munication to the Botanical Society of America at Amherst, Mass., on 28 Aug. 1963 dealt more completely with the same subject [see F. C. Steward, M. O. Mapes, A. E. Kent, *Am. J. Botany* **46**, pt. 2, 618 (1963)]. On the same occasion D. F. Wetherell and W. Halperin described the similar formation of carrot plants from cells of the petiole and root of the wild carrot [D. F. Wetherell and W. Halperin, *Am. J. Botany* **46**, pt. 2, 219 (1963)]. A recent paper by H. Kato and M. Takeuchi [*Plant Cell Physiol. Tokyo* **4**, 243 (1963)] deals with the development of a callus on relatively large disks of carrot root. After these were extensively cultured (4 months), single cells were separated from the friable callus tissue, and these were observed to grow into plantlets in a manner which was very similar to normal embryogenesis. Thus, the growth of carrot plants from free cells is now being achieved in several different laboratories by different means.

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10. Results in this laboratory.
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12. F. C. Steward and E. M. Shantz, paper presented at the Wye Conference on Growth Substances, Wye, England (1955).
13. F. C. Steward and F. K. Millar, *Symp. Soc. Exptl. Biol.* **8**, 367 (1954).
14. The following references are a representative sample: J. H. Cherry and R. H. Hageman, *Plant Physiol.* **35**, 343 (1960); J. H. Cherry, *ibid.* **37**, 670 (1962); J. K. Heyes, *Proc. Roy. Soc. Lon.* **B152**, 218 (1960); Y. Hotta, S. Osawa, T. Sakaki, *Develop. Biol.* **1**, 65 (1959); R. M. Smillie and G. Krotkow, *Can. J. Botany* **39**, 891 (1961).
15. S. M. Caplin and F. C. Steward, *Nature* **163**, 920 (1949).
16. M. Ogur and G. Rosen, *Arch. Biochem.* **25**, 262 (1950).
17. J. D. Watson, *Science* **140**, 17 (1963).
18. F. Jacob and J. Monod, *J. Mol. Biol.* **3**, 318 (1961).
19. This has been known since the work of Zaleski in 1901 [W. Zaleski, *Ber. Deut. Botan. Ges.* **19**, 331 (1901)] and was later investigated and reported in a group of papers by Steward and Preston [F. C. Steward and C. Preston, *Plant Physiol.* **16**, 481 (1941)].
20. U. E. Loening, *Nature* **195**, 467 (1962).
21. For the general background of this subject see W. Beerman, *Cold Spring Harbor Symp. Quant. Biol.* **21**, 217 (1956); M. E. Breuer and C. Paven, *Chromosoma* **7**, 371 (1955).
22. This article is based on work of this laboratory and, therefore, it does not give a comprehensive bibliography of the whole subject. A more general account of the earlier work is given in the proceedings of the 19th Growth Symposium [E. Rudnick, Ed., *Synthesis of Molecular and Cellular Structure* (Ronald Press, New York, 1961)]. Papers by de Ropp, Skoog, Torrey, Bergman, Muir, Hildebrandt, Tulecke, and others have contributed to special aspects of the problems here discussed; references to their work may be found in the papers cited. The work discussed has been supported by grants from the National Cancer Institute and from the National Institutes of General Medical Sciences of the U.S. Public Health Service. Other workers have contributed to this program, even though separate reference to their work is not made here. The participation of R. D. Holsten was supported in part by a Public Health Service fellowship from the National Institutes of General Medical Sciences.

News and Comment

Legislation: In First Session, 88th Congress Shows Itself to be More Critical Patron of Science

Whatever else can be said for the long-drawn-out and spottily productive first session of the 88th Congress, it was not an uneventful one for federal science. The legislators began treating federal science as if it were a genie which they themselves let out of the bottle some years ago and which, they noticed quite recently, had grown greatly and developed a somewhat overbearing manner. There are those in Congress who plainly want to cork it up again, but the majority reaction is to seek ways to make the genie more useful, efficient, and obedient.

Congress has not really been ignoring science and technology. The legislative history of the last two decades is littered with landmarks for science. Creation of the Atomic Energy Commission, the National Science Foundation, and the National Aeronautics and Space Administration and establishment of the machinery of advice and coordination for the Executive, with the new Office of Science and Technology as the point of focus, are cardinal examples. The escalating federal investment in health and medical research, notably through the National Institutes of Health, is another case in point.

But until last year, Congress as a whole seemed offhanded as well as openhanded in its treatment of science. Although science increasingly pervaded government agency operations and the total science budget climbed, there seemed to be little effective concern in Congress about the overall costs or consequences of federal science. In great part, this was due simply to the decentralized way in which Congress deals with the agencies through its Balkanized committee system.

As the annual R&D budget nudged $15 billion, a cloud of uneasiness settled over Congress, and this year a sort of anticyclone mood of economy, generated by the $100-billion federal budget, precipitated a change in the weather in Congress for science.

The attempt to put science in perspective followed three main lines of action: (i) Congress moved to inform itself and the public on the organization and conduct of federal science through exercise of its investigatory powers; (ii) a less strong but significant effort was launched to find ways to improve the advice on scientific matters which Congress gets independently of the executive branch; (iii) Congress played its trump card of fiscal power to apply pressure to science-agency budgets and policies.

While subjecting science to closer scrutiny, the 88th Congress has by no means shown itself to be an indiscriminate wielder of the economy axe. Passed during the first session were three notable education bills—one to aid in construction of academic facilities for colleges and universities, a similar bill to benefit medical schools and other institutions training persons in the health professions, and a bill designed to modernize vocational education and give it ampler federal support (*Science*, 20 December). In addition, Congress enacted two bills which will give the federal government significant new roles in two areas involving science—air pollution and work in behalf of the mentally retarded.

