

atoms. When these atoms strike alkaline earths such as oxides of magnesium or calcium, or alkaline metals such as sodium or potassium, they can unite to form superoxides which readily release oxygen upon exposure to water vapor. Less oxygen was released in the GEx instrument at the more northerly lander 2 site, says Oyama, because the greater amount of water vapor in the ambient atmosphere had already set it free. The same instrument detected nitrogen, CO and argon—evidence of the desorption of gases physically affixed to the surfaces of the soil grains—but even at lander 2, according to Oyama, there was at least 700 times more oxygen detected in the instrument than could be accounted for by desorption alone. The bulk of the oxygen, he reasons, must then have come from a deeper source, chemically bound to the interior of the soil grains—in other words, from the $\text{Ca}(\text{O}_2)_2$ and other superoxides.

For the other phase of his theory, Oyama was inspired by thinking not of inanimate rocks but of human beings. When hydrogen peroxide (H_2O_2), commonly used as a disinfectant, is applied to a human wound, it bubbles. This, says Oyama, is due to the iron in the enzyme catalase, which combines catalytically with the H_2O_2 to release bubbles of oxygen. A similar catalytic reaction, he believes, is at work on Mars.

Viking's third biology experiment uses a "labeled-release" instrument that looks for labeled gases given off by soil exposed to a labeled nutrient. The positive indications reported by the instrument presumably represent oxygen that is released from some source and combined with the labeled carbon into $^{14}\text{CO}_2$. In Oyama's scenario, hydrogen peroxide formed photochemically in the atmosphere reacts with a catalyst on the soil-grain surfaces to release oxygen that diffuses into the grains, reacting with the alkaline earths and metals to form other superoxides inside. Atmospheric water vapor readily converts the superoxides into peroxides, which in turn combines with water in the nutrient to form H_2O_2 that oxidizes the labeled components of the nutrient to release the labeled CO_2 .

Comparing the effectiveness and likelihood of formation of various catalysts under Martian conditions, Oyama concludes that the one eligible candidate is a form of iron oxide known as gamma Fe_2O_3 or maghemite. On earth, he says, maghemite is usually found only around the edges of hydrothermal or magmatic activity, since it represents a rather specific temperature transition between about 300°C and 400°C . The abundance of water on earth has converted much of this material into a noncatalytic form, but on Mars, says Oyama, the maghemite has been able to survive virtually unchanged since its formation in what he believes to have been a major episode of volcanic and/or impact heating early in the planet's history. The

many signs of apparent water activity seen in Viking's photos, he says, simply suggest that the heating episode occurred after the water was gone.

Oyama's theory will have to stand the

test of time, additional data and competing theories. But it does show that looking for life on other worlds has the potential for making valuable contributions in other fields as well. □

Carter revises the science budget

The Carter administration got its first say in science policy matters last week when it published its revisions of the 1978 budget. As incoming President, Carter is given an opportunity to alter the budget of his predecessor before the Congress begins its own decisions on spending. Carter changed little of Ford's authorizations for basic science research. But in the area of energy, Carter made significant changes, emphasizing short-term goals while backing away from distant long-term projects not realizable by the next decade. From breeder reactor projects, Carter cut \$199 million, and an additional \$80 million was cut from the fusion research budget. At the same time, Carter added \$42 million for research on oil and gas recovery and coal conversion techniques.

Of the \$80 million cut from Ford's original authorizations for fusion research, \$60 million came from magnetic fusion projects. The tokamak fusion project at Princeton lost \$20 million, enough to delay completion of the project by six months. The mirror fusion project at Lawrence Livermore was cut \$10 million and the 14-MeV Intense Neutron Source at Los Alamos lost all of its \$10 million, completely canceling that work. An additional \$20 million in operating costs for magnetic fusion was cut across the board. Finally, some five labs lost funds totaling \$20 million for laser fusion research.

The single largest cut from the budget for the liquid fast metal breeder reactor came from the Clinch River project in Tennessee, which lost \$84.8 million. Officials at ERDA said the loss in funding would set back the criticality date from October 1983 to June 1984. The remainder of \$199 million cut from breeder research came from test facilities, fuels and the large plant's design prototype.

