

## Research restriction diluted

The curtailment of basic research sponsored by the Department of Defense, brought about last year by the so-called Mansfield Amendment to the 1970 Military Procurement Authorization Act, has been at least momentarily weakened during the passage's recent meanderings through the legislative maze.

As originally worded in the controversial Section 203 of the bill, the law stated that basic research funded by DOD must be directly related to specific military need or function. Its passage resulted in confusion, misunderstanding and vitriolic debate, both in and out of Congress. Scientists argued it cut off one of the most important sources of funds for basic research (SN: 5/23, p. 501).

In Senate action earlier this year on the 1971 authorization bill, an attempt at clarification was made by modifying the Mansfield Amendment. The clarification expressed the sense of Congress that Defense basic research should not be further curtailed and that there should be an orderly transfer of certain research to the National Science Foundation.

But in early October a House-Senate conference committee, convened to iron out differences in the authorization bills from both Houses, effected a more significant weakening of the provision's language: Such research would be prohibited unless "in the opinion of the Secretary of Defense" the project has a "potential relationship to a military function or operation." And that is where it hangs now. Congress recessed until Nov. 16, when lame ducks return to both Houses, a situation Senate Majority Leader Mike Mansfield (D-Mont.) has called a "disaster."

Although little opposition is expected to passage of the authorization bill in the House, there will be a fight in the Senate. Vigorous dissent already has been expressed by Senators Mansfield and William Proxmire (D-Wis.), who have called the amendment change a "blank check" to the Pentagon on basic research expenditures. Sen. Mansfield has labeled the present wording ". . . a legislative act of abdication to the Secretary of Defense." He, and others, will attempt restoration of the original language in Section 203.

Rep. Emilio Daddario (D-Conn.) opposed the original amendment and declared it caused "confusion, uncertainty and anxiety" throughout the scientific community. Of the revised Section 203, the chairman of the Subcommittee on Science, Research and Development says: "Given the fundamental nature of basic research, this language is about as

clear and precise as any limitation on basic research can be. . . ."

Meanwhile, after one rejection Rep. Daddario has tried for the second time through Presidential Science Adviser Dr. Edward E. David Jr. to arrange a joint executive-legislative conference to clarify policy on the Federal support of basic research. Any response to this second request, written Oct. 12, had not been made public this week. But the Congressman was still urging such a meeting prior to submission of the 1972 Federal budget request by the President in January. □

## ENVIRONMENT

### First DDT, now PCB

The polychlorinated biphenyls (PCB's), a class of industrial compounds with a wide variety of uses, have been suspected since 1966 of causing many of the same ill effects in organisms as DDT and other chlorinated pesticides. Gradually the evidence has accumulated, and now there is little doubt of their danger (SN: 3/28, p. 321).

Depending on the degree of chlorination, the PCB's are as toxic or more toxic than DDT. One experiment, for example, established that a PCB with 62 percent chlorine was almost twice as effective as DDT in breaking down the sex hormone estradiol in birds; this is regarded as the initial step in the mechanism by which egg shells of predatory birds (which have very high tissue concentrations of both chlorinated pesticides and PCB's) are thinned, leading to high chick mortality and eventual extinction.

The most recent evidence came this month from the work of Drs. Lawrence McCloskey and Richard Cheshier, who exposed corals to chlorinated pesticides and PCB's while they were Tektite 2 aquanauts (SN: 10/10, p. 296). PCB's apparently act synergistically with chlorinated pesticides and enhance their effects, says Dr. Cheshier. One of the potentially most serious results of the work was the finding that a mixture of PCB's and chlorinated pesticides will reduce oxygen production by plants associated with the coral after a relatively brief exposure at one part per million.

In the meantime, Monsanto Co., the sole United States manufacturer of PCB's, has greatly restricted the uses of these compounds, claiming it is now recommending use only as insulating fluids in electrical and heat transfer systems where the PCB's are completely enclosed and thus not likely to get into the environment.

But, says Dr. Robert Risebrough of the University of California at Berkeley, a long-time foe of PCB's: "I'm not very optimistic. This electrical equipment is

going to be thrown away eventually. With an expanding technology, I am afraid we will continue to have large amounts of these chemicals entering the environment."

