budget authority for FY 1973 is essentially unchanged from last year. Within this total, the budget for the research institutes has risen by almost 10 percent ($139 million), to $1.6 billion, but the increase has been entirely financed at the expense of a $142 million cut in construction.

Of the $139 million increase for the institutes, by far the largest part ($92 million) goes to the National Cancer Institute (NCI) for the purposes of the presidential cancer crusade, leaving the other institutes with a 4.3 percent increase in their FY 1973 budget, barely enough to cover inflation. In accordance with the new cancer legislation, the NCI director bypassed his two immediate superiors and submitted his budget directly to the White House.

After the NCI, the National Heart and Lung Institute fared best, with a budget increase of $22 million. Of this amount, $5 million is earmarked to give a second major boost in 2 years to the sickle-cell anemia program, which, like cancer, has benefited from being adopted as a political football. Other new money for health seems designed to preempt Democratic initiatives in Congress. Bills to provide extra funds for heart disease, for instance, were introduced in the last session by representatives Paul G. Rogers (D–Fla.) and Claude D. Pepper (D–Fla.), as well as by Senator Walter F. Mondale (D–Minn.). And Senator Alan Cranston (D–Calif.) has been plumping strongly for improved medical care for veterans, which happens to be a major target for new health money in the Nixon budget.

The basic research grant program in NIH's FY 1973 budget contains the untoward feature that there is $11 million less for funding new proposals than was available last year. The cost of commitments to existing research projects has risen by $57 million, making an overall increase of $47 million (8 percent) in the regular research grant program. Applied research (defined as including special programs and contract research) has risen by 10 percent, to $465 million. The emphasis on applied research within the NIH budget is in keeping with the overall picture in federal outlays for health research. Basic research in the health field will increase by 11 percent, to $527 million in FY 1973, while categorical research will rise by 16 percent, to $1.4 billion.

In the Administration's 3-year effort to wring from science what salve it may contain for society's problems, it seems as if science, the "endless frontier" of the 1950's and 1960's, is fast becoming the meticulously planned and managed frontier of the 1970's and 1980's. One result has been an apparent waning of the traditional view that basic science should stand preeminent while its benefits were left to somehow filter down to the common man.

Now, if one can believe a news release on the budget from the OST, quite the opposite view has come into favor: "problem-oriented R & D will provide healthy spillover into basic research."

ROBERT GILLETTE
DEBORAH SHAPLEY, NICHOLAS WADE

Space Shuttle: Compromise Version Still Faces Opposition

"We must sail sometimes with the wind and sometimes against it," said Oliver Wendell Holmes, "but we must sail, not drift, nor lie at anchor." So with man's epic voyage into space—a voyage the United States has led and still shall lead.
—RICHARD M. NIXON, 6 January 1972

In his dramatic endorsement of a multibillion dollar space shuttle project, President Nixon never made it entirely clear whether he regarded himself as sailing with the political winds or against them. Certainly leading Democrats, among them the chief executioners of the supersonic transport (SST), wasted no time in attacking the shuttle as being equally unjustifiable in the face of a scarcity of federal dollars for earthbound social problems. "A senseless extravaganza," Senator Walter Mondale (D–Minn.) called it. Senator William Proxmire (D–Wis.) said it might keep the aerospace industry happy, but with "a steady drain on the federal budget" of monies needed elsewhere. Senator Edmund Muskie (D–Maine), Nixon's most likely opponent in November, reaffirmed his long-standing disapproval of the shuttle, a position some congressional observers found remarkable in view of the impending Florida primary.

However the winds may blow, the President's enthusiastic support of the shuttle clearly pumped a fresh breath of life into the National Aeronautics and Space Administration, buoyed the spirits of a flagging aerospace industry and lost no friends in politically vital West Coast and southern states. As NASA Administrator James C. Fletcher noted, it will take 6 years to transform the shuttle from a drawing board dream to a flying reality. And in that time the project will help to maintain, through the still-uncertain post-Apollo years, the huge teams of engineers and technicians assembled at Cape Kennedy, the Marshall Space Flight Center in Alabama, and the Manned Spacecraft Center near Houston.

