cumulated during more than 12 years of clinical use. . . ."

Now a study reported in the Feb. 10 JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION indicts Orinase and several other oral diabetes drugs—DBI, made by Geigy Pharmaceuticals, Meltrol, made by USV Pharmaceuticals, Tolinase, made by Upjohn and Dymelor, made by Eli Lilly—for causing 10,000 to 15,000 deaths annually from heart disease. The drugs are used by more than 1.5 million Americans to control diabetes. A group of physicians specializing in the management of diabetes is contesting these accusations.

At issue are the conclusions of a long-term study of more than 800 diabetes patients that ended in 1969. The study, called the University Group Diabetes Program, spanned eight and a half years and involved diabetes patients at 12 major hospitals. The study ended after scientists managing the project concluded that the death rate from heart and related diseases was twice as high among patients taking the pills as among those treated either by insulin injection or by diet alone.

No comparable study of diabetes treatment had ever before been made. Since Orinase did control patients' blood sugar, as intended, many diabetes specialists found the results of the university group study hard to believe. After reviewing the data, the Food and Drug Administration and committees of the American Medical Association and the American Diabetes Association issued statements supporting the study's conclusions. The FDA recommended that the drugs be used only when dietary control is not possible for the patient and when the use of insulin is impractical. This meant reducing use of the drugs to a relatively small number of the 1.5 million then using them.

Still the controversy continued. In 1972, the National Institutes of Health gave a contract to the Biometric Society, a respected international group, to analyze in detail the university group study and to end the controversy. In its final report, published in the Feb. 10 JAMA, the Biometric Society found that some of the criticisms leveled against the university group study were valid. But the society concluded that many of the claims on heart disease deaths were unfounded.

Among the drug's leading defenders is the Committee on the Care of the Diabetic, a group of 180 physicians headed by Robert Bradley, director of the Joslin Clinic in Boston. The committee was not able to obtain a copy of the Biometric Society's report until after it was published in JAMA. The committee had hoped to obtain a copy prior to that time, so that it could comment on the subject in the same issue of JAMA. □

Mathematicians: Out of an ivory tower

"There is a tide in the affairs of men which, taken at the flood, leads on to fame. . . ." Thus Shakespeare. There is a tide—or a cycle, as Martha Smith of the University of Texas sees it—in the affairs of mathematicians which, taken at the flood, leads to industrial jobs in applied mathematics. An increased search for practicality and "relevance" is apparent from discussions at the National Mathematics Meetings in Washington last week. This is a new departure in the lives and expectations of mathematicians both young and old (but especially the young), and it arises for a number of reasons in which intellectual and economic spurs combine with ethical attitudes.

Until recently, and for many still, the beau role in which the young mathematician saw himself or herself was as a university teacher doing research in pure mathematics. About 80 percent of the approximately 15,000 Ph.D. mathematicians in the United States are now in such jobs. But college enrollments are fairly static now and are expected to decline in the 1980's so there is a certain economic push on young mathematicians to find industrial jobs. At the same time mathematicians are finding there are things they can do for industry and society generally that are new and often quite far removed from the traditional applied math fields—physical sciences and engineering. This brings an intellectual stimulation that is leading some elder mathematicians, with presumably safely tenured chairs, into more applied research.

The relationship between pure and applied math is symbiotic, but practitioners of the two arts sometimes behave like sibling rivals. Way back in the 19th century, according to a folk tale, some mathematicians approached Henri Poincaré to get his help in arranging a meeting of pure and applied mathematicians. Poincaré is supposed to have refused on the ground that pure and applied mathematicians had nothing to say to each other.

That attitude—if in fact it was Poincaré's—is a minority extreme. But in most times and places pure math has had somewhat more cachet. This was especially true in the post-Sputnik period, when there was plenty of money available to the mathematics community. Smith, who says she was brought up in that generation, describes the attitude as one regarding the National Science Foundation as a kind of godfather and settling down to a satisfying career doing pure math. Another child of that generation, Michael Weiss of Ketron, Inc., remembers that he was one of a group that changed the requirement at Brandeis University that math students take a physics laboratory class. They argued that math was more like philosophy than physics.

Now Weiss, who recently made the switch from academic employment (Wayne State University) to industrial complains that pure math is often detached from nature. Branches of pure math have often started from practical problems, but they wind up "playing games" farther and farther from the reality where they started. "My generation of Ph.D's have not been told the reasons for the things we have learned," he says. "We were brought up formally."

