

to disease and how they might be overcome. Citing studies on stress-related diseases, such as lesions of the stomach, he said it appears that changing general worry to specific fears helps reduce stress-related illness, particularly if the animal learns to deal with the specific danger. Thus, although the animal is still exposed to the stress, knowledge of how to cope with it reduces the incidence of certain diseases.

Stressful sociological conditions are also implicated in a constellation of illnesses. Elmer L. Struening, director of psychiatric research at the New York State Department of Mental Hy-

giene at Columbia University, reviewed a large number of epidemiological studies which show that under certain social conditions, the incidence of infectious and chronic diseases increases. These include unemployment, recent widowhood, lack of support from personal relationships, the isolation of ethnic group members and rapid urbanization of a previously rural area. This research, some of it based on decades of medical records, shows that there is a definite link between psychosocial problems and disease, Struening says, and he points up the need for more research in this area. □

valuating the currency—runaway inflation was threatening the Roman Empire with collapse.

Excavation of two housing complexes sheds light on the daily life on ancient Aphrodisias, at least among the rich. The houses contain elaborate mosaic floors, with geometric and figurative designs, such personal items as a portable sundial and some perfume containers, a few glass objects and ubiquitous terra-cotta lamps. Most of the buildings in the city were destroyed by the frequent earthquakes that plagued the region, so that in the ruins of the temple to Aphrodite were found remains of two previous temples, one dating back to the 6th century B.C.

Despite the occasional intrusions of such modern technologies as carbon dating, classical archaeology remains basically a shovel and trowel operation, performed by people with a strong romantic streak in addition to their scientific curiosity. Erim is no exception, as one immediately senses when he describes his "little gem"—the odeum, or small theater used for concerts and ballet. The floor is patterned with rich local marbles of pink, blue and white, and the film provided an appropriately romantic moonlight tour among the aging columns and interspersed trees. Erim described to *SCIENCE NEWS* how he and some fellow workers would take a transistor record player into the odeum at night and have their own private moonlight concerts.

To preserve the archaeological treasures and to make them available to a wider audience, the Turkish government is building a museum at Aphrodisias, aided by funds from the National Geographic Society, which has sponsored Erim's decade of work. At present, artifacts are stacked on shelves of the excavation headquarters or scattered about the yard, and their organized display will represent a major addition to the world's collections of antiquities. If he can get enough funds, Erim hopes to have the museum open sometime next year, and begin convincing others of his belief that "Aphrodite still looks over her favorite city." □

Aphrodisias: Provincial Roman life

Besides giving scientists a chance to talk with their fellows in other disciplines, the annual AAAS meeting provides an opportunity for the layman to glimpse how the business of science is actually conducted, through a series of public lectures. This year's National Geographic Society-sponsored lecture offered a particularly appealing example as New York University professor Kenan T. Erim narrated a silent film showing in intimate detail some varied scenes from his life's work—excavation of the ancient city of Aphrodisias in southwestern Turkey.

Considered by some scholars to be the most important excavation now in progress at a classical site, the digs at Aphrodisias have revealed a wealth of new material depicting life in a provincial capital of the Roman Empire. In introducing the speaker, University of Pennsylvania anthropologist Ward H. Goodenough called this life in the provinces "the part of the Greco-Roman world that didn't get into the textbooks." He compared the resulting vision of antiquity to one that future archaeologists would have if they tried to describe current American civilization only in terms of what happened in New York, Washington and Chicago.

In those terms, Aphrodisias was a Roman San Francisco, far removed from the seat of power, but endowed with a culture famous throughout the Roman Empire. It had the good fortune to be located near vast marble deposits, and sculpture and marble slabs became principal exports. Named for Aphrodite, goddess of love, natural forces and the goodness of life, the city's remains, slowly uncovered during the past 10 years, reveal a wide variety of the buildings and works of art that represent provincial culture at its best.

One of the most rewarding and difficult tasks of the excavation has been the tedious unearthing of a large amphitheater that had been buried under 30



Aphrodisias's love goddess Aphrodite.

feet of debris. The film shows Turkish workmen staging races with their wheelbarrows as they remove the dirt, while nearby, children drive their herds to pasture through the excavation site. Sculptures found so far in the theater include figures of athletes, gods, philosophers and emperors—which are dutifully put back together with epoxy.

Erim comes from Turkish descent and he has apparently been very successful in winning the confidence of local villagers, who have proved invaluable in helping locate and retrieve works of art. One boy brought him the fragment of sculpture which led to the discovery of an ancient necropolis, and a local farmer used his tractor to help Erim and his workmen recover a large sarcophagus from the site. Another sarcophagus was found being used by villagers as a vat for crushing grapes. One discovery bore a particularly pertinent inscription. On stone panels from the ancient city's marketplace were edicts from 301 A.D. by Emperor Diocletian, freezing all prices and de-

Diabetes drugs and fatal heart disease

One of the most common drugs given by mouth to control diabetes is Orinase, marketed by the Upjohn Co. In the *Physicians' Desk Reference*, one of the doctors' main guides to prescription drug use, the following is stated about Orinase: "Orinase appears to be remarkably free from gross clinical toxicity on the basis of experience ac-

accumulated 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 stu-

dents 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,