tory of the space budget. Congress, in effect, decided that the space budget should level off to remain between $5 and $6 billion annually. Having made its point, Congress this time dealt more genially with space agency officials in hearings, and, despite a close vote on a move in the Senate to reduce funds for the manned lunar landing, the final amounts appropriated over the year were very close to those deemed necessary by NASA to achieve a manned landing on the moon by 1970.

It is possible that the most recent Soviet exploit in space, the change in leadership in the Kremlin, and the detonation of China's first nuclear device might have had some direct effect on congressional action on defense and space programs had Congress been in session, but it is unclear what might have been done or might be done.

AEC. The Atomic Energy Commission, with its combination of military and civil functions, this year got about $2.26 billion for operating expenses compared with $2.32 billion last year. While the cut amounts to about $62 million for the total operating budget, increases are included in the fiscal '65 budget for research in the physical and biological sciences and for civilian applications of isotopes. Funds for basic research in the physical sciences go up from $197 million last year to $214 million this year and in biology and medicine from $71.2 million to $78 million.

NIH. Outside the realms of defense and space, medical research continues to claim an ample share of federal science funds. The National Institutes of Health get $965 million for their operating budget in the current fiscal year compared with $918 appropriated (but not all obligated) last year. The increases went generally to finance growth in the research and education programs of the eight national institutes. Funds available for the "general research support grants" to institutions were increased $5 million to a total of $45 million. Congress returned to its old habit of topping the administration request—the budget estimate was $956 million, but the $10 million extra roughly equals the cost of a special cancer research project (*Science*, 9 Oct. 1964, p. 236).

NSF. The National Science Foundation, chartered as the chief federal patron of basic research and science education, had better luck this year both in the tenor of its reception at hearings and with appropriations. While the original budget request was for $487 million for fiscal '64 and the appropriation was $420.4, this still represents a very substantial increase over the $353.2 million on which NSF operated in 1964.

The science foundation enjoys considerable leeway in alloting funds to programs, and it is not yet clear what adjustments will be made to absorb the reductions in the budget estimate. But it appears that about $25 million will be spent on Project Mohole this year with something over half that going to finance procurement of a drilling platform. The plan is to go immediately to a floating platform which is designed for deep drilling, but which will be used in an intermediate program of drilling at shallower depths. The purpose is to acquire the experience and skill needed to go on to the task of drilling through the mantle.

Last year, Congress, in the form of the House Appropriations subcommittee which handles NSF matters, put NSF officials over the jumps. The congressmen were upset over NSF's transfer of research funds to other federal agencies, over their handling of Project Mohole, and with the agency's ingenuity in starting new programs. At the time, the subcommittee wrote a "no new programs" injunction into the appropriations report.

The air cleared rapidly, however, and, with the knowledge of Congress, NSF did make a start on a new program making graduate "traineeships" available. These traineeships are granted through institutions rather than to individuals on the basis of national competition as regular federal fellowships are. The traineeships are popular with institutions not in the first rank as far as prestige and funds are concerned, and therefore popular with legislators from districts where these institutions are.

This year will see the start of a major new program growing out of the idea that the federal government has a responsibility to foster new "centers of excellence" in scientific research. About $25 million in NSF funds this year will go into this effort, now called the science development program. Only those institutions which have overall plans to upgrade science research and teaching and which have specific proposals on how to do it will be in the running. The self-improvement plans must include ways of tapping new sources of outside money to be added to the federal funds. It is assumed that the development funds will be granted to institutions which are neither the most nor least affluent and distinguished in higher education, and there is a good deal of interest in seeing where the money actually goes.

Judging from the tone of hearings and the size of the appropriations, NSF has come through the congressional squall of fiscal '64 with no serious damage.

Congress this year has also been friendly to conservation and resources legislation. The two most notable examples are the Water Resources Research bill (*Science*, 4 Sept. 1964, p. 1022) and the "Wilderness bill," both of which passed this summer. The latter creates a National Wilderness Preservation System with about 9 million acres of federally owned land included at the outset and another 52 million acres authorized for inclusion later.

In general, the second session of the 88th Congress held no new and unpleasant surprises for science. The investigatory inclinations which Congress showed in 1963 when the Elliott, Daddario, and Price committees were formed in the House has so far produced neither recriminations nor reprisals against federal science.

