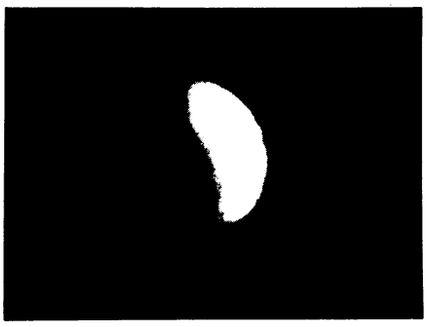
Viking nears Mars; special issue planned



Viking's first view of Mars, taken April 12 with 9.5 million miles left to travel.

With nearly a decade of development, a billion dollars and a 10-month space trek behind it, the first of the two Viking spacecraft will go into orbit around the planet Mars on Saturday, June 19, carrying a landing craft due to touch down on the Martian surface on the Fourth of July. The next issue of SCIENCE NEWS will be a special, 32-page edition, combining the issues of June 5 and 12, devoted to Mars and the Viking mission. Besides a detailed chronology and description of Viking's complex scientific plans, the issue will include a discussion (with tabular data) of Mars itself, a brief history of Martian observations, a centerfold map of the planet and a scientific analysis of the possibilities of extraterrestrial life. It all goes to press on June 10 and in the mail the following day, a compact guide to the most exciting interplanetary mission ever flown. □

A new approach to designing drugs

Visualize a drug that when swallowed or injected homes in on the desired tissue, thus sparing other tissues and avoiding undesirable side effects. Visualize a drug that zaps the target tissue in the right concentration, then switches off after the proper amount has been delivered.

Biomedical fantasy? A team of San Diego scientists believes that such drugs may eventually become a reality.

The reason is that they are working on a radical new approach to drug design. The plan is to attach drugs, which are generally small molecules, to larger carrier molecules that can be more easily manipulated. The research group has been gathering increasing evidence that the approach is feasible, the most recent of which is reported in the April PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES.

The investigators are Michael S. Verlander, J. Craig Venter, Murray Goodman, Nathan O. Kaplan and Bernie Saks of the departments of chemistry and medicine at the University of California.

Designing drugs for systemic use is currently limited at best. Chemists can alter chemical components of a drug and thereby increase or decrease its pharmacological effect. But chemists have no way of making sure that a drug reaches the desired tissue of the body, nor of keeping it from adversely affecting other tissues. Nor can they control the precise amount of drug released at the target site over a period of time. The San Diego team realized, in the early 1970s, that a more effective, safer approach to drug design was needed and set out to find it.

Other researchers had reported that some enzymes and small molecules retained activity when immobilized covalently on the surface of insoluble chemical materials. The San Diego scientists theorized that drugs, generally being small molecules, might be attached to larger chemical matrices, say, polypeptides or polymers. The larger chemical carriers would be easier to manipulate than the smaller drugs would be. It would thus be easier to get drugs to the right tissues in the right amounts at the right times if they were attached to such carriers.

They performed experiments showing that their hypothesis had validity. For instance, they found that the drugs epinephrine, norepinephrine, isoproterenol and propranolol remained active in tissues and animals while covalently bound to glass particles. They have found that luteinizing hormone-releasing factor, a hypothalamic hormone that stimulates ovulation, can be covalently bound to water-soluble, synthetic polymers. In these and other experiments, however, they weren't sure that the immobilized drugs were really producing the pharmacological activity observed. There was a chance that some drug might have leaked off the chemical carrier and have produced the activity instead. They wanted to make sure that the drugs were truly able to act while covalently attached to their chemical carriers. They now believe that they finally have the "rigorous proof" that the drugs act in this manner, and these are the findings just reported. The experiments concern the drug isoproterenol covalently coupled to soluble polypeptides.

Verlander and his colleagues are now ready to see how they can alter drugs' chemical carriers—say polypeptides or polymers—in order to deliver drugs to specific tissues. For instance, a chemical carrier might be chosen for a particular drug because it has a strong affinity for the body site where one wants the drug to act. If the drug can be made to act in a specific site, then it drastically reduces the chances of the drug producing undesirable effects in other parts of the body. Or the chemical carriers might be altered in such a way that only a specific amount of drug is delivered at the target site and over only a specific time schedule. □

Snake blood to fight snake bites

Venom for commercial anti-venom.

Three Utah researchers who amassed the world's largest supply of rattlesnake blood have extracted some potentially life-saving information from that arcane collection. Rattlesnake blood, they now report, contains an antivenom factor that protects venom-injected laboratory animals better and with fewer side effects than commercial antivenoms made from venom and horse serum.

Herpetologists have known since the late 1800s that the blood of vipers and pit vipers (such as rattlesnakes) contains antivenom factors. This is not terribly surprising since the snakes store highly poisonous venoms in their own fang glands. But this knowledge has remained little more than curiosity following the discovery, about the same time, that fang venom injected into horses causes the production of antibodies that can be used clinically to treat snake bite.

These antibody-horse serum preparations were used quite successfully for decades, but have slowly lost some effectiveness for emergency treatment. So many vaccines are produced in horse serum that by now, many persons have developed antibodies to *it*. Many, as a result, experience allergic reactions—sometimes fatal—when treated with antivenom based on horse serum. A doctor treating a rattlesnake bite, therefore, is faced with a difficult decision: Should he administer a commercial antivenom and risk a potentially severe allergic reaction in order to stop the possible bleeding, tissue destruction and scarring that can follow snake bite? Or should he use precious time to test the patient's blood for allergic reaction first while the venom courses through the victim's bloodstream?