More than that, Fletcher said, the $5.5 billion committed by the President for shuttle work will generate 50,000 jobs, half of them in California—where Nixon chose to reveal his endorsement shortly before returning to Washington to declare his candidacy for President. The 50,000 jobs, over 70 percent of which will probably go to workers earning $6,000 to $15,000 a year, will obviously help substantially to offset the loss of some 200,000 aerospace jobs in the past few years. Left unmentioned was the fact that the 50,000-job figure refers to peak employment in the shuttle project, which will not be reached until 1976–77. How many of the new jobs, and how much of the new money, is merely being sapped from existing programs to sustain the shuttle may never be fully known.

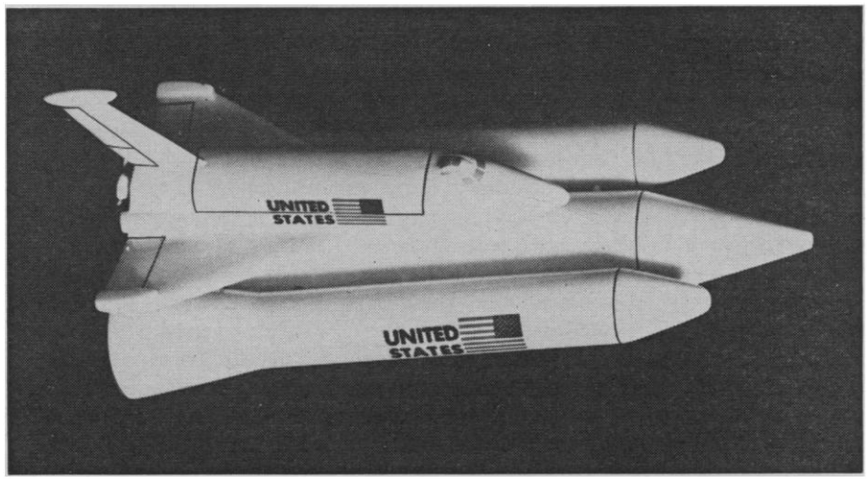
The shuttle Nixon endorsed was considerably less ambitious, and at least a billion dollars cheaper, that the shut-

tle NASA has fought for in Congress and inside the White House for the past 3 years. In basic outline it remains unchanged—a huge booster rocket with a payload-carrying orbiter strapped to its side. But under White House orders, NASA has postponed indefinitely the idea of an exotic manned booster and it reduced the size of the airplane-like orbiter by half and simplified its design. Even at that, some budget bureau officials are said to be unhappy with the magnitude, the design, and the pace of the shuttle project as it now stands.

From NASA's point of view, such corner-cutting would seem to be little cause for complaint. Although predicted operating costs of the shuttle have roughly doubled to about $10 million per flight, the new shuttle's capabilities remain essentially the same as envisioned before: It will lift 65,000 pounds of payload or as many as a dozen passengers and four crewmen, all hermetically sealed in a "shirt-sleeve environment," into the lower reaches of near-earth space; it will then spend up to a month circling the globe on civilian or military missions, and finally glide like an airplane to a conventional landing at a more or less conventional airstrip. In the process, Nixon promised, the shuttle would "take the astronomical costs out of astronautics," make possible the retrieval and repair of earth-orbiting spacecraft, and make travel in space nearly as comfortable and routine as travel by jet.

For all its other virtues, the shuttle and its stamp of presidential approval stand as a tribute to NASA's deft and persistent salesmanship, a talent marked by careful acquiescence to political and economic realities and by a willingness to bleed other programs, including Apollo, to keep the shuttle alive. Indeed, the shuttle that won the hearts and minds of the White House is very much a child of compromise; NASA planners conceived and reconceived its design and even its justification with an eye to maximizing its attractiveness while mollifying opposition to it in Congress. So far, the effort has been highly successful, and it shows every sign of continuing to be, despite some smoldering discontent toward the shuttle that still exists in the Senate.

Plans for the shuttle originated in the late 1960's as an outgrowth of early studies of a permanent, manned, orbiting space station. As the next step after the three-man Skylab project, which is due to fly in 1973, the 12-man space station would fly in the 1980's.



One conception of a proposed space shuttle and its expendable booster.

In the course of the station studies, however, NASA planners soon discovered that ferrying men and provisions to the station by means of conventional, expendable rockets, would be prohibitively expensive. To reduce "recurring" costs, a reusable shuttle was conceived as a necessary adjunct to the station and to any further manned adventures in space.

Sometime in the 1980's, the shuttle was to become the central element of an elaborate space transportation system that would include a "space tug" for trundling heavy payloads about in near-earth space, and a similar but larger tug for long hauls to the moon.

