year, as the Secretary has ordered, become clear. A major argument is over cost. The faction in favor of the F-18 argues that, if the Navy builds only F-14's now, and waits several years before replacing the Marine's fighter and attack planes and the Navy's attack planes, those replacements will become proportionately more expensive than replacing them now, with a single, large purchase of F-18's. The pro-F-14 faction counter that it will be cheaper in the long run to go on buying F-14's as fast as possible and simply replacing the A-7 attack planes with more A-7's as they wear out.

Another pro-F-14 argument is that the cost per unit of the F-18 has risen to $15 million—it is now more expensive than the first F-14's—and that the Navy has no business spending that sort of money on less capable aircraft. The F-18 faction counters that in future year dollars, 1975–1987, the kind for which the $15 million figure applies, the cost per unit of the F-14 will be no less than $35.8 million!

The cost arguments rapidly escalate into ideological ones. The pro-F-18 faction argues that with the costs of submarines, carriers, smaller ships, and aircraft rising exponentially, it is high time the Navy was taught the lesson that the B-1 cancellation was meant to teach the Air Force: that the country cannot always afford, and does not always need, the most elaborate and expensive systems.

The swing-wing, two-seater F-14 in flight.

Equally vehement, however, are the pro-F-14 arguments which invoke the cost savings of building only F-14's, and holding back on the modernization of the attack forces, as examples of surefooted, refined military judgment. Those who favor the F-14 often add that the F-18 is taking on the earmarks of the TFX, in having been conceived by outsiders without regard for real Navy requirements, and in its recent alleged gains in aircraft weight and cost.

It is obviously too soon to predict where all this will come out. The House Armed Services Committee recently, in a predictable opening move, authorized production of half again as many F-14's as the Secretary asked for in his budget. On the other hand, the Senate, which has yet to act on the authorization measure, is expected to be somewhat more partial to the F-18. In the midst of all this, however, one irony should not go overlooked—namely, that the F-18 story seems to show that it is sometimes as hard for outsiders to the armed services to introduce a new weapons system as it is for them to terminate one.

—DEBORAH SHAPLEY

Congress Set to Grapple Again with Gene Splicing

The stage has now been set for Congress to try again at what it failed to do last session—pass a bill to govern gene splicing research. How the action will unfold is far from clear. Some observers believe agreement will crystallize around a new bill being framed in the House. Others predict the same deadlock as that which produced last session's legislative morass.

At present the principal object of attention is the new draft bill devised by Burke Zimmerman, staff aide to House health subcommittee chairman Paul Rogers. The draft was designed so as to win maximum agreement among all interested parties, and almost succeeded. NIH director Donald Fredrickson has endorsed it as "the most promising solution yet proposed." But an attempted agreement with Senator Edward Kennedy's staff that he would also support the draft did not work out. On 1 March Kennedy introduced the Rogers bill but with amendments that restate much of the position he declared but later receded from during the last session. "We are almost where we were six months ago—little has changed; the new Rogers bill is probably more acceptable than anthing else but it doesn't resolve any of the big issues," says a Senate aide.

Both substance and personalities are pertinent to understanding the sometimes mysterious ways in which Congress works its collective will. One sometimes relevant fact is that Kennedy and Rogers, chairmen of the Senate and House health subcommittees respectively, each likes to see his own version of a bill prevail. Another is that Rogers' initiatives are not invariably smiled upon by Harley Staggers, the chairman of Rogers' parent committee. Rogers' hand is often strengthened in full committee by having all his subcommittee members on board. Kennedy has greater flexibility to follow his own course.

Abrupt changes of course have characterized Kennedy's stance on recombinant DNA. At hearings held in September 1976, a few months after the NIH guidelines on the research had been issued, Kennedy indicated that he would consider legislation only if industry did not comply. But last spring he introduced a bill that appeared to scientists and others to be a bad case of regulatory overkill.

Intensive lobbying by individuals and scientific groups created a basis for senators such as Gaylord Nelson and Adlai Stevenson to oppose Kennedy (*Science*, 20 January 1978). Citing new evidence

0036-8075/78/0324-1319$00.50/0

adduced by Stanley Cohen of Stanford, but also perhaps because he no longer had the votes, Kennedy withdrew his bill last October and replaced it with a proposal simply to extend the NIH guidelines to industry. This was probably a case of underregulation in that it is apparently legally difficult to extend the guidelines in any simple way.

