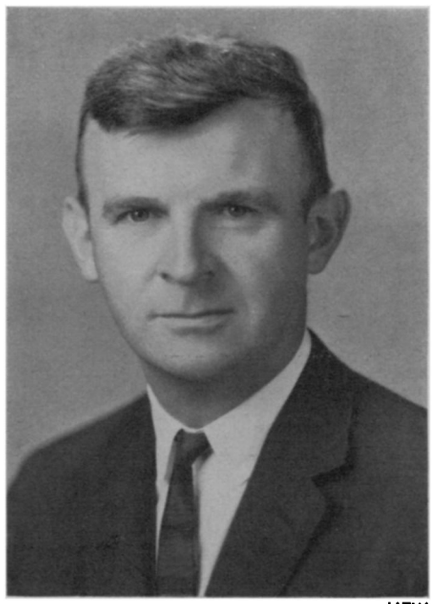
is involved in, based on the principle of conservation of energy. This is a long way from tadpoles; curricula of similar sophistication have been or are being produced by several working groups.

Four major programs under government funding include a California group's "Science Curriculum Improvement Study," the American Association for the Advancement of Science's, "Science—A Process," the Watertown, Mass., "Elementary Science Study" and the New York University-based "Conceptually Oriented Program in Elementary Science." In addition many school systems are working out curriculum alterations of their own.

To handle the new kind of science teaching requires especially trained science teachers who function in a way similar to the specialized music and art teachers who have been traditional in elementary schools, says Dr. Shamos.

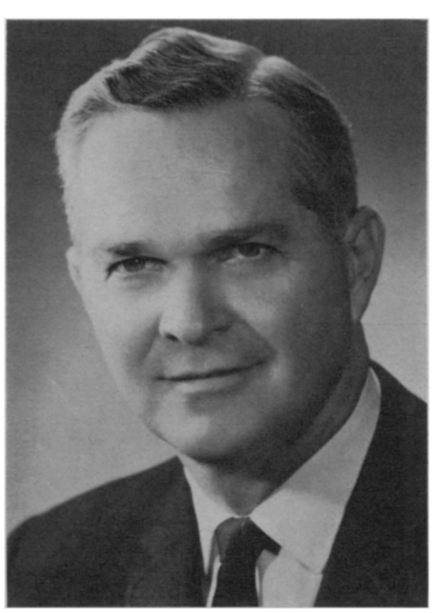
There are between 90,000 and 100,000 elementary schools in the United States, and they have about a million teachers. Retraining all these teachers so that they could handle the new science curricula would not only be a formidable task, but an unfair imposition. Also, in the opinion of Dr. Leo Schubert of American University, this year's convention program chairman, getting such a project started would require overcoming attitudes of indifference, fear and even outright hostility to science on the part of many teachers.

It is better, both agree, to start fresh with especially trained new teachers. Prof. Shamos would like to see one special science teacher in each of the U.S. schools. At present there are very few. School boards have begun to hire them in significant numbers only in the last two or three years, says Prof. Schubert. ◇



HEW

Lee unifies HEW health programs.



HEW

Marston is acting head of services.

HEALTH BUREAUCRACY

Shifts affect hospital builders, not researchers

Two out of three shoes have dropped in the long-considered reorganization of the health side of the U.S. Department of Health, Education and Welfare. The first came last month when Dr. Philip R. Lee, assistant secretary for health and scientific affairs, moved from a staff position into a line position as director of all the department's health activities (SN: 3/23 p. 284).

Now, as step two, the Public Health Service has been split into two administrations, one to retain the name of the present National Insitutes of Health, the other to be called the Health Services and Mental Health Administration.

It is believed that relatively low-level reshuffling of the reorganization plan is all that is holding up the third step —the consolidation of the Food and Drug Administration and various environmental health control programs into a Consumer Protection Administration.

