

## Top STS prize for virtual-photon work

A new formula for the force between two charged particles, derived "two and a half years ago" in the space of "a couple of days," earned North Hollywood (Calif.) high school senior Ron Keeva Unz a \$12,000 scholarship in the 38th annual Westinghouse Science Talent Search in Washington this week. Unz was among 40 high school scientists competing for \$89,500 in college scholarships and cash awards.

For Unz, son of a University of Kansas physics professor, the prize-winning project was more or less routine. Hearing the attraction and repulsion of charged particles described in terms of momentum transfers via "virtual" (or imaginary) photons, Unz wondered whether such virtual photons would be affected by gravitational fields in the same way that real photons are. He found that his question, which sprang from an "80- or 90-year-old theory," had never been addressed.

Unz calculated the loss of energy and momentum of virtual photons as they move against the magnetic gradients established by the particles whose interactions the virtual photons are postulated to explain. He found that "if the gravitational field of the emitting particle decreases the frequencies of the photons emitted, the electric field of the particle is decreased by the same factor." Unz says that although the new electric and potential field equations he developed to account for this are "radically different from those predicted by current theory, they are still perfectly in agreement with all current experimental evidence." Only for objects with very high mass and density—such as neutron stars—would the difference between currently held theory and his revision of it become noticeable. "Thus, if this paper's theory is correct," he says, "neutron stars should have much lower than expected electrical fields."

Second and third prize scholarships of \$10,000 each went to 17-year-olds David Nathan Shykind of Silver Spring, Md., and Eileen Chang of Forest Hills, N.Y.

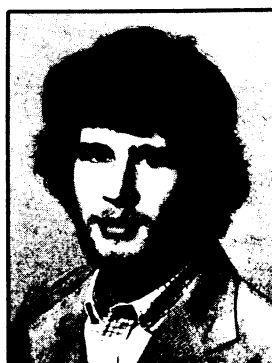
Shykind confirmed the provocative results announced several years ago in a French study on limited-specificity antibodies, according to Richard Wistar Jr., under whom Shykind worked at the Naval Medical Research Institute in Bethesda, Md. Individuals born without IgA proteins in their blood will develop allergic—and potentially lethal—reactions when transfused with blood products containing any IgA. Shykind confirmed that some "normal" people with IgA also are allergic to IgA, but only to one or two types, not the broad range that normally precipitate reactions in IgA-deficient individuals.

Chang's road to a \$10,000 scholarship involved scooping mosquito eggs at 50-



Photos: Westinghouse

*First place winner, Unz (above) received \$12,000 scholarship. Runners-up Shykind (right) and Chang (lower right) got \$10,000 scholarships.*



foot intervals along a 20-mile length of Scajaquada Creek, near Buffalo; among those collected were *Culex pipiens*, a carrier of St. Louis encephalitis. Chang raised the mosquitos to the larval stage and treated them with precocene II, a chemical which she had earlier read had controlled juvenile hormones in milkweed bugs, leading to their sterility. While her results differed from the milkweed experiments in that the mosquitos never fully matured, the result was the same, no reproduction.

Fourth to sixth place scholarships of \$7,500 were awarded respectively to: David John LePoire, 17, of Holland, Mich., for a computer program to calculate electron densities and energies; Geoffrey Campbell Frank, 17, of Mississippi State, Miss., for study of bacteria subjected to crude oil; and Gregory Sorkin, 16, of Belle-rose, N.Y., for study of graph theory.

The following each won \$5,000 scholarships: Michael Urciuoli, 17, of Queens,

N.Y., for a math distribution problem; Julia Elizabeth Little, 17, of St. Albans, W.Va., for a fertility-related analysis of boar sperm; Ernest Mingway Moy, 17, of Dix Hills, N.Y., for hemoglobin studies; and Ashfaq Abdulrehman Munshi, 17, of New York City, for a model of impurities in the structure of glass. The remaining 30 winners received \$500 cash awards. □

## Radiation panel calls for more research

The report of a federal review group on ionizing radiation, released last week, is more notable for what it didn't say than what it did say. Requested last May by President Jimmy Carter and compiled by seven federal agencies under the direction of the Department of Health, Education and Welfare, it left unanswered such timely and controversial questions as who should receive compensation for radiation-related injury, whether occupational-exposure standards should be reduced, and which federal agency should coordinate the regulation of and research on radiation. HEW Secretary Joseph A. Califano Jr., however, called the report the "most comprehensive single review ever undertaken on issues related to radiation."

