comparison with earlier counts misleading. Since September, physicians have reported cases to the state health departments instead of directly to CDC. The center, however, finds a decline even when it considers only cases reported through state health departments. □

Platonic chemistry: Now a dodecahedrane

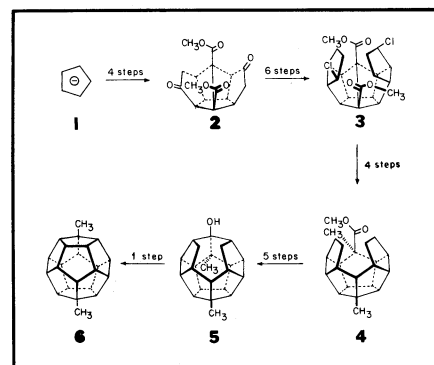
What do you get when you mix sophisticated organic chemistry know-how with the abstract thinking of Plato's time? Chemists trying to form polyhedrons out of carbons and hydrogens.

Platonic philosophers recognized five regular polyhedra: the cube, tetrahedron, octahedron, icosahedron and dodecahedron. When the heritage of these Platonic solids entered the realm of organic chemistry about two decades ago, researchers first constructed hydrocarbon cubes (cubanes) and tetrahedrons (tetrahedranes) with carbons at the corners of each polyhedral face. A hydrocarbon icosahedron—in which five lines intersect to form each corner—was ruled out because carbons can bind to only four other atoms. The octahedron also did not appear to be a feasible synthetic target because each corner carbon should have to bind to four other carbons at impossible, strained angles. The dodecahedron, therefore, was the only realistic, synthetic hydrocarbon-cage target remaining among the five Platonic solids.

Now, Leo A. Paquette and colleagues of Ohio State University at Columbus have constructed the first 20-sided hydrocarbon structure, or dodecahedrane, completing the possible set of wholly hydrocarbon Platonic solids. The chemists detail the synthesis of their Platonic solid—1,16-dimethyldodecahedrane (labeled "6" in the diagram)—in the Feb. 6 SCIENCE.

The synthesis of dimethyldodecahedrane was quite a chemical challenge, says research colleague Gary G. Christoph. "The real problem is in trying to get all 20 [corner] carbon atoms in the right configuration so it is possible to finally close the structure," he explains. "The structure of the molecule looks like the lines on a soccer ball," Christoph says. "We're fighting nature to form these lines; if it were easy, nature would already have done it." But the organic soccer ball does not exist naturally; instead, it took 19 man-years of laboratory effort to produce the "unusual beast," says Christoph.

Exploring this beast's potential utility is one of the next steps of the dodecahedral research. "It's hard to say what it's going to be good for," Paquette says, "because we have never before had it to study." Still, the researchers have some ideas. First, the ball bearing-like quality of the dodecahedral crystals may impart a lubricant property. In addition, modifications of the structure to enlarge the center space may make it possible to insert atoms in the vacant enclosure. Finally, the dimethyldodecahedrane's high degree of symmetry may be useful. Researchers have theorized that the more symmetrical a hydrocarbon is, the easier it can penetrate the body's cell walls. If this theory is proved true, then highly symmetrical hydrocarbons may make more efficient the delivery, for



instance, of antiviral agents.

Meanwhile, Paquette and colleagues are striving for an even more symmetrical organic dodecahedron: The two extra methyl, or CH_3 , groups on their present structure make it two degrees less symmetrical than its parent—one without the extra groups. Says Christoph, "We hope to have the parent compound within the next several months or so." □

Vitamins vs. mental retardation

Vitamin and mineral supplements can significantly increase the intelligence of retarded children, especially those with Down's syndrome, researchers report in the January PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES. The work is reported by Ruth Harrell, professor emerita of psychology at Old Dominion University in Norfolk, Va., Dwight Newell of Old Dominion University, Ruth H. Capp of the University of Arizona College of Medicine, Donald R. Davis of the University of Texas, and Julius Peerless and Leonard R. Ravitz, private physicians in Norfolk, Va.

The researchers studied 22 severely retarded youngsters, eight of them with Down's syndrome, in order to test a hypothesis put forth 30 years ago by Roger J. Williams of the University of Texas—that genetically determined diseases such as mental retardation can be improved with better nutrition. The I.Q. levels of all the youngsters were tested at the start of the study. Half of them then received relatively large amounts of 11 vitamins and moderate amounts of eight minerals three times a day for four months. The other half got placebos three times daily during the same period. At the end of the four months, all of the subjects had their I.Q.s retested. Those who had received vitamins and minerals showed a statistically significant mean I.Q. score increase of five points compared with an increase of 1.1 points for the placebo subjects. When the placebo subjects got the vitamin-mineral supplements for a four-month period,