The Camp David Asteroid

On Sept. 10, while President Carter, Israeli Prime Minister Begin and Egyptian President Sadat were at Camp David, Md., studying the future of the Middle East, astronomers on Palomar Mountain in California were studying the sky — a tenuous connection, except for an asteroid discovered on one of that night's photographic plates by Eleanor Helin of the California Institute of Technology. In commemoration of the Camp David peace talks, Helin has proposed that the object be officially named Ra-Shalom, for "the Egyptian sun god Ra, who symbolizes enlightenment and life, and Shalom, the traditional Hebrew greeting meaning, 'peace'." (It also turns out to be a play on the asteroid's identification number, 1978 RA, which embodies a two-letter code indicating the time of year and sequential position of the object's discovery.)

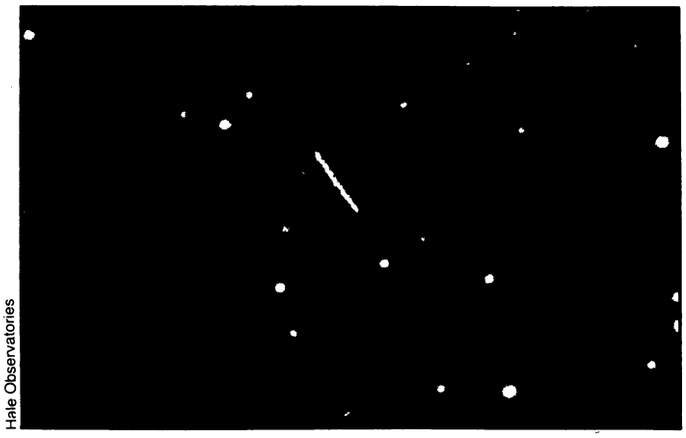
There the Camp David connection ends. But Ra-Shalom's distinctions do not.

Most such objects, technically referred to as "minor planets," circle the sun in a belt between the orbits of Mars and Jupiter. A few dozen have been identified on paths that take them inside Mars, but Ra-Shalom is one of only 26 known asteroids whose orbits extend inside the orbit of the earth, a class known (for the first of their kind to be discovered and named) as "Apollo asteroids."

Among those 26, furthermore, there are only three whose semi-major axes — essentially, the object's mean distance from the sun — are less than the earth's, and Ra-Shalom has the shortest semi-major axis of all. As a result, it takes less time to circle the sun than does any other known asteroid: A "year" on Ra-Shalom is only 0.759 earth-years long — about nine months. Because its orbit is so elongated (eccentricity 0.436), it does not spend all its time cruising just inside the earth's path. Instead, it ranges from just outside earth's orbit, about 180 million kilometers (1.195 astronomical units) from the sun, to within the orbit of Venus, only about 71 million km (.469 AU) from the sun.

The object was actually photographed in 1975 by astronomer Richard West of the European Southern Observatory in Chile, but those observations were too few to yield clear orbital measurements for an official "discovery." James G. Williams of Jet Propulsion Laboratory now has determined that the 1975 and 1978 observations are of the same object.

But there's still more to Ra-Shalom. Color measurements by Edward Bowell of Lowell Observatory in Arizona indicate that the object may be a carbonaceous chondrite (only the tentative second Apollo asteroid ever to be so identified), a class of meteorites rich in organic material and believed to represent some of the most primitive material in the solar system. Polarization measurements by Benjamin J. Zellner of the University of Arizona are consistent with a similar conclusion, in which case its diameter is about 3 to 4 km, and Bowell has calculated from the preliminary observations that it may rotate once on its axis about every 12 hours.



Hale Observatories

Asteroid Ra-Shalom, photographed by Hale Observatories' 46-cm Schmidt telescope (20-min. exposure).