And just how the PCB's have entered the environment—where they are now ubiquitous, although there are greater amounts near industrial areas—is still unknown. But many of the uses before Monsanto's Aug. 30 restrictions clearly were capable of releasing large amounts into the environment. Among these uses: plastizers, coatings for paper and fabric, fire-retardant compounds, asphalt, adhesives, paraffins, printer's ink, rubber products, solvents for pesticides, lacquers, coatings for water-repellent canvas and as hydraulic fluids.

Recent work, however, has begun to provide at least an indication of sources, says Dr. Risebrough. PCB's have been found, he says, in municipal sewage entering Lake Michigan and in California. Further work may allow researchers to learn just how the PCB's enter the sewage.

Hampering the work has been Monsanto's reluctance to cooperate, claims Rep. William F. Ryan (D-N.Y.) a crusader against PCB's. Ryan says Monsanto has refused to provide him with a list of all uses, claiming this "would serve no useful nonpolitical purpose." And Dr. Risebrough says Monsanto also has refused to provide statistics on amounts of PCB's manufactured. A Monsanto spokesman admitted both charges this week, saying secrecy was necessary because Monsanto is the sole producer of PCB's.

The PCB's have unique advantages industrially because of their chemical stability. This stability is called persistence, however, in substances such as PCB's and chlorinated pesticides that do not degrade in the environment and thus are concentrated in food chains. Says Dr. Risebrough: Badly needed are programs for assessing the environmental impacts of new commercial substances before they become so widely used that we are economically dependent upon them. □

## DRUG CONTROL

### Tough bill plus research

Drug addiction is regarded as a medical problem and not solely a criminal act in the newly passed Comprehensive Drug Abuse and Control Act of 1970. This is the result of vigorous efforts by physicians and scientists working with a handful of like-minded legislators, among whom Sen. Harold E. Hughes (D-Iowa) and Rep. Paul Rogers (D-Fla.) were most prominent.

The initial Administration-backed bill was a harsh, punitive and enforcement measure (SN: 4/4 p. 339).

Passing the Senate with a unanimous vote, it lacked any provision for education, prevention and rehabilitation. As finally amended by joint Senate-House conference committee and passed by Congress last week, the act allots \$115 million for these purposes, setting up a three-year program to be carried out by community health centers. But it retains the Administration provision for "no knock" warrants to search for illegal drugs.

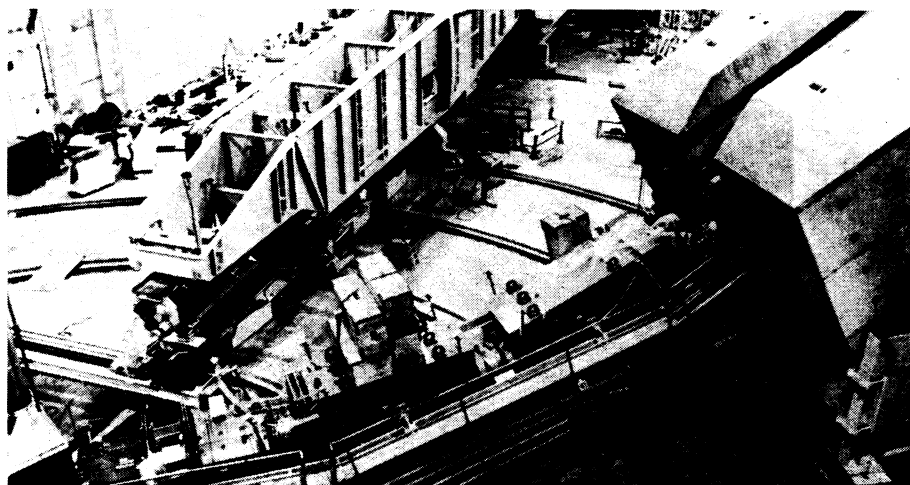
But the physician-scientist lobby, led by Boston lawyer Neil Chayet, lost on the most fought-over provision. The act classifies drugs now controlled into five schedules, according to their potential for abuse and addiction. The Attorney General is given power to classify new compounds as these appear, and to conduct research for purposes of classification. The opposition

lobby had sought to vest the classification and research powers in the Secretary of Health, Education and Welfare and to base classification schedules on degree of danger to the individual from illicit use. For example, the act puts both marijuana and heroin in Schedule I, although danger to the user differs sharply. The HEW Secretary can veto the Attorney General's future classifications but has no more right than any other citizen to appeal classification of drugs named in the bill.

