which all the chromosomes undergo when they condense during a division cycle is also a prime area of ignorance.

There is no question that these and many similar problems must be solved before we begin to understand genetic systems in higher organisms. The major virtures of heterochromatin are two: large chromosome segments are frequently involved in the heterochromatic state, and we may follow them visually both through the processes of cell mechanics and development and through their evolutionary modification. In spite of the ambiguities, the study of heterochromatin remains a worthwhile task.

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NEWS AND COMMENT

R & D Funds Show Effects of a Tough Budget Year

The proposed federal budget for the 1967 fiscal year is the first budget since the middle 1950's, when federal science acquired the general structure familiar today, which has not carried a request for an increase in total funds for research and development.

In the budget which the President sent to Congress on Monday, expenditures for R&D activities would be $15.939 billion, some $22 million less than the estimated $15.961 that will be spent in the current fiscal year, which ends 30 June.

This downturn in what for about a decade has been a steadily ascending curve directly reflects the major rationale of the new budget: to provide funds to support a military buildup in Southeast Asia without underfinancing new education and welfare programs enacted during the past two sessions of Congress under the banner of the Great Society.

The impact on the science budget is created less by cutbacks than by the lack of increases which the scientific community has grown accustomed to expect. Shifts of funds within the budget have, in the case of some programs and some functions, resulted in fairly substantial increases. Funds for basic research, for example, would rise under the new budget. But there is a built-in "creep" of costs in research, and it is expected that this will be a tight year, especially for new research and training grants.

The largest single reduction to affect any science agency is a cut of $300 million in funds requested for the National Aeronautics and Space Administration. The new budget asks for $5.3 billion for next year, compared with $5.6 billion in the current fiscal year. Up to now, the NASA budget has been bigger each year since the agency was established in 1958. Reductions are possible this year, say administration officials, because a number of space-agency programs are moving from the expensive development stage to the less costly operational phase. Financially most significant is the fact that costly facilities at the Houston manned space-flight center and at Cape Kennedy are completed or nearly so. This winding up of major construction projects accounts for some $200 million of the reduction in costs which have hitherto been charged to the R&D budget.

Cuts in construction are, as a matter of fact, a cost-reducing factor which affects not only the science budget but the whole federal budget for the coming fiscal year. In the science budget, obligational authority for construction (for funds which would be obligated but not necessarily spent in the 1967 fiscal year) would be reduced from $849.3 million in the current year to $617.4 in fiscal 1967 (see Table 4).

This cutback in construction has two major purposes. In addition to making more funds available for military expenditures and Great Society programs, the cuts would take federal money out

Table 1. Obligations for conduct of development (in millions of dollars).

Department or agency	1965	1966	1967
Defense	5,054	5,518	5,493
NASA	3,745	3,803	3,544
AEC	907	891	876
Other	122	317	273
Total	9,828	10,529	10,187

Table 2. Obligations for conduct of research (in millions of dollars).

Department or agency	1965	1966	1967
Defense	1,738	1,899	1,812
NASA	1,224	1,382	1,366
AEC	334	365	393
HEW	859	1,029	1,155
NSF	217	257	287
Other	222	289	318
Total	4,797	5,447	5,551

of the construction market and thus decrease inflationary pressures.

The economy is in its fifth year of expansion, and many observers have seen the war in Vietnam as placing demands on production and manpower which are inflationary. Last year the administration's principal concerns in fashioning the budget were to encourage continued economic growth and provide financing for Great Society legislation. The dominating problem was still unemployment, which, despite the long-run expansion of the economy, was still above 5 percent and apparently stuck there.

Events of the past year have greatly changed the picture. Unemployment fell to 4.1 percent, very close to the 4 percent which, under the economic policy guidelines developed in the Kennedy-Johnson period, has been informally regarded as "acceptable." (Rates of unemployment among poorly educated young people, particularly among Negroes and members of other minority groups, remain very high, however, and it is at these groups that the administration's Poverty Program measures are particularly aimed.)

New this year, in addition to the drop in unemployment, is an incipient break in the wage and price stability which has helped make possible the expansion-without-inflation of the past 5 years. A new round of price and wage increases would not only fuel inflation but further complicate the administration's already serious problems with the nation's international balance of payments. The administration's recognition of the changes is reflected in proposals for early collection of taxes and reinstatement of excise taxes on automobiles and telephone calls—measures which, though mild, would take money out of circulation and, presumably, help cool an "overheating" economy.