When NASA first publicized these plans, in 1969, it described the shuttle and the station as a single interdependent project. While the space agency did suggest other uses for the shuttle—among them the launching and servicing of unmanned satellites, civilian and military reconnaisance, and rescues in space—these were clearly secondary to the vehicle's main role as springboard for new, manned adventures in space.

The "shuttle/station" pitch was forthright enough, but it nearly killed the shuttle. Representative Joseph Karth (D–Minn.), ordinarily an ardent supporter of the space program—particularly the unmanned program—seized on the dual project as evidence that NASA was attempting to extract from Congress a piecemeal commitment to what he called "its ultimate objective" of sending men to Mars. In 1970, Karth pressed a floor amendment to block appropriations for the "shuttle/station," and failed only by a 53 to 53 tie. A similar amendment offered by Mondale fell short by a vote of 28 to 32.

Somewhat the wiser in 1971, the space agency did a sudden about-face, asserting that the shuttle could be justified in economic terms entirely by its prospective savings in an *unmanned* space program. To support this contention, NASA released an elaborate cost-benefit study of the shuttle performed for the space agency by the Princeton, N.J., firm of Mathematica, Inc.

This analysis indicated that, during a 10- to 12-year period, the shuttle could save enough over the cost of expendable rockets to more than pay for its own development. Some of this saving would obtain from the fact that the shuttle's great lifting power, gentle ride, and satellite-retrieving capability would permit simpler, less rugged, and therefore cheaper payloads.

To emphasize the shuttle's new justification, and to quash rumors of the martian dream, NASA officials also made it known that the project was to be "decoupled" from the space station project—its original reason for being—by giving it separate project staff and separate designation in the budget.

This strategy succeeded in pacifying Karth, who now says he is "enthusiastic" about the shuttle, and most of the opposition in the House has since evaporated. In the Senate, more Machiavellian minds remained unsoothed, but three subsequent fights over the shuttle turned out new legions of senators whose constituents stood to benefit from lucrative shuttle contracts. The critics lost by margins as great as 42 votes.

But NASA and the tax-paying public paid a price for tranquility in Congress. As James Fletcher pointed out on 6 January, "total savings made possible by the shuttle will depend on its frequency of use." And NASA's own cost-benefit

study showed that to break even solely on the basis of an unmanned program, would require a program considerably larger and more active than the one NASA happened to run. Thus the space agency was obliged to find another customer besides itself, even if it meant tailoring the shuttle's design to meet someone else's special demands.

The space agency, of course, found that the Air Force could use the shuttle. And the Air Force soon found itself in a novel and happy situation: NASA needed Air Force business even more than the Air Force needed a shuttle. Obviously the shuttle would replace the Defense Department's defunct Manned Orbiting Laboratory project; but, as Air Force Secretary Robert Seamans told a congressional hearing last year, "I cannot sit here today and say that the space transportation system is an essential military requirement."

The arrangement that eventually evolved between NASA and the Air Force called upon the latter merely to contribute its political support (and its business), and not to pay for the shuttle's development. NASA's civilian image was thus preserved intact, but in exchange, the space agency was obliged to meet special Air Force design requirements, among them a demand for a more complex and costly delta-winged orbiter stage, rather than a simpler straight-winged job.

The space agency's rapid footwork to protect its most coveted project has led Senator Mondale, the shuttle's most persistent critic in Congress, to complain that "instead of [following] the normal process of presenting a clear and consistent justification for a program—and then seeking to fund it—NASA wants to continue this project on a fund now, justify later basis."

Mondale and others are convinced that the shuttle will become a make-work tool, a means by which the space agency may hope to lift its budget skyward by its own bootstraps, as Proxmire puts it. Such suspicions are reinforced by the fact that NASA has merely deferred to the 1980's, and has not abandoned, its plans for a space station, a space tug, and most of the other accouterments of the original space transportation system.

So, come this spring, not long after cherry blossom time, Mondale, Proxmire, and other veterans of the SST fight will muster for their fifth offensive

Environmental Action Organizations Are Suffering

Activist environmental organizations have fallen into the doldrums this winter. Contributions and membership levels have not increased at rates anticipated a year ago, and "ecology" seems to have lost some of its charisma.

Some observers are speaking ominously of an "environmental backlash" created by fears that the costs of environmental reform are more than the public is willing to pay. It would probably be more nearly accurate to say that there has been a subsiding of the wave of public enthusiasm for the cause which swelled around the time of Earth Day on 22 April 1970.