Air Pollution. The Clean Air Act of 1963 strengthens the existing federal program to control and prevent air pollution. A total of $90 million is authorized for the program over the 4 years 1964 through 1967. The money is to be used mainly to support research and training and for grants for establishing or improving local, state, and interstate agencies for air pollution control. Significantly, the act for the first time carries enforcement authority, which is keyed to a series of actions starting with consultations, and ascending through recommendations by the

Secretary of Health, Education, and Welfare, public hearings, and a possible final resort, to legal action by the state or federal government to end or reduce the pollution in question. The new law applies only to "interstate pollution," and establishing origins of and responsibility for pollution is likely to provide fuel for legal argument.

Mental Retardation. The full name of the new law, the Mental Retardation Facilities and Community Mental Health Centers Construction Act, accurately suggests its provisions. A total of $329 million is authorized, including $150 million in matching grants over the next 3 years for constructing community medical centers and $126 million over 5 years for building research and treatment facilities for the mentally retarded. An additional $53 million over 3 years is provided for training teachers of retarded children and those with other handicaps. Cut out of the bill in House-Senate conference was $427 million over 8 years to underwrite staffing of the community centers. Funds for the new program have not yet cleared the appropriations committees.

These "new starts" were certifiable achievements for the Kennedy-Johnson administration, but they seem to have been won in spite of, rather than because of, the temper of Congress, which in general has been inclined to retrench.

NIH. To cite the example of the agency which has grown accustomed to annual giant steps in its appropriations, NIH, Congress this year shattered its own munificent precedent by reducing the NIH request for funds by $12 million, to $918 million. Since the fiscal 1964 figure is still nearly $40 million higher than the previous year's budget, the action can hardly be called a smashing stroke of economy, but until last year, Congress had the generous habit of topping the administration request substantially.

In the same HEW budget, NIH's parent agency, the Public Health Service, was again denied funds to establish an environmental health center in the Washington area and was also rebuffed on a request for permission for the HEW Secretary to appoint up to 150 PHS employees at salaries of up to $30,000 a year as a device to attract highly trained personnel who can command high salaries elsewhere.

The mood of Congress also seemed evident in its treatment of the agency which to Congress most clearly represents scientific research, as distinct from mission-oriented development work—the National Science Foundation.

NSF. A House-Senate appropriations compromise put the NSF budget for fiscal '64 at $353 million. This was some $30 million more than NSF received in '63, but it fell far short of the $589 million requested. The slashing reduction in the request scotched administration hopes of using NSF funds for a drastic expansion of federal support of graduate education for engineers and scientists.

In hearings in both House and Senate, NSF last year suffered unaccustomed knuckle-rapping on such matters as transferring research funds to other government agencies, the conduct of Project Mohole, and its prolificacy in starting new programs. Officials from NSF and from other science-based agencies last year found the atmosphere unmistakably cooler and the questioning stiffer than in the past, and the altered climate on Capitol Hill is likely to persist.

NASA. Officials of the space agency were subjected to the most lengthy and intensive authorization and appropriations hearings in its relatively brief history. Reduction of the NASA budget requests by $600 million to 5.1 billion has been discussed in this space. In the final conference version of the NASA appropriations bill, the conferees who had been tying strings to NASA's money suspended objections to the agency's academic grant program so long as NASA "used good judgment," but ventured resolutely into foreign policy by prohibiting use of NASA funds for a joint lunar expedition between the U.S. and any other country (implicitly the U.S.S.R.).

AEC. The Atomic Energy Commission budget also underwent a more thorough pruning than usual. The final fiscal '64 appropriation was $2.7 billion, which was some $106 million less than the 1964 budget request and $392 million below the previous year's appropriation. The cuts, for the most part, were made on an across-the-board basis and will affect most divisions and activities of the agency. A spokesman for the agency acknowledged that the reductions were the most stringent imposed on the AEC, at least in recent years.

Arms Control and Civil Defense. The effect of the partial test ban treaty on congressional attitudes is still difficult to assess even in relation to two agencies which might be expected to be most sensitive to such developments —arms control and disarmament and civil defense.

The Arms Control and Disarmament Agency budget request for fiscal '64 was for $15 million ($11 million of it for research). The appropriation was $7.5 million, compared with a million dollars less last year.

The case of civil defense is more complicated. Appropriations of $111 million were voted, virtually the same figure as last year. But this does not include any funds for a shelter construction program. The House last summer, in a reversal of form, authorized $190.6 million for shelters. Senate hearings on the proposal are nearing completion, and a decision on shelters will have to await the new session.

Congress's bank-examiner outlook on science this year also affected the Office of Science and Technology, headed by presidential science adviser Jerome B. Wiesner, the agency in the Executive Office of the President charged with helping to coordinate and rationalize federal science. Some $1,025,000 was asked for the OST budget for fiscal '64, compared with about $765,000 last year. Congress roughly split the difference, appropriating $880,000.

In the second session of the present Congress the legislators are likely to grow better informed on the subject of federal science through the investigatory efforts of the ad hoc Elliott committee (*Science*, 13 December) and new standing committees on research and development in the House, such as the Daddario and Price subcommittees, which have been discussed in this space. Congress has a lot to learn about R&D, but for science it seems certain that the 88th will be the Congress of the hard look.—JOHN WALSH

Disarmament: Its Economic Impact To Be Studied by Johnson Panel; Subject Has Been Little Explored

One of the most intractable residues of the cold war is the dependence of the American economy on defense spending, which in recent years has reached the level of approximately $1 billion a week. Although the so-called "military-industrial complex" has been the target of considerable polemic, the actual effects of the relationship between industry and the military have