Meanwhile the bill passed by Rogers' House health subcommittee was killed in full committee, in part because Staggers had been persuaded (by Cohen and others) that no legislation was necessary.

Some scientists do favor legislation, including in particular the authorities at Harvard who want to see a federal law that preempts intervention by local authorities of the likes of Cambridge city mayor Alfred Vellucci. Harvard, joined by Stanford and Washington University, St. Louis, wrote a draft bill with a strong preemption clause.

The first move in the present session of Congress occurred when Staggers, now persuaded that legislation might be a good thing after all, introduced the Harvard bill. Rogers is said not to have been overjoyed at the apparent attempt by Harvard, which needs his support on other issues, to end-run him with his chairman.

In the hope of avoiding last session's deadlock, Rogers has been trying to pick up the pieces with a consensus bill that all parties can get behind. The salient feature of the draft is that it contains close to the minimum regulatory apparatus necessary to make the guidelines legally enforceable; also it is to last for only 2 years. Essentially the bill extends the relevant portions of the NIH guidelines to industry and others, vesting inspection and enforcement authority in the familiar hands of the Secretary of Health, Education, and Welfare. These features have won the bill the general support of the NIH and of Harlyn Hal-

Briefing

Califano, Marshall, Petitioned on Beryllium

Two cabinet officials, Labor Secretary Ray Marshall and Health, Education, and Welfare Secretary Joseph A. Califano, have been asked to judge the integrity of government studies purporting to show that beryllium is a carcinogen in humans. The beryllium industry and its scientific consultants have charged that the studies, conducted by the National Institute of Occupational Safety and Health (NIOSH), were biased against beryllium. The studies are to be the basis for a new workplace standard for beryllium, which the Occupational Safety and Health Administration (OSHA) has said it will issue soon.

Eight prominent scientists,* some of whom have been consultants to the beryllium industry at one time or another and several of whom enjoy international reputations, have written to Marshall, who oversees OSHA, and Califano, who oversees NIOSH, to express concern about the "quality, and therefore the credibility" of NIOSH's research. NIOSH is the scientific support agency for OSHA, which sets workplace health standards.

Their letter, dated 10 February, cites two news articles in *Science* (2 December 1977 and 27 January 1978) to explain their concern. The beryllium studies discussed in the articles are, they write, "shocking examples of the shoddy scholarship and questionable objectivity utilized in making important national regulatory decisions.

"We do not address here the question of the carcinogenicity of beryllium" the letter continues. "While this question is important there is an even more fundamental issue. The assistant Secretary of Labor in OSHA had an obligation to issue standards based on scientifically sound data. Workers have a right to honest analysis."

While beryllium is the "most clearly documented" case, the scientists write that NIOSH studies of other substances might also be suspect. "Problems comparable to those that have surfaced in the context of beryllium pervade studies in many areas that have been the object of OSHA regulatory decisions in recent years."

While neither Marshall nor Califano has replied to the letter, it comes at a time when both the substance and organization of the government's occupational health research is under high-level scrutiny. After the sudden resignation of NIOSH director Jack Finklea in early January, higher level HEW officials said they were studying NIOSH's organization and its relations with OSHA and other groups, such as the National Institute for Environmental Health Sciences, another institute in HEW.

In addition, OSHA is starting to implement the sweeping new crackdown on workplace carcinogens it announced many months ago, and so it is studying the question of what data it should accept as evidence that a substance poses a cancer risk to workers. Finally, an interagency group set up to aid implementation of the Toxic Substances Control Act is examining the strengths and weaknesses of government epidemiology and studies of low-dose exposures, and looking at possible new institutional arrangements.

But some people in the labor movement and in government science circles are concerned about these reexaminations of NIOSH and related government research. They say these could cause the Carter Administration to lose the momentum of its drive to be active in the field of occupational health, in which, under the two previous Administrations, relatively little was done.