The old-line, nonpolitical conservation groups, many of which have a solid base of support from foundations, have not reported much suffering. The Izaak Walton League, the Conservation Foundation, and the Wildlife Federation, for example, report that 1971 was a year of steady, if not exciting, increase in membership.

But the activist organizations, most of them new, which rely on continuous publicity and public enthusiasm, are feeling the pinch. Gifts to them are not tax deductible and foundations are legally prohibited from supporting lobby groups. The Sierra Club must be included among these, because in 1969 it lost the security of its tax-deductible status after it began overt lobbying activities. For the Sierra Club, "The problem came up overnight. In September everything was rosy," says Richard Lahn of the Washington office. At a November board meeting, the club laid on a staff hiring freeze and put restrictions on travel, telephone, and postage spending. In a staff memorandum it was explained that new monthly memberships were substantially less than the projected 3000, that book sales had dropped sharply, and that overdue bills were piling up. Some think last year's hike in membership dues—from $12 to $15—has contributed to the financial slowdown. Sierra Club publications are not selling as well as expected, partly because of the high cost of the coffee-table variety and also because Time-Life is making inroads on the market with a series of luxurious books on natural wonders.

Friends of the Earth (FOE), a lobby group established in July 1969 by former Sierra Club executive director David Brower, is in more serious straits. Its membership, now 22,000, has not risen significantly in the last 6 months. The organization is now $250,000 in the red because it hasn't been able to summon the money to pay back substantial loans it procured in order to get launched. Drastic trimming has resulted—the San Francisco office has been closed down, and offices in New York and Albuquerque are folding. An expensive direct-mail campaign conducted last fall turned out to be a losing gamble.

Environmental Action, the group that spent 3 months and $100,000 organizing the 1970 Earth Day, is now running on the thinnest shoestring of all. The staff of nine are working on subsistence wages of $55 a week. Direct-mail solicitations have produced a disappointing yield. "So much of the energy that should be going into action programs is going into worrying about the money situation," laments the group's coordinator Sam Love. But, "we're not going to fold—because we're stubborn."

The money slump has also affected Zero Population Growth (ZPG), the only population control organization that has forsworn deductibility for political activity. ZPG's Washington-based director of political activities Carl Pope says ZPG's problems are somewhat different from those of other environmental groups because of the diffuse and long-term nature of the problem. People might be more concerned "if the earth were being worn away by all of our footsteps," he says, but well-publicized developments (such as, hopefully, the forthcoming report by the President's Commission on Population Growth and the American Future) are

against the space shuttle in 3 years.

But victory over the SST notwithstanding (and rumors persist in Washington that it will be revived), the prospects for scuttling the shuttle are slim.

The issues, after all, despite their seeming similarity, are different in crucial respects. While new political visibility accorded the shuttle by the President's backing may render it more vulnerable to attack by a Democratic Congress, the shuttle seems to possess few of the SST's intrinsic weaknesses. In the first place, the central moral issue raised by the SST was the propriety of government subsidy for an essentially commercial enterprise. Moreover, the only obvious beneficiaries of this subsidy, apart from the aerospace industry, which needed the work, were a handful of airlines and a limited number of affluent travelers who looked forward to going to the same places for the same reasons as always, but at a slightly more exciting speed.

The shuttle, by contrast, has no such commercial overtones, and, by any measure, it is a more truly national enterprise than the SST. Certainly without it the manned space program may be expected to wither considerably, and perhaps vanish altogether, by the end of the decade.

For both the SST and the shuttle, however, the central issue of substance is economy. But here NASA seems to have covered its flanks with cost-benefit analyses more thoroughly than the Department of Transportation ever did. As a result, the shuttle's opponents have so far been reduced to hopeful probing for weak spots in the information and assumptions that went into cost-benefit studies. For instance, Mondale aides say that they doubt the veracity of data—apparently furnished mostly by the Lockheed Corporation, a contender for shuttle contracts—which the study uses to argue that the shuttle would lead to significantly lower payload costs and thereby reduce the overall cost of the entire space program. There appears to be no hard, recent information to refute this contention, however.