The dismembering of the Public Health Service is likely to have a great effect on the administration of Federally financed biomedical research, but the shock waves are not expected to reach the lab bench. It will, however, facilitate medical school construction.

The subdivision of PHS announced by Secretary Designate Wilbur J. Cohen goes a long way toward finally realizing the dreams of NIH Director James A. Shannon. Shannon has pushed for an NIH independent of the Public Health Service and Surgeon General William H. Stewart, on the grounds that Stewart and PHS think in terms of service while NIH is bent on research. Further, NIH administrators have had to work through an organizational layer between them and the surgeon general; many of them feel this layer has been insensitive to NIH needs.

The reorganization plan was ordered to reduce the degree of autonomy in the balkanized HEW health services, not increase it through the creation of yet another practically independent agency. Under the plan, therefore, NIH has had to be content with a separate-but-equal role, still under Stewart.

According to Cohen's announcement, Stewart retains his title of surgeon general and becomes "principal deputy" to Dr. Lee. The retention of the title is an anachronism designed to satisfy the requirements of many statutes to the effect that certain functions can be performed only by authority of the surgeon general.

Shannon, as director of the new NIH, will report directly to Stewart, as will Dr. Robert Q. Marston, acting director of the health services administration, and Dr. James L. Goddard, almost certain to be named head of the consumer protection administration.

The more powerful role for Stewart seems to be the result of pressure from his considerable number of supporters in the public health field.

The shakeup is not likely to affect either intramural researchers or researchers working under NIH grants, except as it is expected to reduce confusion in the administration of their funds. There are not likely to be new attitudes felt toward basic as opposed to applied research, at least while Shannon is director (he retires in September, unless he and Congress can be persuaded to extend his tenure).

From the NIH standpoint the main impact will be felt in the administration of medical school support funds. The medical schools have been pushing the reorganization, and are happy with the current version. Previously an institution wishing to build a medical school had to go to one agency for library funds, another for money to build the educational plant, and another for money to install research facilities. This procedure had to be followed even though all the money was going into one building; one agency might turn an application down while another ap-

proved its Siamese twin.

Now NIH encompasses the National Library of Medicine and the Bureau of Health Manpower. The combination, when it becomes fully effective, will be able to finance building and operation of a medical school from start to finish.

About 40 percent of the funds for biomedical education come from the Federal Government. The great majority of these funds will now be handled by the new NIH. The nation spends about $1.5 billion each year on biomedical research and education. Forty-seven percent of this goes to educational institutions.

ACS

Battles over genetic theory

It is typical of the American Chemical Society that the most significant controversy at its convention in San Francisco last week should have contributions from a botanist, a physicist, a molecular biologist and a physician. Chemists have to speak all kinds of scientific languages.

The subject, disarmingly presented under the patronage of the society's division of the history of chemistry, was the role of the chemical DNA in the process of heredity. At issue was the question of man's ability to control physical characteristics of his offspring. The issue is one of intensifying scientific controversy; the Federation of American Scientists expects to launch a major confrontation on it at the next meeting of The American Association for the Advancement of Science.

The great advances in molecular biology in the last 15 years, often described as the DNA revolution, come largely from the discovery by two geneticists, Drs. James D. Watson and Francis Crick, that the DNA molecule, thought to be the carrier of genetic information, has a rather simple shape—a pair of strands twined together in a helix, something like a spiral staircase.

From this model, it was found possible within a few years to describe how information is encoded in the DNA molecule by combinations of four different kinds of subunits called nucleotides. The basis for all characteristics of all living matter, it is claimed, is contained in the arrangement of nucleotides in the standard DNA molecule.

The location of genetic information in a specific molecule had led to wide speculation on the possibility of influencing heredity by chemically manipulating DNA. The more flamboyant proponents of this procedure have seen in DNA the means of controlling sex and physical characteristics, preventing allergy, obesity or arthritis and eliminating cancer and diabetes. Such genetic engineering has even been suggested as means of increasing intelligence and preventing mental illness. These predictions, Dr. Barry Commoner of Washington University in St. Louis complained to a packed ACS audience, are a cruel mockery of human hopes.