*The scientists are Merril Eisenbud of New York University Medical Center; Leonard J. Goldwater of Columbia University; Ian Higgins of the University of Michigan School of Public Health; Brian MacMahon of the Harvard School of Public Health; Adrianne E. Rogers of the Massachusetts Institute of Technology; H. Daniel Roth, a self-employed consultant; Irving R. Tabershaw of the University of California at Berkeley; and Howard S. Van Ordstand of the Cleveland Clinic Foundation.

Women in Science Legislation Advanced

Senator Edward M. Kennedy (D–Mass.) plans to make a point during forthcoming hearings on the fiscal 1979 National Science Foundation (NSF) authorization bill, of querying the foundation about what more it can do to encourage women to pursue scientific careers.

Staffers for the senator, who chairs a subcommittee with oversight responsibilities for the NSF, say he considers that the $1 million to $2 million of NSF funds allocated to encouraging women in science is too little—especially in view of the fact that women constitute 50 percent of the U.S. population, whereas minority group members, who represent only 10 percent of the total population, are the targets of some $12 million worth of NSF programs.

Kennedy and four other influential sen-

0036-8075/78/0324-1320$00.50/0

vorson, a Brandeis University microbiologist who has organized an active lobby on the issue.

Also pleasing to NIH was a clause exempting the gene-splicing rules from the National Environmental Policy Act. This would save NIH the burden of drafting environmental policy statements each time the guidelines were revised. But strenuous lobbying by Friends of the Earth and others has probably doomed the waiver clause to extinction.

To bring Staggers on board, Rogers has written in a strong preemption clause which in effect prevents local authorities from writing their own regulations unless the Secretary of HEW finds them both more stringent than the federal standards and necessary to protect health and the environment. The new bill thus has the support of Harvard and other institutions.

Harvard on, Kennedy off

To win Kennedy's support Rogers had included provision for a study commission to assess the long-term applications of gene splicing. But when Rogers later had to write in the Harvard bill's preemption clause in order to bring Staggers on board, the price was that Kennedy thereupon stepped off ship. The version of the Rogers bill which Kennedy dropped in on 1 March does not contain the preemption clause. It also carries provision for a study commission stronger than that envisaged by Rogers and having a majority of nonbiologists as members. The preemption issue, in other words, remains as undecided as before.

With the stage as now set, almost anything could happen, although the most likely single outcome is probably that the Rogers bill will prevail in some form. Introduced by Staggers, it is scheduled by mark-up by the full committee beginning on March 14.

In the Senate, the attitudes of Stevenators, Harrison Williams (D–N.J.), Claiborne Pell (D–R.I.), William Hathaway (D–Me.), and Jacob Javits (D–N.Y.) are cosponsors of a bill which would have the NSF spend $25 million each year for 10 years, beginning in 1980, to encourage women in scientific careers. Portions of the bill, staffers say, may be appended to the NSF authorizing legislation in mark-up later this year.

The "Women in Science and Technology Equal Opportunities Act" starts from the sociological truth that only 10 percent of all practicing Ph.D. scientists are women because young girls in the 7th through 12th grades tend to lose interest in mathematics; later, then, in college, they cannot pursue science because they lack the necessary fundamental skills. So the bill authorizes funds for various educational aid programs directed toward this group, to encourage their continuing interest and participation, and to encourage even their parents.

Since women go on dropping out of science and mathematics courses as undergraduates in college, thinning the ranks of potential women scientists still more, the bill would offer various incentives to universities to encourage more participation by women undergraduates.

As for NSF, the legislation proposes among other things that it develop appropriate books and instructional materials, establish community outreach and museum programs, and set up a clearinghouse so that prospective employers can identify qualified women scientists for jobs. Finally, there would be awards to individuals and institutions who have met the act's aims. Many of the provisions grew out of the recommendations of an American Association for the Advancement of Science conference on women in science held last October, which Kennedy addressed.

At the moment, Kennedy is said to not want to punish NSF or educational institutions that do not encourage women to pursue science. Rather than assuming that the issue is being actively avoided, Kennedy is said to believe it has merely been neglected, and a simple, carrot-and-stick approach is most appropriate for legislation at this time.