Though many observers feel the draft review did not live up to expectations, it did call for:

- Conducting more research, emphasizing low-level exposures, from the population level to the cellular level.
- Setting guidelines to identify victims of radiation exposure and to determine compensation for related injury.
- Establishing a registry of radiation workers.
- Eliminating unnecessary diagnostic X-rays and reducing necessary exposures through better technician training and product standards. The report noted that the Food and Drug Administration already has begun such a program, which Califano says has reduced (in the last five years) by 60 percent the average dose received from dental and breast X-rays.
- Increasing information for the public on radiation dangers.
- Re-evaluating privacy laws to allow researchers access to records.

Another report by the review group, on coordinating future federal action on radiation, is not yet ready for publication.

More than 3,500 pages of memos and reports on the health effects of radiation during atmospheric nuclear-weapons tests between 1945 and 1962 were also made public last week by HEW. In a press conference last week Califano said that National Institutes of Health director Donald Fredrickson will convene an "outside" scientific panel to review these previously unpublished documents. Fredrickson has also been asked to oversee a

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review (during the next 18 months) of federal radiation research in order to ensure a comprehensive research program, but one that avoids costly duplication of efforts.

Also, within the next year, the Center for Disease Control will design a "comprehensive research program on occupational exposures to low-level radiation," Califano said.

Details on the design of the largest occupational-exposure study yet undertaken were also announced last week by the Energy Department's Ruth Clusen. The epidemiological study of 90,000 shipyard workers exposed to low levels of radiation (and at least as many unexposed workers with identical jobs) is beginning under the direction of Genevieve Matanoski at Johns Hopkins University. Data collection alone is expected to take up to five years and cost \$7 million to \$10 million; it will involve past and current workers at all six navy shipyards and one private yard.

And in the Congress, Rep. Bob Eckhardt (D-Tex.) says his Commerce subcommittee on oversight and investigation will launch a "full-scale investigation into all phases of radiation-health dangers," focusing on exposures from weapons tests. □

## Strokes decline dramatically

Last autumn, the National Heart, Lung and Blood Institute reported that deaths from heart attacks have fallen off dramatically during the past 15 years. Here is another bit of good news: Strokes, major killers along with heart disease, are also plummeting precipitously.

Actually, evidence that the incidence of strokes has been declining in the United States is not new, but diagnostic inaccuracies, changes in diagnostic fashion, death certification and other factors have made it difficult to make sure that death statistics really reveal trends in stroke occurrence. W. Michael Garraway and his colleagues at the Mayo Clinic in Rochester, Minn., now have taken advantage of an exceptionally comprehensive and accurate diagnostic record system in Rochester in an attempt to confirm a decline in strokes among Rochester residents during a 30-year time span.

In Rochester, nearly all medical diagnoses, whether made at the Mayo Clinic or elsewhere, are entered into an automated record retrieval system. The accuracy of many of these diagnoses is also substantiated by autopsies, which is often not the case with diagnoses in other areas of the United States. Garraway and his co-workers examined data entered into Rochester's diagnosis retrieval system between 1945 and 1974, and they report in the

March 1 *NEW ENGLAND JOURNAL OF MEDICINE* that strokes have declined among Rochester residents by approximately 50 percent. Thus, if health trends in Rochester reflect those of the rest of the United States, as they probably do, strokes have undoubtedly been declining among all Americans during the same time span.

The question now, of course, is why this drop? Garraway and his co-workers suggest two possible explanations: the Surgeon General's warning in 1964 about the health hazards of cigarette smoking — a stroke and heart attack risk factor — and the American Heart Association's recommendation that same year that Americans decrease their dietary intake of saturated fats and cholesterol — another stroke and

heart attack risk factor. A third possible explanation for a decline in strokes, Robert I. Levy of the National Heart, Lung and Blood Institute writes in an accompanying editorial, is the availability of drugs to treat high blood pressure — yet another stroke and heart attack risk factor — since the early 1950s, and federal-private efforts since 1972, under the National High Blood Pressure Education Program, to have Americans diagnosed and treated for high blood pressure (SN: 12/11/76, p. 377).