At the budget briefing last Saturday, Secretary of the Treasury Henry H. Fowler and Bureau of the Budget Director Charles L. Schultze described the budget as a "moderately restraining budget" and a "noninflationary budget." It is significant that the record $112.8 billion budget contemplates a deficit of $1.8 billion, the smallest in 7 years. While achieving this will require luck and major increases in revenues, the figure indicates that the administration feels it is time to modify perhaps the most radical feature in Kennedy-Johnson fiscal policy, a feature which won surprising acceptance from business. This was the tactic of maintaining a budget deficit in a period of economic expansion so long as unemployment was high (*Science*, 29 Jan. 1965).

The major palpable effect on the science budget of this noninflationary budget with a big increment for the military is, as noted, a deferment of construction of science facilities. What this will mean in terms of limitations on the future growth of research and training activities at this time can only be guessed at.

In the overall R&D budget, it is still true that, as go the Defense Department and NASA, so goes the total budget. Nearly $7 billion in R&D funds are earmarked for Defense, and more than $5 billion, for NASA, amounts that together make up nearly four-fifths of the total R&D budget. Funds for these two bellwethers have been leveling off for the past 3 years, and so has the total R&D budget. (An analysis of federal research, development, and related programs is to be found in a pamphlet titled "Special Analyses," available separately for the first time this year.*)

The Budget and Defense Department budget briefings dispelled the suspense on the question of whether the Nike-X antiballistic missile (ABM) system would be moved into a new and more expensive phase, perhaps toward deployment. Development work will continue, with approximately $400 million being spent on it, but there is no request for authorization of funds for deployment. Defense Department spokesmen have indicated that the decision on deployment can be deferred for at least another year.

Table 3. Obligations for conduct of basic research (in millions of dollars).

Department or agency	1965	1966	1967
Defense	263	273	297
NASA	512	606	659
AEC	258	285	311
HEW	301	355	391
NSF	217	257	287
Other	70	80	89
Total	1,695	1,941	2,116

Table. 4. Obligations for research and development facilities (in millions of dollars).

Department or agency	1965	1966	1967
Defense	69	85	105
NASA	532	345	123
AEC	269	190	220
HEW	102	110	80
NSF	56	67	62
Other	42	29	25
Total	1,084	849	617

The civil defense budget reflects the status of Nike-X. A major fallout-shelter construction program is regarded as a corollary to deployment of an ABM system, but requests for funds for civil defense show no really significant changes.

The agency which most conspicuously bucks this year's budget trends is the Department of Health, Education, and Welfare. At a briefing last Saturday, HEW Secretary John W. Gardner said that fiscal 1967 is "not a slowdown year for HEW." The President's budget calls for an expenditure of $10.2 billion by HEW, some $2.5 billion more than the department is spending in the current fiscal year. About $2.1 billion of this increase would go to finance new education and Social Security legislation, notably Medicare.

The Public Health Service, HEW's major subsidiary for administration of research, education, and operational programs in the field of health, would get about $2.5 billion under the new budget, compared with some $2.2 billion in the current year. Funds for the National Institutes of Health, which claim about half the total PHS budget, would rise in the coming year by about $59 million, to a total of $1.303 billion. This is a smaller increase than NIH has become habituated to, but it represents a *net* increase. A reduction of $35 million in NIH support of research-

* For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Price 50 cents.

facilities construction will be an offsetting factor permitting an increase in support of extramural and intramural research activities of more than $93 million over fiscal year 1966.

A HEW memorandum prepared for a briefing of the press on the departmental budget noted a "higher priority given in the HEW budget generally to new facilities for the education and training of manpower in health and other fields. In keeping with this policy, NIH will, within the $15 million remaining in the budget for support of health research facilities, give emphasis to the development of enlarged medical schools."

Some $43 million has been requested for the Regional Heart, Stroke, and Cancer Medical Centers, about half the $90 million authorized by Congress for fiscal 1967. The request would seem to represent a go-slow decision on a program which has had a troubled infancy (*Science*, 15 Oct. 1965).

For all the categorical NIH institutes, the new budget provides increases, but these can fairly be described as moderate ones. The rate of increase in funds for research has leveled off at NIH in late years, although there have been surges ahead in a few categories, such as mental health. There has been a period of administrative reorganization and consolidation out in Bethesda, and the coming year was looked to by many as a time for a big advance in funding. While Congress may well top the budget requests, chances for major increases would appear to be slim.

For control of water pollution, a big increment of $120 million is being asked. This would bring total federal funds for pollution control to $307 million. About half the total would be for construction grants for waste-treatment plants. Other funds go into research on control of pollution caused by acid mine drainage and toward more effective treatment of sewage wastes and stepped-up planning on pollution control in river basins.