Goldberger Named Caltech President

The California Institute of Technology has chosen a new president after a faculty search process that began a year ago when President Carter named the then-president, Harold Brown, to be secretary of defense. The new president will be Marvin L. Goldberger, who from 1970 to 1976 was chairman of the Princeton physics department and who, like Brown and Lee A. DuBridge, Caltech's president from 1946 to 1969, is a prominent physicist with a long involvement in government military matters.

Goldberger, who takes office on 1 July, participated as a student in the Manhattan project; he worked under Eugene P. Wigner at Chicago as part of the team that designed the atomic pile at Hanford, Washington. Only after the war did he get his Ph.D., under Enrico Fermi at Chicago. In 1957 he moved to a permanent post at Princeton. In the late 1950's, Goldberger helped to found the Jason Division of the Institute for Defense Analyses, an elite group of academic physicists who spent their summers together working on erudite problems for the Department of Defense. Goldberger was chairman of the Jason Divison for many years, through 1966, before it became a target of the antiwar movement as opposition to the Vietnam war grew on university campuses. Goldberger was also on the President's Science Advisory Committee in the late 1960's and chairman of its subpanel on strategic weapons during the height of the national controversy over the antiballistic missile.

Goldberger also served as chairman of the Federation of American Scientists in 1972 and 1973, and has made two trips to China. Since 1977 he has been the holder of Princeton's oldest endowed chair, as the Joseph Henry professor of physics.

The selection of Goldberger does not bode any major changes for Caltech, since it will be the third time since World War Two that the presidency has gone to an outsider, a physicist with military expertise. (DuBridge was head of MIT's Radiation Laboratory that developed radar during World War Two before going to Caltech, and Brown had been director of Lawrence Livermore Laboratory, Director of Defense Research and Engineering, and Air Force Secretary before going to Caltech.

Goldberger told *Science* he plans to involve himself in teaching there. "Caltech is sufficiently small that, if you have an idea, there is a finite chance of your convincing your colleagues it's a good one and implementing it. And, the prestige of Caltech is so great that if you have an idea and pull it off, you have much larger impact." He added that he would even like to teach an undergraduate course too, if it can be arranged.

Deborah Shapley

son and Nelson may well be important in influencing Kennedy's position. Stevenson's science and space subcommittee has no claim to jurisdiction over recombinant DNA, but Kennedy may invite Stevenson to offer amendments in order to gain his and others' votes. Stevenson, who held hearings on gene splicing last November, has not yet issued his report but is said to favor the general approach of the Rogers bill with certain possibly significant exceptions.

If the House comes out with a strong preemption clause but Kennedy prevails in the Senate with his anti-preemption position, the House-Senate conference meeting could, as one aide put it, be "absolutely bloody." But supporters of preemption believe matters may never get that far: head-counts taken last session on a strong preemption clause written by Nelson suggested he would prevail over Kennedy. Also Jacob Javits, a leading Republican member of Kennedy's health subcommittee, is expected to fight Kennedy on preemption.

Kennedy has not so far really showed his hand; no one knows what position he will eventually take. Probably the closer he comes to the Rogers-Staggers position, the more likely is it that a bill of some kind will emerge from Congress this session.

Another deadlock, however, is not impossible, in which case sentiment may gather within the Administration for using existing powers to regulate gene splicing research. Former FDA general counsel Peter Hutt, who has long insisted that such powers exist in a clause known as Section 361 of the Public Health Service Act, was recently asked by the White House Office of Science and Technology Policy to review the suitability of the section. In a recent letter to OSTP assistant director Gilbert Omenn, Hutt says the section has been used to regulate a variety of matters ranging from pet turtles to blood banking, and would also serve well for recombinant DNA. If Congress fails to enact a gene splicing law, and if the Secretary of HEW declines to assert jurisdiction under Section 361, a "serious regulatory void will exist," which Hutt believes is likely to be filled by the Occupational Safety and Health Administration. "This would, in my judgment, be a serious error," Hutt says.