The carbonaceous nature of the object is not completely certain, however. The low infrared emissions recorded by the University of Arizona's Larry Lebofsky would normally be interpreted as indicating a smaller diameter and a noncarbonaceous composition. The same problem arose during 1976 studies of the asteroid Petulia, and in that case there were radar data confirming the larger size. One way to reconcile the matter would be to assume a hard, rocky surface rather than the fine rubble typical of most asteroids, and Lebofsky suggests that the low gravity of carbonaceous objects in this size range may indeed let their loose surface material escape into space. Or if the color measurements are slightly off, says Bowell (who made them), perhaps Ra-Shalom is a different class, such as a metallic type M. □

Cancer and the workplace: 'A disaster'

Between 20 percent and 40 percent of all cancers that can be expected to occur during the next several decades may be caused by exposure to various chemicals in the workplace, according to a study released by the Department of Health, Education and Welfare. The report concludes that previous studies, which put the figure at closer to 5 percent, were inadequate because they generally overlooked the multiple causes of cancer and the time lag between exposure and illness.

Much of the impetus for HEW's revised estimate comes from recent studies showing a much greater incidence of cancer among asbestos workers than had previously been expected. Since the beginning of the Second World War, about 4 million workers have received "heavy exposure" to asbestos, and of those that have already died, between 35 and 44 percent have died of cancer. Only 8 or 9 percent would ordinarily have been expected to die from the particular kinds of cancer afflicting these workers.

These mortality figures are only now becoming evident because of the latency period of perhaps 30 years that can intervene between initial exposure to asbestos and the development of asbestos-related cancer. Generally, the workers in wartime shipyards were young men who only now are reaching the age when cancer becomes prevalent. The conclusion is that as other hazardous chemicals have become common since the end of the war, another generation of workers has inadvertently been exposed and that their cancers will begin to show up in years to come.

Concludes the report: "Perhaps the most important lesson to be learned from the abestos story is that a major public health disaster can develop while its early manifestations are lost by being attributed to other factors. This would support the argument that the earlier estimates for industrially related cancers may be deceptively low — having left out such information as the asbestos situation has now brought to our attention."

The report was prepared by a team of 10 scientists, representing the National Cancer Institute, the National Institute of Environmental Health Sciences and the National Institute for Occupational Safety and Health.

Out of 400,000 to 500,000 cancer deaths each year, the report estimates that be-

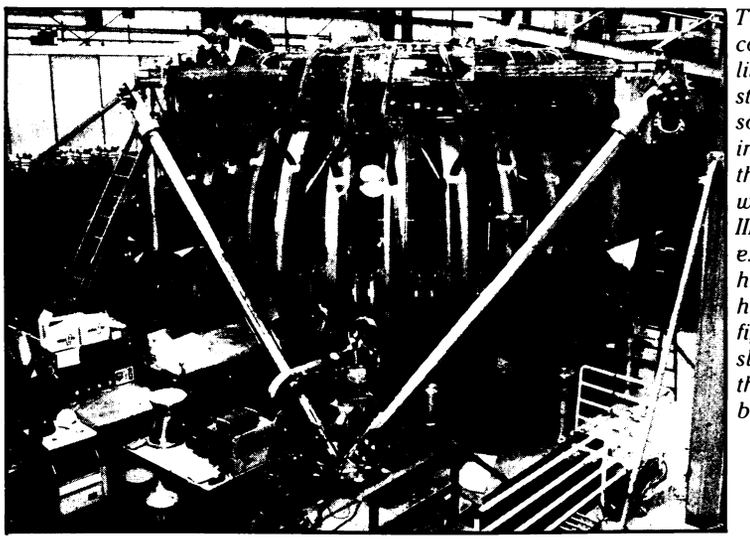
tween 58,000 and 75,000 are "associated with" asbestos. However, because exposure to more than one carcinogen may increase one's chances of getting cancer far more than might be expected from the individual risk factors, projecting cancer incidence from all factors combined becomes quite complicated. For example, many of the cancer cases will be associated with smoking as well as with some industrial carcinogen. For this reason, a rather artificial term—"excess cancers"—is used to compare the potential danger to workers from various industrial substances. (The quantity reflects the number of cancers that would result from a given length of exposure in a group of workers of the same age who didn't change jobs.) For asbestos, the number of expected "excess cancers" a year is 13,900—far less than the number actually expected to be associated with asbestos exposure, but a useful figure when comparing risks. The excess cancers expected annually from five other common industrial substances — arsenic, benzene, chromium, nickel oxides and petroleum fractions — is 33,000, leading the researchers to conclude that "the five other agents together pose hazards similar to or greater than those posed by asbestos."