Whatever the cause or causes of a reduction in strokes, the elderly have benefited the most, Garraway and colleagues' study reveals. Strokes among persons 80 years or older, at least in Rochester, fell off 60 percent from 1945 to 1974. □

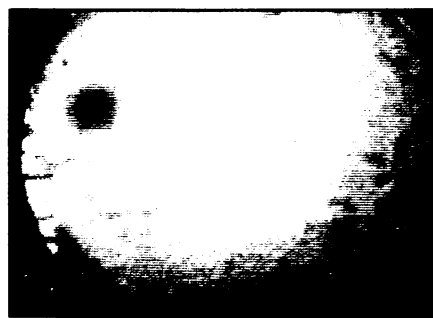
## Solid hydrogen produced under pressure

It was, Ho-kwang Mao admits, an emotional moment. As he and colleague Peter M. Bell pressurized the hydrogen-filled chamber to 7.4 million pounds per square inch (57 kilobars), the liquefied gas almost instantaneously popped into a clear, granular solid that resembled sugar or salt. It marked the first time that scientists have produced, and observed, solid hydrogen at room temperature.

"It is an exciting thing just to see," says Mao, who works with Bell at the Geophysical Laboratory of the Carnegie Institution of Washington. But more important, the achievement represents a critical step toward producing room-temperature metallic hydrogen — the suspected superconductor which, if created, might revolutionize electrical and other energy production, according to some scientists. "I would say we have a very good chance to get 1 megabar [the pressure at room temperature at which scientists believe metallic hydrogen would be formed] within a matter of several months," Mao told *SCIENCE NEWS*.

In their experiments, Mao and Bell pumped liquefied hydrogen gas into a diamond-anvil, high pressure cell (SN: 6/10/78, p. 375) at  $-256^{\circ}\text{C}$ . The researchers then sealed the diamond-walled chamber — diamonds are used because of their resistance to extremely high pressures — and gradually warmed it to room temperature,  $25^{\circ}\text{C}$ .

After the solidification milestone was passed at 57 kilobars, the pressure was slowly increased to 360 kilobars. At this point the hydrogen took on a denser crystalline formation and a yellowish tint, a puzzling feature that Mao says the researchers will "study more." The hydrogen's denseness at this pressure matched that of ruby crystals placed in the chamber as pressure-measurement devices — a "very interesting" phenomenon, Mao says. No further changes were observed as the pressure rose to a maximum 650 kilobars — 650,000 times the atmospheric pressure at sea level.



Mao, Bell/SCIENCE

*Time-lapse photomicrograph taken through a diamond window shows the crystalline form of hydrogen at 57 kilobars.*

According to current theory, 1 megabar of pressure will cause hydrogen molecules to break apart into individual atoms. "If they do, we will have metallic hydrogen," Bell says. To reach that point, Bell and Mao are already at work modifying the chamber to accommodate the higher pressures. Microscopic changes in the diamonds' face angles and relative size and in the cell's gasket mechanisms are required to contain the hydrogen, Mao says. At super-high pressures, hydrogen tends to seep, molecule-by-molecule, through whatever presses against it. But Mao is confident that the alterations will lead to total containment at 1 megabar.

Russian physicists reported several years ago that they believed they had produced metallic hydrogen (SN: 9/18/76, p. 181). But the report was sketchy, much of the data unavailable to Western scientists and no follow-up experiments were reported. And, Mao says, Russian pressure measurements were comparatively insensitive, and the Soviets did not actually see the metallic form but inferred it from other measures.

Bell and Mao are confident that "a gradual, high order-type transition to the metallic state ... could occur in hydrogen," they say in the March 9 *SCIENCE*. "There is no reason to believe that pressures above [650 kilobars] on hydrogen cannot be achieved." □