Another individual whose views may be pertinent is Stanley Cohen, whose arguments have been cited by both Kennedy and Staggers. Cohen opposes all legislation on the grounds that the NIH guidelines describe a standard operating practice which no more needs special legislation to back it than does any other standard practice. While not specifically in favor of applying Section 361, Cohen cites that as one of the existing legal mechanisms that would render new legislation unnecessary. Cohen opposes (even though Stanford supports) Harvard's attempt to obtain preemption through legislation, his argument being that scientists should rest their position strictly on the scientific merits of the case and not try to "second guess the political process."

Whatever the wisdom of second guessing the political process, even a first guess on the outcome of this session's action on gene splicing could only be made with hazard.

—NICHOLAS WADE

RECENT DEATHS

Harlow W. Ades, 65; retired professor of electrical engineering, physiology and biophysics, and psychology, University of Illinois, Urbana-Champaign; 12 October.

Harry Alpert, 64; professor of sociology, University of Oregon; 6 November.

Alvan L. Barach, 82; former associate professor of clinical medicine, College of Physicians and Surgeons, Columbia University; 13 December.

Lester F. Beck, 68; former professor of psychology, University of Oregon; 29 October.

Howard W. Deems, 78; former chairman of agriculture, University of Nebraska, Lincoln; 22 December.

George W. de Villafranca, 55; professor and chairman of biological sciences, Smith College; 25 December.

Robert DeWolfe, 50; professor of chemistry, University of California, Santa Barbara; 15 December.

Eugene Feenberg, 71; professor emeritus of theoretical physics, Washington University, 7 November.

Charles Fishel, 58; associate dean, College of Medicine, University of South Florida; 22 December.

Noel E. Foss, 72; former dean, School of Pharmacy, University of Maryland; 13 December.

Frederick J. Gaudet, 75; professor emeritus of psychology, Stevens Institute of Technology; 12 December.

Ben R. Gossick, 63; former chairman, department of physics and astronomy, University of Kentucky; 12 November.

David A. Grant, 61; professor of psychology, University of Wisconsin, Madison; 28 December.

Bernard Gregory, 58; former head, European Organization for Nuclear Research and French National Center for Scientific Research; 25 December.

Lexemuel R. Hesler, 89; professor emeritus of botany, University of Tennessee; 20 November.

Howard C. Hoyt, 86; associate professor emeritus of physics, Wayne State University; 9 October.

K. G. Larson, 94; professor emeritus of physics, Augustana College; 8 November.

Edward A. Livesay, 89; former professor of animal husbandry, West Virginia University; 7 November.

John Lyman, 62; professor emeritus of environmental chemistry, University of North Carolina, Chapel Hill; 16 November.

Walter A. Maclinn, 66; former chairman of food technology, Rutgers University; 25 November.

Gerald J. Matchett, 65; former professor of economics, Illinois Institute of Technology; 11 October.

Richard W. Mattoon, 65; chemical physicist, Abbott Laboratories; 24 September.

Kenneth May, 62; professor of mathematics and history of science, University of Toronto; 1 December.

Bruce V. Moore, 86; professor emeritus of psychology, Pennsylvania State University; 14 November.

Fernandus Payne, 96; professor emeritus of zoology, Indiana University; 13 October.

Norville C. Pervier, 86; former professor of chemistry, University of Minnesota; 18 October.

Jean Rostand, 83; French biologist, historian of science and humanist; 3 September.

Herbert E. Street, 65; former professor of botany and founding chairman, School of Biological Sciences, University of Leicester; 4 December.

Charles H. Vehse, 81; professor emeritus of mathematics, West Virginia University; 26 September.

Norman D. Watkins, 43; professor of oceanography, University of Rhode Island; 2 November.

Cleveland J. White, 84; professor emeritus of medicine, Loyola University; 8 October.

George J. Willauer, 81; former clinical professor of surgery, Thomas Jefferson University; 19 December.

Erratum: In the report by K. Denniston-Thompson *et al.*, entitled "Physical structure of the replication origin of bacteriophage lambda" (9 December 1977, pp. 1051–1056), the T·A base pair at position 1426 (Fig. 6) should be an A·T base pair; also the position of the G·C base pair affected by the *ti*12 mutation should be 1453 rather than 1451.