Other sponsors commented:

Caltech: Reorganization is a matter for IDA's trustees to decide, says President Lee A. DuBridge, and Caltech will go along with their choice. No unilateral action.

Columbia: Contrary to press reports, says a university spokesman, no decision has been taken; the matter is under discussion.

Illinois: The trustees' suggestion is under discussion, says Executive Vice President Lyle H. Lanier, but no decision has been reached.

MIT: Provost Jerome B. Wiesner says the proposed change in IDA organization has been discussed and the inclination is to go along with other universities in accepting it.

Michigan: The University wants to withdraw its corporate participation, but will name an individual trustee, says Vice President M. Radock.

Pennsylvania State and Stanford: No discussion yet.

Princeton: The faculty voted by a heavy majority that the proposed reorganization does not go far enough to remove university participation. President Robert F. Goheen will take the matter to the board of trustees again in June.

BUDGET AX

Research absorbs the cuts

When it comes to spending money, science and technology take less than 10 percent of the Federal Government's proposed $186.1 billion budget.

But when it comes to saving money, another picture emerges.

There was a time when Congressional moves to chop funds from the Federal agencies' research allocations looked like so much empty threat; research and development funds couldn't possibly be cut without doing serious damage to the Federal programs of which they are a part.

But the picture has changed; the long-standing Congressional threat to hold Federal programs as hostage against President Johnson's demands for a 10 percent tax increase has become a reality. The President and his chief antagonist on the issues, House Ways and Means Committee Chairman Wilbur Mills, apparently reached agreement last week on the tax increase in return for a $4 billion spending cut.

It is at this stage that the peculiar arithmetic of Federal budgeting becomes the handwriting on the wall.

Of the $186 billion budget proposal for the fiscal year that starts July 1, only some $39.5 billion are classed as "relatively controllable civilian programs." The other billions cover defense expenditures, locked-in trust funds for such programs as social security and medicare, farm price supports and other legislated expenditures against which the budget-cutters have no weapon.

And, even excepting defense, which is having its own R&D troubles, nonmilitary research and development (SN: 2/10, p. 133) makes up 25 percent of the total from which the cuts will have to be made.

"It's going to be R&D, by definition," laments a budget-watching official of the President's Office of Science and Technology.

Either in the appropriations of funds for authorized programs or in the authorization of new programs, several agencies, including the Atomic Energy Commission and the National Science Foundation have already felt the bite.

On the Science Foundation side, the House last week was deliberating a cut of $100 million or more in the $500 million proposed in President Johnson's budget for fiscal 1969 (SN: 2/10, p. 136).

If this 20 percent slice survives attempts to recoup planned for later Senate action, many scientists fear for the viability of the NSF for several years into the future.

Other science programs are also affected by budget cuts recommended by the House Appropriations Committee. Among these are the Office of Science and Technology, coordinator of Federal science policy, down $735,000 from a $2.5 million request ($500,000 of the request was for a Presidential energy resources study which will have to be postponed), and the National Aeronautics and Space Administration—decreased by $362 million to just over $4 billion. About $294 million of the NASA cut comes out of research and development funds (SN: 2/10, p. 135).

Also cut back, by authorization committees, have been the Atomic Energy Commission—down about 10 percent from the total budget request of $2.9 billion, with a particularly heavy swipe out of AEC's nonmilitary functions; and the Department of Defense, for which the Senate Armed Services Committee recommended a three percent decrease in military research and development, slicing $240 million from a total request for research, development, test and evaluation of $8 billion.

"It's going to be hard on the universities and on science education," laments the OST official. "I hope we'll not be cutting back on the training of future scientists to the point where it will hurt later."

CONTINUING PROCESS

Memory: more than chemistry

Experience almost certainly leaves marks in the chemical structure of the brain. But that does not mean memory can be found there.

"We will never find the stuff of which memory is made. . . . Memory is not just something. It is an entire system in constant dynamic change."

These remarks, from scientists attending the third international conference on The Future of the Brain Sciences, reflect growing belief that the search for chemical memory is misdirected since memory is not only chemistry, but also a set of changing relationships within nervous tissue.

The search for chemical memory codes is like "looking for the difference between jazz and symphonic music by studying the bumps on a record," says Dr. Karl H. Pribram, neurosurgeon and psychologist at Stanford University School of Medicine, one of 50 scientists attending the New York conference, sponsored by the Manfred Sakel Institute in New York and the Foundation for Research on the Nervous System in Boston.

For most of its short life, the scientific investigation of memory has focused on finding a chemical basis. From this effort has come evidence that protein synthesis is apparently required for memory storage. Ribonucleic acid (RNA) and even DNA—the chemical genetic code—seem to play a role. Under the microscope, scientists have found protein macromolecules packed around nerve cells. These proteins theoretically respond to experience, changing the neuron's tendency to react and possibly creating new circuits.

The chemical evidence led several investigators to try memory transfer experiments. They ground up the brains of trained fish or rats, extracted RNA, and fed the residue to untrained donors, claiming chemical learning transfer. But the scientific community has never been convinced by transfer experiments (SN: 4/20, p. 376). For one thing, they depend too heavily on the concept of memory codes.

By current thinking, memory is both storage and process, both stable and transient. Experience causes biochemical changes in brain structure, but that very structure is in the process of constant alteration, continuous computing. Computing is also part of memory.

The conference advanced memory science along both biochemical and computer fronts.

Dr. Samuel Bogoch, conference chairman and director of the Boston research center, reported a nine-fold in-

crease in brain sugars during the first ten minutes of a pigeon's training. The increase is probably due to the animal's general state of alertness; it is not permanent. Dr. Bogoch, however, found that some sugar proteins do show permanent elevation with learning. Months after their training, pigeons maintain this increased glycoprotein content, and the amount of the increase is related to how well the animals have learned. The better the learner, the more residue in its brain.