Outside PHS, one of the largest proportional increases to a science-based agency will go to the Food and Drug Administration. FDA is slated to receive an increase in funds of $9 million, to bring its fiscal 1967 budget to $68 million. The agency is one which is regarded as in the process of overhaul. According to the HEW briefing memorandum, "In the main these funds will be directed to (1) review of new drugs for safety and efficiency, (2) the control of barbiturates and amphetamines under the Drug Abuse Act of 1965, and (3) increased inspection of food and drug imports."

For oceanography, obligations under the new budget would rise from $178.2 in the current fiscal year to $219.9 for next year. The major portion of the increase would be accounted for by a boost in funds for Defense Department oceanographic programs, which would go up from $80.5 to $113.4 million. Funds for oceanographic research would apparently remain about the same in the new budget, but Defense would spend more on surveys and on "ocean engineering," particularly, it appears, on a nuclear-powered submarine and deep-submergence vehicles.

The Interior Department's Office of Saline Water received another proportionally large annual boost, with $30.9 million requested in new obligational authority, compared with $23.1 million in the current fiscal year.

Funds for research in the atmospheric sciences are scheduled to increase from $224.1 to $234.6 million. More emphasis this year would be put into weather modification studies financed by the Interior Department's Bureau of Reclamation, the National Science Foundation, and the new Environmental Science Services Administration in the Department of Commerce.

The Atomic Energy Commission, which has been a big spender on R&D programs, also fared comparatively well this year. None of the AEC's major research, education, or "peaceful uses" programs were cut, and funds for research and construction were increased (see Tables 2 and 4). An item of $2.2 million is earmarked for continued studies on the 200-Bev accelerator which has attracted such covetous attention from the scientific community. The money will be spent for studies mostly at the Lawrence Radiation Laboratory and to pay the expenses involved in selecting a site. President Johnson noted in his budget message that design funds will be requested once the site is chosen, presumably this year.

For the National Science Foundation, the new budget recommends a sub-

Washington University Chosen for New PHS Program

Washington University, St. Louis, is the first grant recipient in a new Public Health Service program to support university institutes for environmental health research. With the aid of a $4.25 million grant extending over 7 years, the university is establishing a facility to be known as the Center for the Biology of Natural Systems, to "seek new approaches in basic science toward solving the increasingly urgent problems of environmental health." Barry Commoner, chairman of the school's botany department, is the director.

The center's approach will be to study at a fundamental level the complex natural systems that effect human health. Emphasis will be on interdisciplinary collaboration.

The center will involve the university, the Missouri Botanical (Shaw's) Garden, and the St. Louis Zoo. The faculty will be composed of senior fellows drawn from the staffs of the departments of botany, chemistry, computer mathematics, environmental engineering, physics, preventive medicine, and zoology. Practicing environmental health scientists will be invited to participate in the program as visiting fellows for various periods, both to help the center get the specialist's viewpoint, and to help the visitors gain an overall view of the basic science approach.

In conjunction with the research, a training program will be offered as a regular part of the university's graduate program. Pre- and postdoctoral fellowships are available for the coming academic year beginning in September. Predoctorals are $3000 to $3600 for 12 months, plus tuition waiver; postdoctorals are $5000 to $6000 for the year. Both provide dependent allowances. Applications should be made by 15 March directly to one of the participating departments. Students will retain their original departmental affiliation and must meet the regular degree requirements. Those interested in the center will also apply for admission as junior fellows.—M.K.Z.

stantial increase in funds, but gives no real encouragement to the agency to conquer new worlds. Total new obligational authority for the agency would be $525 million in fiscal 1967, compared with $479.6 this year. If Congress complies, NSF would break the half-billion-dollar barrier which has seemed shatterproof to the agency for several years. Most of the roughly $48 million increase called for would go to expand activities in two major and familiar areas of NSF operations, support of basic research through project grants (up $25 million to bring the total to $180 million) and science education (up $14 million, for a total of $140 million). Project Mohole would get some $19 million next year, up slightly from $17.6 obligated in the current year. The science development program, which has provided funds for science programs in institutions with a potential for improvement, would get only $5 million more than in the current year, or a total of $45 million. Known as the "new centers of excellence" program, the science development program has been popular among universities not in the top 20, and among federal legislators who represent constituencies with institutions that have not received large amounts of federal money for research.

In comparing the new budget with last year's, the important difference is less one of money than of mood. The atmosphere in Washington has acquired a grimness clearly generated by the war in Vietnam and the difficulties of ending it. Perhaps portentously, more people here seem to be calling it the war in Southeast Asia.