This dilemma led the three Utah researchers to reexamine rattlesnake blood as a potential source of antivenom. Richard C. Straight and J. L. Glenn of the Veterans Administration Hospital in Salt Lake City and C. C. Snyder of the University of Utah report encouraging re-

sults in the May 20 NATURE. They found that a protein factor (or factors) in the blood plasmas of the Eastern and Western diamondback rattlesnakes will neutralize the lethal toxic effects of venom on mice and rabbits better and faster than commercial antivenom. The diamondbacks' protein factors also prevent blood and tissue damage more completely and will counteract the venoms of many species.

Although rattlesnake bites are not a large problem in the United States (about 1,000 bites are reported per year and cause about 30 deaths) they are a major clinical problem in parts of India and Africa. Besides this, Straight says, thousands of persons handle venomous reptiles as pets, zoo specimens and in research and "of course want the best treatment they can get if and when they need it." The team is not developing a substitute antivenom from snake blood right now, but welcomes interest from others with developmental facilities, Straight says. □

Solomon's mines: End of the search?

Solomon, famous for his wisdom and wealth, was wise enough not to reveal the source of his wealth, but now the secret is out. Without giving a clue to its location, the Bible cites Ophir, a land fabulously rich in gold, as the site of Solomon's mines. And after a four-year detailed geologic, geochemical and geophysical investigation, researchers have located the probable site of Ophir and Solomon's mines in the mountains of Saudi Arabia.

In 1931, K.S. Twitchell, a mining engineer from the United States, visited a mine called Mahd adh Dhahab (Cradle of Gold) located midway between Mecca and Medina. Twitchell concluded that "the workings of Mahd adh Dhahab are the largest I ever saw in Arabia. . . . It is reasonable to guess that this might have been the source of King Solomon's gold." Mining engineers who worked the Mahd adh Dhahab gold-silver mine between 1939 and 1954 also suspected that it was the site of Biblical Ophir. A joint project of the U.S. Geological Survey and the Saudi Arabian Directorate General of Mineral Resources has confirmed these guesses and suspicions. Robert W. Luce, a USGS geologist, says, "Our investigations have now confirmed that the old mine could have been as rich as described in Biblical accounts and, indeed, is a logical candidate to be the lost Ophir."

Confirming evidence comes from several sources. For one thing, the mine is located near a natural north-south trade route that has been used for more than 4,000 years and could have been used by Solomon's people 3,000 years ago. Also, the slopes around the mine are littered with thousands of stone hammers and grindstones that could possibly date from Solomon's time. The most conclusive evidence comes from estimates of the mine's possible output. The Bible says that kings Hiram and Solomon brought a total of 1,086 talents of gold (nearly 31 metric tons) from Ophir to Jerusalem. A million tons of waste mine dumps and rocks left by ancient miners have been examined and found to contain an average of 0.6 ounces of gold per ton. This indicates that the ore mined must have been much richer and could have provided Solomon with his estimated half the known gold supply of the ancient world.

USGS

Grindstone and trough for crushing gold, possibly from the time of King Solomon.

While the district around Mahd adh Dhahab still contains workable deposits of gold and silver, it is not likely that the rediscovered Ophir will produce another Solomon. □

Bones of Buddha

Gautama Buddha, founder of one of the world's major religions, died in the 6th century B.C., and his cremated remains were distributed among eight communities closely associated with the events of his life. An Indian government archaeological team now reports finding a portion of the remains of the founder of Buddhism. Since 1971, excavation has been underway in Piprahwa, a small village in the Uttar Pradesh state. The village is believed to be the site of the ancient city of Kapilvastu where Prince Siddhartha, who became Gautama Buddha, spent the first 29 years of his life before renouncing his parents and his possessions. In 1973, a soapstone casket was unearthed with an inscription on the lid saying it contained the mortal remains of Prince Siddhartha. The inscription, written in ancient Buddhist script, has since been examined, and the Indian archaeologists are convinced of its authenticity. □

Handler: NRC needs guaranteed funding

As the principal operating agency of the National Academy of Sciences, the National Academy of Engineering and the Institute of Medicine, the National Research Council conducts advisory studies for federal agencies by mobilizing the services of some 7,500 scientists from all over the country. But Philip Handler, president of the National Academy of Sciences and chairman of the NRC Governing Board, says that to conduct long-term research a more permanent funding arrangement is needed.

The NRC, he says, has fallen into a "somewhat precarious existence" by receiving funds only for specific projects (now about $50 million a year). As a result, it has had to operate "largely in a responsive mode, undertaking studies on the request of the government; only rarely has a committee been able to undertake, on its own initiative, a large, comprehensive study of a major question."

Handler's proposed solution is to institute a somewhat awkwardly phrased "assured subvention analogous to endowment income." In other words, the government would annually set aside a substantial block of money for the NRC's discretionary use, free from interference. Academies of science in several European countries enjoy this sort of relationship with their government sponsors. □

Mathematician wins Waterman Award

Princeton University mathematician Charles L. Fefferman has won the National Science Foundation's first annual Alan T. Waterman Award for outstanding accomplishment and promise as a young researcher. The award was established by Congress last year on the occasion of NSF's 25th anniversary and is named after the first director of the Foundation.

Fefferman, who is 27 years old, was selected from among 232 nominees by an award panel headed by Nobel laureate Melvin Calvin. He was cited "for his researches in Fourier analysis, partial differential equations and several complex variables, which have brought fresh insight and renewed vigor to the classical areas of mathematics and contributed signally to the advancement of modern mathematical analysis." The award includes a medal and a grant of $50,000 a year for three years of research and study at an institution of the recipient's choice.

The award is designed to recognize and encourage promising researchers while they are still young (many Nobel prizes are awarded years after the scientist involved has passed his prime), but by any