The critics also perceive a certain slipperiness to NASA's estimates of shuttle costs. In 1969 the space agency put a $5.2 billion price tag on a fully reusable and exceedingly sophisticated shuttle design. By last year this estimate had crept publicly up to between $6 billion and $8 billion and less publicly to

from Money Shortages, Slump in Public Commitment

needed to keep people worried. The movement was not helped when the press made front-page stories of a report sponsored by the Washington Center for Metropolitan Studies which purported to show that the baby boom had been supplanted by a "baby bust." But the real blow in ZPG's solar plexus has been delivered by "Right to Life" citizens groups who have mobilized vocal anti-abortion campaigns. While ZPG's emphasis is on family planning rather than abortion, the Right to Life people "stopped us in our tracks," says Pope. The ZPG's immediate goal, which is to push through Congress a joint resolution endorsing a national policy of population stabilization, is now in cold storage.

Discussions with the groups mentioned above confirm one FOE staff member's observation that "the road for nondeductible groups is a very hairy road indeed."

None of the reasons for the leveling off of public enthusiasm are particularly obscure. The campuses are not presently a prime source of emotional energy. The Nixon economic freeze has made nondeductible charitable donations an early casualty, and many political donations are now going to presidential candidates rather than to causes. Some people feel, too, that the market has become glutted with public-interest lobby groups that the public, now back in its normal state of anxious apathy, is reluctant to support.

In a way, environmental activism has entered its own Phase II. Now that the consciousness-raising stage is over and pollution is firmly associated with evil, few issues are susceptible to black and white interpretations. Battles are moving off the front page and into the back rooms of the legislatures and the courts. The Environmental Defense Fund (EDF) and the National Resources Defense Council, for example, both of which are involved in environmental court battles, are still reasonably well off. Rod Cameron of the 4-year-old EDF points out that EDF is engaged in specific, visible activities and thus is more assured of a stable financial constituency.

Assurance that the issue is still foremost in the concerns of Americans comes from a poll conducted last summer by Common Cause, the national citizens' lobby. The 35,000 persons who answered the 14-item questionnaire ranked environmental protection as second in importance only to withdrawal from Vietnam.

Nevertheless, the activist groups are realizing that better planning and increased expertise will be necessary to press their cause within government. Local citizens' groups are increasingly addressing themselves to such specific projects as trash recycling or attempts to block inner-city expressways and undesirable power plants. But in Washington, the activist groups, many of which are manned by young people barely out of college, must work their way behind the scenes and into the tough legal and technical complexities that surround policy-making.

The backlash they face comes not from the public, but from businesses and industries that are finally taking the movement seriously and are responding forcefully—with stepped-up lobbying; sophisticated advertising campaigns proclaiming their dedication to sunshine and green grass; and employee "education" programs, which, crudely summed up, sometimes amount to saying: "Which do you want, clean air or a job?" (an approach commonly called "environmental blackmail").

Environmental activism has lost a lot of innocence since the flowery euphoria that characterized Earth Day. Typically, the young people working in the little offices in Washington still believe they have the public behind them and are determined to stick with their increasingly difficult cause. No one is particularly concerned that ecology might be a passing fad, because, as they say, "If it's a fad, it's the last fad."—CONSTANCE HOLDEN

between $9 billion and $11 billion. Now the estimated cost of developing a partly expendable, less sophisticated shuttle is pegged at $5.5 billion.

It should be noted, however, that this figure reflects what the auto dealers call the cost of the vehicle "stripped." Essential extras include a $1 billion contingency fund for cost overruns and another $300 million for each of three operational shuttles (the rock-bottom price buys only two test vehicles) which NASA and the Air Force would like. Another extra is a launch and recovery base for the shuttles—two if the Air Force gets its own to avoid an embarrassing mixture of civilian and military traffic at a single site. Cost of base facilities: around $300 million each. Thus the entire bill, not including the manned shuttle booster which space officials still hope to build in the 1980's, might easily approach $9 billion.

Another issue raised by the shuttle's critics centers on how often it will have to fly, and how much, and what, it will have to carry to pay for its own development. Space agency spokesmen say the currently proposed system would be cost-effective—that is, it would bring a 10 percent return on investment —by making 514 flights over a 12-year period. This implies an average of 43 military and civilian flights a year, about the same pace as in the 1960's. But this level of activity assumes that on each trip the shuttles will carry an average of 60 percent of their maximum load, or about 39,000 pounds. At 43 flights a year this implies a total annual payload of about 1000 tons, or four times what the United States has ever before launched in a single year, even at the peak of the Apollo program.