The fact is, says Dr. Commoner, who is chairman of the botany department at Washington University, DNA is not the exclusive means of determining how an offspring cell will develop. In the transfer of information to daughter cells, things can happen that alter or influence what information is received, he says, citing experiments carried out by himself and other investigators.

If the influence of DNA on inheritance is only partial, being affected by exterior conditions, then any attempt to control inheritance by chemical manipulation of DNA is likely to yield unexpected and uncontrollable results, says Dr. Commoner.

"An attempt to produce a genius," he warns, "is more likely to create a monster."

Dr. Commoner's warnings about overoptimistic applications of the genetic code theory were backed up by a physician, Dr. Samuel P. Bessman of the University of Maryland Medical School.

Dr. Bessman complained that, on the basis of sketchy evidence, and reasoning from genetic theory, it was erroneously concluded that the disease, phenylketonuria (PKU) could be avoided by special diet. Public enthusiasm for the idea was so great that some three dozen states passed laws specifying specific treatment, despite lack of evidence that it does any good (SN:8/19/67 p. 184).

Stanford University physicist Dr. Howard H. Pattee devoted himself to the area still presenting the most serious problems to biologists: How the information encoded on DNA is transferred to cell enzymes which then control the growth of new cells.

Dr. Pattee says the simple mechanistic models of enzyme operation can't explain the speed and reliability of information transfer. A complete explanation, he said, will have to take into account quantum mechanics—the fact that all matter, when it gets down to the submolecular level, does not just sit still, but has a wave motion that significantly affects its behavior.

All the controversy over the DNA revolution has unsettled and dismayed the practitioners of the biochemical art. And their dismay was heightened by the recent publication of Dr. Watson's controversial description of the discovery of the DNA structure, "The Double Helix" (SN: 3/2 p. 210).

Typical of some of the comments were those of Dr. Erwin Chargaff of Columbia University, a long-time investigator of DNA, who complained that following the double helix discovery, the study of DNA turned into a "vulgar dance around the golden helix," a movement that was "more a creed than a science, with initiation rites like the Masonic order in the 18th century but without the advantage of Mozart's music." Its practitioners, he said, were "short-order cooks described as geniuses."

F-111A AND F-111B

Crashes in Asia and U.S.

Combat flights of the $6.5 million-a-copy F-111's began March 25 with raids on supply and troop-staging areas in the panhandle section of southern North Vietnam.

Three days later, the first plane disappeared. It never returned to its base from a bombing run, and was listed as simply overdue. Two days after that, a second F-111 was lost when it crashed, reportedly in Thailand. The remaining four planes were grounded, and a tight security lid was clamped on the fates of the first two.

The North Vietnamese claim to have shot down both planes. The U.S. Air Force will say nothing about the first one, and claims that the second crashed because of an inflight emergency not caused by hostile fire.

The question that has risen to plague Air Force and Defense Department brass is whether the F-111 should have been in Southeast Asia at all.

The Air Force, of course, says yes, and the plane has been declared eminently airworthy by its pilots. But some critics believe the plane should not have been sent into combat until it is as impregnable as it can be made.

Senator Karl E. Mundt (R-S.D.) goes so far as to demand that the remaining four Harvest Reaper aircraft be brought home, and no more be sent, until they can be equipped with the ultra-sophisticated avionics package now planned for aircraft 160, more than 100 planes away on General Dynamics' production line.

While the Air Force's F-111A was in trouble in Thailand, the Navy's F-111B was shot down on Capitol Hill. When the Navy reduced its fiscal 1969 fund request from 30 of the overweight planes to eight in order to free money for study of an alternative super-fighter called the VFAX, the Senate Armed Services Committee pulled the plug altogether. The committee voted 11 to 2 not to give the F-111B any funds at all, apparently scuttling the Navy version.