Sen. Thomas J. Dodd (D-Conn.) said he was shocked by the last-minute removal of Valium and Librium—both widely used tranquilizers—as controlled drugs. He said he would introduce an amendment to add these Hoffmann-LaRoche prescription drugs, which, he charged, have been used in several thousand suicide attempts. □

## SUBNUCLEAR PARTICLES

### Evidence for partons



Stanford Univ.

*Searching for partons, spectrometers at SLAC record scattered electrons.*

In attempts to determine the internal structure of protons and neutrons, physicists bombard them with electrons. The electrons, being smaller particles than the protons and neutrons, penetrate into them and emerge with information about the internal structure.

The higher the energy of the electrons the deeper they will penetrate into the target and the more they reveal about the structure. Over the last two years, a series of experiments have been done at the Stanford Linear Accelerator Center, in which first protons and most recently neutrons have been bombarded by electrons of 20.5 billion electron-volts energy.

Among the several ideas of what the inside of a proton or neutron might look like, the results are most consistent with a model that sees protons and neutrons as composed of several subentities, called partons, a word coined by Dr. Richard P. Feynman of Cali-

fornia Institute of Technology.

There exists a ready-made theory in which protons, neutrons and most other particles are viewed as consisting of several subparticles, the so-called quarks. The quark theory was evolved to explain certain patterns that appear among the properties of groups of elementary particles, but a generally accepted discovery of a free quark has not yet been made, so their existence is considered hypothetical only.

**For that reason**, and because the characteristics of the experimentally observed parts of neutrons and protons are imperfectly known, the term parton was invented to avoid a too-hasty identification with quarks.

The simplest way to view a neutron or proton is as a simple undifferentiated blob of matter. If it is that, then high-energy electrons should find it relatively transparent, and the probability that the collision will scatter

them at angles to their original path should be small.

The proton experiments, however, showed a higher probability of scattering the electrons than this simple view called for. The experimental probabilities were found to depend on the momentum and energy transferred from the electron to the proton in such a way as to bring two other possible models to prime consideration.

**The first of these** is a so-called diffraction model, in which the proton remains undifferentiated but the manner of the collision is changed: The electron does not strike the proton directly but interacts with it by means of a third particle, a rho meson, which bounces back and forth between them. The second picture is the parton model, in which the proton is seen as an assemblage of a number of subparticles, and the electron bounces off one of them.

The way to decide between these two models is to use neutrons as targets. The diffraction model predicts that the scattering probabilities will be the same for neutrons as for protons. The parton model predicts lower scattering probabilities for the neutron, says Dr. Richard Taylor of SLAC.

The neutron experiments were done by 18 physicists from SLAC and the Massachusetts Institute of Technology. Senior members of the group were Drs. Jerome I. Friedman and H. W. Kendall of MIT and Dr. Taylor and Dr. Herbert DeStaeble of SLAC. To measure the electron scattering from neutrons, they bombarded deuterium nuclei (which contain one proton and one neutron) with electrons and subtracted the known data for protons. The scattering probabilities for neutrons came out less than those for the protons.

**Another experiment** consistent with partons is the first completed at the Adone storage ring in Frascati, Italy. The experiment collided a beam of electrons with one of positrons. When an electron and a positron come together, they annihilate each other and form a gamma ray. The gamma rays sometimes turn into pi mesons. The Italian experiment found that the probability of producing pi mesons was much higher than expected. The size of the probability is consistent with the suggestion that a parton appears as an intermediate step between the gamma ray and the pi meson.

Results so far are thus consistent with the parton model, but says Dr. Taylor, "It is possible to build models of similar character without partons." Nevertheless, he says, "The parton model has been correct in a qualitative way from the beginning. Other theories, when able to predict, have usually predicted something different." □