Congressional critics take this to mean that the space program, unmanned or otherwise, will have to be vastly expanded to take full advantage of the shuttle's economies of scale. NASA officials, however, say that much of extra weight will be accounted for by heavier (though cheaper) payloads and by final rocket stages for far-ranging probes and satellites not previously counted as payload.

The critics may have scored some valid points, but fine details of economy are not the stuff from which great public debates are often made. The shuttle's opponents in Congress are all too well aware that their attack on the SST drew its strength from a vast and vocal public constituency aroused by alarms—rightly or wrongly—of environmental damage and organized by major conservation organizations. In the end, of course, it was the SST's shaky economic grounding that did it in, not the threat of doom and boom from the stratosphere. But a good case can be made that the economic arguments would not have carried the weight that they did in the absence of issues more easily grasped and pursued by the public.

As things stand, no such catalytic issue seems in the offing in the coming debate over NASA's ferryboat to the future. There is no visible ground swell of public support for the shuttle's congressional critics. The major conservation groups haven't the time, money, or inclination to carry a battle that has little to do with their direct interests. And Mondale and his allies have so far found only a handful of scientists with more than a faint dislike of the shuttle and with some competence to assess its merits. "Unless we can pull together the kind of public campaign that brought down the SST," one Senate aide laments, "the shuttle is going to get by this year without a thorough examination, and without an adversary hearing in Congress."—ROBERT GILLETTE

RECENT DEATHS

John W. Ashton, 71; former dean, College of Arts and Sciences and the Graduate School, former vice president, Indiana University; 8 November.

Henry A. Blair, 71; chairman emeritus, radiation biology and biophysics department, University of Rochester Medical Center; 4 November.

LeRoy Bowman, 83; professor emeritus of sociology, Brooklyn College; 30 September.

Lucy J. Hayner, 73; professor emeritus of physics, Columbia University; 21 September.

Thomas A. Hippaka, 76; professor of education, Iowa State University; 5 September.

S. Russell Keim, 43; executive director, marine board, National Academy of Engineering; 8 November.

Ken-Ichi Kojima, 41; professor of zoology, University of Texas; 14 November.

William H. Johnston, 51; president, Scientific Research Instruments Corp., Maryland; 9 November.

Eliot Jones, 84; former professor of economics, Stanford University; 17 October.

Sophia J. Kleegman, 70; clinical professor of obstetrics and gynecology, New York University School of Medicine; 26 September.

Samuel Laycock, 80; dean emeritus of education, University of Saskatchewan, Canada; 5 September.

Edgar MacNaughton, 84; former professor of mechanical engineering, Tufts University; 21 October.

Raymond D. Magus, 33; instructor in pharmacology, University of North Carolina; 13 May.

John P. Maurer, 56; president, Southeastern University; 14 November.

Robert A. Moore, 70; retired president, Downstate Medical Center, State University of New York; 24 September.

Alonzo G. Moron, 62; former president, Hampton Institute; 31 October.

Bradley M. Patten, 82; professor emeritus of anatomy, University of Michigan; 8 November.

C. Richard Purdy, 62; professor of mathematics, California State College, Hayward; 21 October.

L. Corsan Reid, 77; retired professor of research surgery, New York University Graduate Medical School; 1 October.

John A. Ross, Jr., 92; former president, Clarkson College of Technology; 17 September.

Truman G. Schnabel, Sr., 85; professor emeritus of medicine, University of Pennsylvania; 27 August.

J. Hervey Shutts, 63; former professor of biological sciences and science education, Mankato State College; 7 September.

E. Russell Stabler, 65; retired professor of mathematics, Hofstra University; 26 September.

Robert L. Strider, 49; dean of graduate and undergraduate programs, arts and sciences division, Johns Hopkins University; 4 September.

Joel H. Swartz, 78; retired geophysicist, U.S. Geological Survey; 28 September.

Gerald Tannenbaum, 44; associate professor of psychiatry, New York Medical College; 23 September.

Marian M. Torrey, 77; former chairman, mathematics department, Goucher College; 16 September.

Henry Tucker, 48; professor of systems engineering, University of Arizona; 13 September.

Dmitri A. Zhdanov, 63; Soviet anatomist and president, World Association of Anatomists; 26 September.

Erratum: Warren F. Goodell, vice president for Administration at Columbia University, was mistakenly referred to as Charles Goodell (14 Jan., p. 153).