While fusion and breeder reactor research did not appear to the new administration to offer quick payoffs, at least in the next decade, the administration regarded fossil fuel research differently. Carter increased funding for more second- and third-generation coal conversion techniques, efforts to improve their efficiency and economic feasibility. New techniques in oil and gas recovery were also emphasized by Carter. Some of this research will concentrate on new polymer field flooding technologies. In addition, Carter increased by \$1.8 billion authority for the petroleum storage program. Energy conservation, too, was increased \$244 million in 1978 over Ford's request, \$160 million of that intended for R&D.

Funding for the National Science Foundation was kept at the same level, despite the hope by some that Carter would increase funds for basic science. Many were pleasantly surprised by the addition of \$15 million to the NASA budget. The first \$10 million was earmarked for an evaluation and analysis of a future mission to Mars by the 1984 launch opportunity. Included in the evaluation would be a look into the possibility of using rover technology for a new Mars lander and a surface sample return vehicle, as well as studies of new scientific instrumentation.

The other \$5 million of the NASA budget increase was for a back-up spacecraft for the Landsat D earth resources satellite.

Besides the new administration's efforts to emphasize short-term, quickly realizable goals in energy research, the revised budget also stressed fiscal austerity. Now, the budget goes to the appropriate committees in the Congress where it will be debated, drafted and redrafted for the next six months. □

Researcher admits he faked journal data

A remarkable case of a scientist intentionally falsifying research results is announced in a statement by the man's colleagues in the Feb. 24 NATURE together with a candid admission from the scientist that data in published papers he co-authored "are mere figments of my imagination." The admission totally invalidates the research results in three scientific papers in an important area of biological research dealing with levels of cyclic GMP in neuroblastoma cells and hybrid cells. Data on cyclic AMP in a fourth paper were also falsified. Two of the papers had been published in NATURE.

The new case recalls several other episodes in recent years of faked research results, the most notorious of which was the Summerlin incident with "patchwork mice" (SN: 6/1/74, p. 348). This one differs from earlier cases in that both the accusation and the admission have been

Morphine elevates levels of cyclic GMP in a neuroblastoma X glioma hybrid cell line

The use of cell lines derived from tumours of the nervous system as models for both neurones and glia has become well established. Clonal lines derived from mouse neuroblastoma C1300 have been shown to possess many properties characteristic of neurones. Several such properties are more strongly expressed in hybrids between mouse neuroblastoma and glioma cells. These hybrids contain choline vesicles.

Nature 256:57 (1975)

One of Gullis's articles: "Invented data."

published simultaneously and in the clearcut manner in which the facts of the falsification are acknowledged.

The incidents took place at the Max Planck Institute for Biochemistry in West Germany and involve a postdoctoral scientist named Robert J. Gullis. Gullis left the laboratory in September 1976 after having spent two postdoctoral years there, engaged mainly in measuring the levels of the chemical cyclic GMP in neuroblastoma cells and neuroblastoma/glioma hybrid cells.

The statement about the incident is written by Bernd Hamprecht of the laboratory:

"After Dr. Gullis had left," reports Hamprecht, "several of my colleagues (Brandt, Traber and van Calker) repeated this work but were unable to reproduce it. Dr. Gullis was therefore asked to return to our laboratory and repeat his essential experiments under supervision. . . . In none of the experiments was Dr. Gullis able to obtain his previous results. Neither morphine nor levorphanol nor the enkephalins nor cholinergic agonists changed the level of cyclic GMP in hybrid cells.

"Dr. Gullis admitted having invented the results of all his experiments. Thus, I should like to let it be known to the scientific community that the following three publications are based on invented data."

Hamprecht then lists three papers for which Gullis was the lead author:

One of them, in *NATURE* 256:57-59 (1975), concluded that morphine elevates levels of cyclic GMP in a neuroblastoma/glioma hybrid cell line. The other papers were in *FEBS LETTERS* 59:74-79 (1975) and in a book titled *Opiates and Endogenous Opioid Peptides* published by Elsevier in 1976. In a fourth paper stating that enkephalin regulates levels of cyclic nucleotides in the hybrid cells (*NATURE*, 262:311-313, 1976), Hamprecht says the data on cyclic AMP were falsified by Gullis. Hamprecht was a co-author with Gullis on all four papers.