In response to this kind of feeling there is a growing humanistic trend among mathematicians, a feeling that the body of math is good for society, that it can be used to help humanity. Math is being brought out of the ivory tower and into such things as health systems, industrial processes and economic theorizing. Even the purest of pure mathematicians, who used to be stereotyped as the archetypal absent-minded professors, are said to hope that if their own work cannot be used, then work influenced by theirs will prove useful.

"The concept of what math can do for society is broadening greatly," says Richard Anderson of Louisiana State University. The applications are coming in strange ways and unforeseen places. Industrial and social organizations that never had mathematicians before are finding surprising ways that mathematicians can help them. An example cited by Wendell Fleming of Brown University is a former student of his who used his training in geometry to help a maker of patterns for women's dresses figure out the best way to lay out the different pieces on a sheet of cloth. Previously the thing was done by an artisan's rule of thumb: "There was some guy in the factory that just sort of knew," Fleming says. Now it is done by mathematical modeling, and it saves money for the company. Another example is organizing the schedules of toll collectors on bridges so that there is not too much backing up of cars and yet there are no collectors with long idle periods. Mathematizing the problem yields sizable savings.

These examples are both from the domain of operations research, a branch of applied mathematics that has uses in a wide range of industrial, agricultural and social procedures. So popular is the search for "relevance" among mathematicians that a short course on operations research given at the meeting drew 500 auditors.

Nor is the flow all one way. The new interaction between math and the world sends goodies back to the study,

or wherever pure mathematicians do their cogitating. Fleming cites his own field, the calculus of variations, which is concerned with determining the maxima and minima of certain kinds of processes. It's an "old, old subject," and it appeared to be all but dead until aerospace activity burgeoned. The need for optimal control methods in aerospace systems revitalized the calculus of variations.

The future is likely to see mathematicians grappling more and more with the real world, which after all is where mathematicians started back in ancient Babylonia, and the resulting stimulus will be mutual. "It's a healthy time," says Anderson. □

Hole in ionosphere by Saturn 5

Old space hands felt a nostalgic pang on May 14, 1973, when the last of the titanic Saturn 5 rockets took off on its pillar of flame, carrying the Skylab workshop into orbit around the earth. It is thus somehow fitting that, in addition to all the noise and spectacle of its kind, this final super-booster now appears to have made its mark with an extra flourish: a huge temporary "hole" in the ionosphere, some 1,200 miles across, within which about 99 percent of the existing free electrons were virtually swept out of circulation.

In the upper portion of the ionosphere, known as the F layer, solar radiation causes about .1 percent of the existing single atoms of oxygen to dissociate, or break down, into positively charged oxygen ions and free (negatively charged) electrons. As the Skylab Saturn 5 climbed through the F layer on its way to orbital altitude. the powerful engines of its second stage left a huge, rapidly expanding exhaust cloud of water vapor and hydrogen, which combined with the nondissociated oxygen to form positively charged OH and water ions. In minutes, according to Michael Mendillo of Boston University, Gerald Hawkins of the Smithsonian Astrophysical Observatory and John Klobuchar of the Air Force Cambridge Research Laboratories in the Jan. 31 SCIENCE, this sudden spawning of positive ions simply combined with the negative electrons, producing "a dramatic ionospheric phenomenon, unique in magnitude and in spatial and temporal extent." So graphic was the effect that it was monitored from the Sagamore Hill Radio Observatory in Massachusetts, as well as Illinois and Labrador.

Previous Saturn 5's produced no comparable effects, the researchers point out, because second stages fired at lower altitudes. □

40 top young scientists selected

For the last three summers Keith Gover of Detroit has studied silkworms. At 17, his teachers agree, he's an expert. And, thanks to his dedication to his goal, he's successfully bred hybrid moths.

Gover and 39 other high-school students with the same spark of enthusiasm for research have been selected the nation's most scientifically talented high-school seniors. All of them are in the running for a $10,000, four-year scholarship, plus $57,500 more in other scholarships and awards, to be awarded next month.

All 40 will be honored with an expense-paid trip to Washington (Feb. 26 through March 3) to attend the Science Talent Institute, where their projects, displayed for the public, will be judged.

This year's crop of finalists, 30 boys and 10 girls, were chosen from 14,321 contestants, of whom 1,118 completed their entries by writing a report on their independent science research projects, submitting personal data and teacher recommendations. The trip winners are 15 to 18 years old and come from 35 cities in 19 states. Emphasis in selecting winners is placed on creative research.