And that's just the beginning. Some 221 substances have been identified as causing cancer in animals, but for most not enough occupational exposure data have been gathered to allow projections like those above. To compensate for this handicap, the report presents a list of occupations known to involve high cancer risks, but where no single agent can be identified. Furniture workers, for example, experience three or four times the number of cancers in the nasal cavity and sinuses than would ordinarily be expected. Other high-risk occupations: shoe workers, miners, tire workers, newspaper pressworkers and chemists.

Predictably, industry representatives strongly disagreed with the conclusions of the report. "If the vinyl chloride estimates are any indication of the accuracy of the rest of the report," said Ralph L. Harding Jr., president of the Society of the Plastics Industry, "the document must stand convicted as an embarrassment to medical science and to the government agencies that produced it." The study has estimated an excess cancer rate from vinyl chloride of 1,940 cases annually. Harding called the estimate "ludicrous to the point of absurdity," saying that only 23 confirmed fatalities from the chemical had been seen in the last 16 years.

Other industry sources were more cautious, preferring to wait until company scientists had had a chance to analyze the data carefully. More specific challenges will certainly follow, and the whole issue of how the public should be protected from hard-to-predict risks is likely to heat up when new proposals for regulations result from this report. □

Doublet III pulls up its hosen



General Atomic

The vertical coils look a little bit like stays, and somewhere inside them is the chamber where Doublet III's plasma is expected to hold its hourglass figure as it slithers toward the day of breakeven.

Of American experiments aimed toward controlled thermonuclear fusion, the series called Doublet, which has been operated by General Atomic in San Diego, is unique for its shape. The Doublet series is made up of magnetic confinement experiments in which a magnetic field is used to confine a plasma of atomic nuclei and electrons until the nuclei fuse. There are many other varieties of magnetic confinement experiment. The vacuum chamber in which Doublet's magnetic fields do their confining is a toroid. That, too, is not unusual; there are many toroidal experiments.

The unusual quality is the cross-sectional shape of the plasma, which is bilobar, or figure-eight shaped. Most plasmas are held in circular or elliptic cross sections, but it has been General Atomic's conviction, or rather the conviction of Tihiro Ohkawa, vice president and head of General Atomic's fusion division, that the Doublet shape would provide savings in magnetic field strength that would mean less power needed to keep a fusion reactor going, and therefore a more economical reactor system than other options (SN: 1/22/77, p. 61).

Now General Atomic has dedicated Doublet III, the biggest in the series, 500 tons, 16 feet tall, 19 feet in diameter. In it they hope by the early 1980s to reach "breakeven," the situation in which energy generated by fusions equals the energy expended to get the fusions going. To them this means temperatures near 100 million degrees for up to a second and a density of 300 trillion nuclear particles per cubic centimeter. □

Self and non-self chemicals of immunity

Cancers might be attacked more successfully and flu vaccines might be more effective if the body's immune system could be thrown into high gear at a physician's command. Two chemical approaches that may rev up disease-fighting ability are: imitating a natural invader and imitating a signal normally sent between the defense troops. Drugs that result from investigations of these mechanisms, also could aid patients with immune system deficiencies and with auto-immune diseases.

The first approach, imitating a natural invader, is based on the established use of dead bacteria and bacterial extracts to stimulate a general immune response. This technique took a step forward in 1974 when Edgar Lederer of Orsay, France, isolated a small bacterial molecule, a sugar attached to two amino acids, that contained much of the immune stimulating activity. The molecule, called a muramyl peptide, is as potent as but less toxic than a complete bacterial extract.

At the recent meeting of the American Chemical Society in Miami Beach, Peter Dukor of Ciba-Geigy Limited in Basel, Switzerland, discussed research on the muramyl peptide. It has been synthesized chemically, along with analogs that have even greater activity than the natural molecule. Dukor suggests that these peptides act by stimulating macrophages. In the body, the macrophages release chemicals that act at several places on the immune system. Thus, the single peptide can boost proliferation of the T and B lymphocytes and also can act to stimulate precursor cells to mature into additional macrophages. The first application of the bacterial component, Dukor expects, will be as an ingredient to enhance the effect of vaccines.

A second approach to enhancing disease-fighting ability involves imitating body chemicals that stimulate the immune system. Researchers have identified