Emphasis in the budget is specifically on the buildup in Vietnam and on support of Great Society legislation. The President has said that if more is needed he will ask for it, and the feeling is growing that the military situation is open-ended.

In nonmilitary sectors of the budget, including funds for R&D, the prospect seems to be one of slow growth or no growth in present programs and of high hurdles for new programs, or initiatives. Last year innovation was the watchword, and administration scouts were out looking for new ideas, cost notwithstanding. Phases come and go in Washington, and that one seems to be ended. This year, as one agency planner ruefully expressed it recently, "They might as well put a sign up over the door of the Bureau of the Budget, 'No new ideas wanted, even good ones.' "—JOHN WALSH

Weather Modification: Panels Want Greater Federal Effort

The lack of a scientific consensus on the value of cloud-seeding experiments has had a discouraging effect on proposals for greater government involvement in weather modification. The missing consensus may now be taking shape, however, as the result of a report issued last week by a prestigious panel appointed more than 2 years ago by the National Academy of Sciences.

The NAS panel,* chaired by Gordon J. F. MacDonald, professor in the Institute of Geophysics and Planetary Physics at the University of California, Los Angeles, has substantially revised its own previous views about cloud seeding. In a preliminary report issued in October 1964 the panel observed that many fundamental questions about atmospheric processes remained to be answered. "It is unlikely that these problems will be solved by the expansion of present efforts which emphasize the *a posteriori* evaluation of largely uncontrolled experiments," it said.

Now, after analysis of operational cloud-seeding projects and review of a number of recently completed experiments, the panel believes that available data, though inconclusive, indicate that seeding techniques are useful enough to be of immediate national concern. "Specifically, we find some evidence for precipitation increases of as much as 10 or even 20 percent over areas as large as 1000 square miles over periods ranging from weeks to years," the panel said.

It recommended the early establishment of "several carefully designed, randomized, seeding experiments, planned in such a way as to permit assessment of the seedability of a variety of storm types." Similar experiments should be conducted in both the western and eastern United States, the panel said. At a news conference, MacDonald estimated that the cost of each experiment would not exceed a few million dollars annually. Each would require a team of 20 to 30 people and several years to complete, the project in the East requiring a year or two more than the one in the West. Silver iodide would be used for seeding.

The NAS panel has worked closely with the Commission on Weather Modification (established by the National Science Foundation in June 1964), which also issued its report† last week. The commission left the scientific aspects of weather modification largely to MacDonald's group, while concentrating on the biological, social, economic, legal, and political aspects.

Except for the fact that the com-

* The Panel's report, *Weather and Climate Modification: Problems and Prospects* (in two volumes), Publication No. 1350, is available for $5 from the Printing and Publishing Office, National Academy of Sciences–National Research Council, Washington, D.C. 20418. The members of the panel are, in addition to MacDonald, Julian H. Bigelow, Institute for Advanced Study; Jule G. Charney, M.I.T.; Ralph E. Huschke, Rand Corporation; Francis S. Johnson, Southwest Center for Advanced Studies; Heinz H. Lettau, University of Wisconsin; Edward N. Lorenz, M.I.T.; James E. McDonald, University of Arizona; Joseph Smagorinsky, Environmental Science Services Administration (ESSA); Joanne Simpson, ESSA (through 1964); Verner E. Suomi, University of Wisconsin; Edward Teller, University of California, Livermore; H. K. Weickmann, ESSA; and E. J. Workman, University of Hawaii. Donald L. Gilman of ESSA and Edward P. Todd of NSF are liaison members.

† *Weather and Climate Modification: Report of the Special Commission on Weather Modification*, may be obtained by persons with institutional certification, at no cost, from the National Science Foundation, 1800 G Street, NW, Washington, D.C. The supply is limited. Members of the commission are: A. R. Chamberlain, vice president of Colorado State University, chairman; John Bardeen, departments of physics and electrical engineering, University of Illinois; William G. Colman, Advisory Commission on Intergovernmental Relations; John C. Dreier, School of Advanced International Studies, Johns Hopkins; Leonid Hurwicz, economics department, University of Minnesota; Thomas F. Malone, research department, Travelers Insurance Company; Arthur W. Murphy, School of Law, Columbia; Sumner T. Pike, Lubec, Maine; William S. von Arx, M.I.T. and Woods Hole Oceanographic Institution; Gilbert F. White, geography department, University of Chicago; and Karl M. Wilbur, zoology department, Duke.