Dr. Bogoch views the sugar proteins as "switches" on nerve cells influencing the action of neurons. If they can be synthetically duplicated, he suggests, it may be possible to build many more switches into one brain.

Dr. Heinz Von Foerster, professor of electrical engineering at the University of Illinois, explains how protein molecules on the neuron may alter in response to experience.

He describes the molecules as tiny computer parts, reacting to electrical charges. They are continuously changing in molecular structure from stable to excited energy states and back again. An electric charge comes along—the result of experience—and kicks the molecule into an excited state. Its structure changes, for example, from a stable tetrahedron to a less stable square, allowing the molecule to react chemically and form bonds. In the process, it changes a neuron.

"The whole neuron is a different fellow," says Dr. Von Foerster. "Next time its function will be different."

Without chemical bonding, the molecules will return rapidly to their most stable state. Dr. Von Foerster has calculated that the time required for these flips matches that of neural transmission—0.1 to 0.001 second.

As an alternative to storage, Dr. Von Foerster offers what he calls "cognitive tiles." A tile is the smallest neural unit capable of computing meaning from experience.

From conversations with neurophysiologists, he believes a tile can be as small as a single neuron—in other words, one nerve cell may be capable of sensing meaning. At other times, two neurons, four neurons or an entire network would make up the tiles which are laid out in mosaic patterns.

From recent evidence, it appears that many of these relationships between neurons are already programmed at the level of sense organs. Experience does not always come into the brain as unrelated stimuli; the retina itself seems able to compute relationships.

Dr. Von Foerster rejects the idea that all experience is stored somewhere in the brain. "If people stored all the nonsense they have ever seen, they could never retrieve anything," he says.

WHERE NEXT?

A Soviet Month In Space

Satellite	Launch	Decay (to 5/7)	Period (min.)	Inclination (degrees)	Apogee (mi.)	Perigee (mi.)	Purpose
Cosmos 210	4/3	4/11	90.2	81.3	232	123	recon.
Luna 14	4/7		selenocentric orbit				moon data
Cosmos 211	4/9		102.1	81.3	958	123	scientific
Cosmos 212	4/14	4/19	88.3	51.6	124	112	docking
Cosmos 213	4/15	4/20	89.1	51.6	157	115	docking
Cosmos 214	4/18	4/26	90.2	81.3	237	123	recon.
Cosmos 215	4/18		91.4	48.4	321	132	scientific
Cosmos 216	4/20	4/28	89.2	51.0	166	123	recon.
Molniya 1H	4/21		720.8	64.0	24861	254	communications
Cosmos 217	4/24	4/24	87.6	62.2	113	93	maneuvering
Cosmos 218	4/25	4/25	orbit too brief for data				FOBS test
Cosmos 219	4/26		104.7	48.4	1083	140	scientific

The only Soviet manned space flight in the last three years, that of Soyuz 1 on April 23, 1967, ended in the death of Cosmonaut Vladimir Komarov. Since then a vigorous program of unmanned tests of spacecraft and equipment has made U.S. space officials expect something big to happen.

The something big could be just about anything. Guesses have ranged from a manned earth-orbital test of the Soyuz moon craft, to a manned space station carrying as many as a dozen men, to a robot spaceship that would automatically dig up and bring back to earth a sample of the moon, to a manned circumlunar flight.

One thing that has stirred the spacewatchers recently has been the most active space month in Russia's history. During April, the Soviets made more launches—12—than there had ever been in a single month before by any country. The U.S. had put as many or more satellites into orbit during one month four times in the past, but each time one of the U.S. launches included a military flight in which eight satellites were orbited at once.

Three of the satellites in Russia's high-flying April were of particular interest to Westerners looking for signs of coming manned missions. Cosmos 212 and 213 docked, coasted and undocked in orbit automatically (SN: 5/4, p. 430), which could indicate preliminary success in developing a maneuvering capability for use in rescuing astronauts from orbit, a technique on which the U.S. is still debating. Another probe, identified only as another Cosmos number, carried out maneuvers on its own a few days later, swooping down to only 93 miles above the earth. This is some seven miles lower than the orbit of any United States manned flight.

There have also been reports that Soviet space researchers are developing a new super-booster, though they are not unexpected around NASA budget time.

There were indications late in the month that Soviet tracking ships had been sent to their posts at sea, which in the past has often been a good indicator that a major shot was coming. Almost two weeks later, however, there have been no further signs of an immediate launch, although some observers believe that past Russian statements could indicate a circumlunar flight this month.

INTERFERON

Opening another route

Most of the work to date on the antiviral agent interferon has sought either to find a way to produce enough of the protein for injection, or to find some agent that will induce the body's own interferon production.

Now it appears that a third approach must be investigated—the injection of foreign cells that have already begun to make interferon.

For almost a decade, interferon has hung like the grapes of Tantalus, always slightly out of reach. It was identified in 1957 by Dr. Alisk Isaacs, as the substance responsible for one viral infection's interference with the development of a later arriving virus. Interferon at first was hailed as a potential answer for just about every virus disease known.

Interferon is a chemical produced by cells under attack by a virus which blocks replication of the virus. It is a cell's first line of defense against viruses.

Dr. Lowell A. Glasgow of the University of Rochester School of Medicine in Rochester, N.Y., says his group has induced interferon production in the white blood cells of mice, then transfused these cells into other mice.

The transfusion of these interferon factories, Dr. Glasgow says, provides