Gullis follows with his own statement fully admitting he made up the data:

"I wish to disclose the fact that papers published in several journals with myself as principal author are not reliable. The curves and values published are mere figments of my imagination, and during my short research career I published my hypotheses rather than experimentally determined results. The reason was that I was so convinced of my ideas that I simply put them down on paper; it was not because of the tremendous importance of published papers to the career of a scientist.

"Therefore I would like to let it be known that the following papers published while I was working in the laboratory of Dr. B. Hamprecht are not reliable."

He then lists the same papers mentioned by Hamprecht. He also lists four other papers published in four separate bio-

chemistry journals, which, he says, are "purely hypothesis."

Gullis concludes with apology: "This letter is to point out to the scientific community that the results presented in these papers are wrong and based purely on hypothesis. I must take full responsibility for these unfortunate incidents and have consequently suffered. I hope that my experiences are noted by others, and I

would like to apologize to the scientific community and the various people involved."

Faking of results is, for reasons Nobel laureate biologist P. B. Medawar recently discussed (SN: 5/22/76, p. 335), a scientist's greatest sin. With this published admission not only is an entire group of research results wiped off the record; the scientific career of Gullis is ended. □

Vindication of early childhood programs

Recent analysis of several long-range studies indicate that early childhood education programs like project Headstart can effectively raise the intelligence of disadvantaged children, guide them toward better social adjustment and help them learn more in school. Discussing the accumulated research during a symposium at the AAAS meeting in Denver, Bernard Brown of the U.S. Office of Child Development declared that except for a few short-term local studies, "the score is 96 to zero" in favor of the early childhood programs.

Such enthusiastic support, apparently shared by other participants in the symposium, has not always been so forthcoming. After 11 years, with a current budget of \$450 million, Headstart remains a politically controversial program. Much of the problem, Brown says, began with an early study of Headstart by the Westinghouse Learning Corp. and Ohio University (SN: 4/26/69, p. 400), which concluded that children were not benefiting from the program. Brown blames press coverage and personal praise of the study by President Nixon for perpetuating the incorrect results of an unreliable piece of research.

Psychologist Francis H. Palmer of the State University of New York at Stony Brook presented a paper analyzing several of the studies and he concludes that early, pessimistic results were based on short-term data that did not take into account how well children actually performed once they entered school. "Where school-age results are available, they are consistently encouraging," Palmer says. Although gains derived from these programs depend on their duration and the amount of effort involved, he says, even brief programs involving a very young child may later make their mark, as "sleeper effects" become evident during school years.

Yale psychologist Victoria Seitz reported that delayed effects may be particularly important for girls. In one group she studied, girls who had participated in Headstart and Follow Through programs did not show any superior mathematics ability over controls when tested in the third grade, yet they scored significantly higher when tested again in the eighth grade.

The relative effectiveness of various

individual programs remains unclear. Palmer summarizes the results of studies involving, among others, the Montessori method (emphasis on self-initiative) and the Bereiter-Engelmann method (involving rigorous drill). Not surprisingly, the Montessori children initially scored higher on measures of inventiveness and curiosity, while the Bereiter-Engelmann children outperformed others in academic achievement. However, the differences virtually disappeared by the end of the second grade.

Robert D. Hess of Stanford University points out a structural difference between programs that does appear to be significant. Those involving some home visits by program professionals result in the greatest gains. Nine programs that combined home visits with preschool classes, he says, produced IQ gains of around 10 points. Twelve programs that did not involve home visits resulted in IQ gains for the children of around 6 points.

"It seems that the content of a curriculum may be less important in determining program effectiveness than how the curriculum involves parents," Palmer concludes. He points, for example, to an entirely home-based program in Nassau county, New York. For seven months a year, over two years, an instructor would make two half-hour visits a week to show mothers how to teach their children. The children started out with below-normal IQs in the low 90s, but now that they are in school they show above-normal IQs averaging between 107 and 108. They also show similar superiority in school achievement tests and have experienced less behavioral problems.

Ultimately these programs could result in "considerable economic benefit" for society, Bernard Brown says. By raising the abilities of disadvantaged children up to normal, preschool programs have helped save larger amounts of money that would have been needed later for remedial education. An outstanding example of this was cited by John H. Meier of the Office of Child Development at a Denver press conference. In Gainesville, Fla., he said, only 1 percent of children whose parents had participated in a home-based education program needed special education by the fifth grade. Nearly 30 percent of the students in a control group needed special help by then. □