Projects this year cover a wide range of science and engineering fields—genetics, computer mathematics, physics, biochemistry, nematology, electrical engineering, zoological taxonomy, microbiology, paleontology, entomology and wildlife ecology. A contestant from New Orleans studied the protein levels in crayfish during the intermolt cycle, concluding that crayfish absorb protein from the cuticle and store it in the blood for later use in the formation of a new shell. A young scientist who studied the lipoproteins in rat plasma for his project designed and installed a computer program for his high school's swim team in his spare time.

A Boston student became a camera bug after setting up a darkroom at home to supplement drawings for his science project, and another built a laboratory onto the side of his bedroom to do his research. A student from Los Angeles prepared a complete field guide to tiger beetles, found along mud flats in Southern California and almost impossible to identify by sex and breed. A Florida student, after spending two years studying airfoils in model gliders, concluded that if his airfoil really worked on full scale transport planes it could reduce stalling and make air travel safer.

Twenty-four of this year's contestants spent last summer employed as lab technicians or attending science workshops at state universities. Most of them did their research at home, on their own, consulting faculty members only routinely. Thirty percent of the students' parents are professional scientists, and 30 of the 40 students are in the top 10 percent of their class.

The Science Talent Search is sponsored jointly by Westinghouse Electric Corp. and Science Service, Inc., publisher of SCIENCE NEWS. Science Service administers and Westinghouse provides financial support for the searches through the Westinghouse Educational Foundation.

The top 40 are:

CALIFORNIA: Meiling L. Fang, Alhambra H.S., Alhambra; Daniel R. Marshak, La Jolla H.S., La Jolla; Julia A. Craig, Leigh H.S., San Jose; Derrick T. Kikuchi, San Marcos H.S., Santa Barbara; Christopher D. Nagano, Santa Monica H.S., Santa Monica.

FLORIDA: Lorraine A. Pillus, Cocoa H.S., Cocoa; Kathy R. Albe, Coral Gables Sr. H.S., Coral Gables; Richard J. Foch, Astronaut H.S., Titusville.

GEORGIA: Charles E. McKemie, Griffin H.S., Griffin.

HAWAII: Wendell T. W. Ching, Aiea H.S., Aiea; Scott O. Zeitlin, Kalani H.S., Honolulu.

ILLINOIS: Joel I. Dubin and Evan D. Kharasch, Niles Twp. West H.S., Skokie.

IOWA: Robert A. Light, Bettendorf H.S., Bettendorf.

LOUISIANA: Donald V. Brignac, Lutcher H.S., Lutcher; H. Britton Sanderford, St. John Vianney Preparatory School, New Orleans.

MARYLAND: Jon S. Marans, Springbrook H.S., Silver Spring.

MASSACHUSETTS: Anthony R. Maranto, Phillips Academy, Andover; Christopher G. Howard, Wachusett Reg. H.S., Holden; Joyce D. Rounds, Taunton H.S., Taunton.

MICHIGAN: Keith B. Gover, Redford Union H.S., Detroit.

MISSOURI: Julie A. Logan, Palmyra H.S., Palmyra.

NEW JERSEY: Alan S. Geller, Ridgewood H.S., Ridgewood.

NEW YORK: Howard H. Heller and Terry A. Jacobson, Benjamin N. Cardozo H.S., Bayside; Arthur D. Lander, John Dewey H.S., Brooklyn; Kenneth R. Aupperle, Half Hollow Hills H.S., Dix Hills; Stephanie L. Sakson, John Glenn H.S., Huntington; Lisa R. Edelstein, Jamaica H.S., Jamaica; Craig F. Miller and Byron B. Siu, Bronx H.S. of Science, N.Y.; Paul A. Zeitz, Stuyvesant H.S., N.Y.; Philip Garcia, Trinity School, N.Y.

OKLAHOMA: Kevin L. Behar, Ponca City Sr. H.S., Ponca City.

OREGON: Gary A. Stipe, Sunset H.S., Beaverton.

PENNSYLVANIA: Charlene G. Sanders, Lower Merion H.S., Ardmore; Richard M. Busch, Warwick Sr. H.S., Lititz.

VIRGINIA: Tom B. Mattson, Abingdon H.S., Abingdon.

WASHINGTON: Robert M. Claudson, Hanford H.S., Richland.

WISCONSIN: Debra S. Erdmann, Wausau West H.S., Wausau. □