Last year Congress reacted to the rapid and sustained rise in funds for federal science by cutting the rate of increase. This year Congress continued to apply the checkrein. If this new change in pace is maintained, one question which arises is how the scientific community, which has grown accustomed to the gallop, will adjust to the slower gait.—JOHN WALSH

Comsat: U.S. Satellite Company Leads New International Venture; System To Be Ready around 1966

In creating the Communications Satellite Corporation, the U.S. Congress performed in a way worthy of Hans Christian Anderson, for the key to Comsat—as to so many children's tales—is that you can only see it if you "believe." In the 21 months since its official incorporation, Comsat has acquired more and more of the attributes of a conventional business—it has stockholders and partners and contractors and a regular payroll—but it still

lacks the one thing usually indispensable to the support of such an apparatus: a product. Nonetheless, the balance between faith and works in the corporation's program has shifted considerably in the past 10 months. If many of the key decisions are still open, many are closed, and the corporation appears to be well ensconced as the leader of an international effort to establish a worldwide system of communication via satellite within the next few years.

Stock Issue

Since the basic shape of the corporation was determined by Congress, many of Comsat's activities have merely had the effect of filling out a prefabricated mold. After operating on borrowed money for more than a year, the corporation went public in June 1964 with a stock issue so successful it left Wall Street in a daze and confounded the skeptics who said Comsat was too speculative to do well. Ten million shares were placed on the market at $20 apiece. Within a few months the selling price had risen to a high of $46. Earlier this week it was listed at $40¾. As provided by law, half the stock was reserved for existing commercial communications carriers and half was made available to the general public. Despite a gloomy prospectus fully explicating the venture's riskiness, the public share was distributed among an estimated 130,000 individuals—many of whom indicated they were buying for their grandchildren, and not in the expectation of profits for themselves—and the carrier share was oversubscribed.

As anticipated by both the proponents and the critics of commercial satellite development, A.T.&T. became the largest stockholder, owning 29 percent of the total stock and 58 percent of the portion reserved for industry. International Telephone and Telegraph is next, owning 10.5 percent of the total stock and 21 percent of industry's share. General Telephone and Electronics purchased 3.5 percent of the total share and 7 percent of industry's share, and RCA purchased 2.5 percent of the total, or 5 percent of the industry allocation. Other communications carriers purchased a total of 4.5 percent, or 9 percent of the industry portion. The four largest carriers have thus ended up with 90.9 percent of the industry segment and 45.4 percent of the total issue. The roughly $200 million raised through the stock sale is expected to finance most of the cost of preliminary experiments plus the basic satellite system now planned for sometime between 1966 and 1968.

The stock sale did not affect the continuity of Comsat's top management, which is still in the hands of the men appointed by President Kennedy as an interim directorate. Leo Welch, former chairman of Standard Oil of New Jersey, is the chairman and Joseph Charyk, former Undersecretary of the Air Force, and chief scientist of Ford Motors' space subsidiary, is the president. They are two of six members of the Board of Directors chosen from the public, as called for by law; the other four are also drawn from the original incorporators. The communications carriers elected six board members, three representing A.T.&T., two, I.T.T., and one, the Hawaiian Telephone Company, an independent carrier. The three presidential appointees, also provided for in the law, are Frederic Donner, chairman of the board of General Motors, Clark Kerr, president of the University of California, and George Meany, president of the AFL-CIO. The corporation now has a staff of about 100, equally divided between technical and managerial members.

One of the questions that is still open is what kind of satellite system will eventually be chosen. Comsat's directors were sufficiently impressed by the performance of NASA's high-altitude synchronous satellite Syncom II to decide to launch a synchronous satellite of their own in advance of a full system. Hughes Aircraft was given a contract to produce two such satellites, the first of which is to be delivered in April 1965. The chief purpose of launching the advance satellite, which has been named "Early Bird," is to obtain information helpful in the design of a commercial system, but Early Bird is expected to provide 240 two-way telephone circuits between the United States and Western Europe, and will probably get some commercial traffic itself. (Technical developments between now and the time of its completion may raise its capacity to as much as 1,200 circuits.) Enthusiasm for the synchronous satellite was also increased by the performance of NASA's Syncom III, providentially launched in mid-August and made available for telecasts of the October Olympics in Japan. Syncom III did not have too much time to show off, because after elaborate negotiation between Comsat, the State Department, the Japanese government and NBC to provide full satellite coverage of the Olympics in this country, NBC failed to interrupt its regular commercial schedule and very little of the games were actually shown. What was shown, however, was described by the New York *Times* as "breath-taking," and Comsat officials were plainly encouraged by the technical success though angered by the commercial fiasco.

Despite Comsat's official neutrality on the question of systems, if experience with Early Bird indicates that the problems most closely associated with synchronous satellites—time delays and echo suppression effects—can be overcome, it is probable that a synchronous system would be selected. In that event, if present plans were followed, two satellites would be launched above the Atlantic Ocean and one above the Pacific Ocean around the middle of 1966, with the possibility of an additional Pacific satellite, or an Indian Ocean satellite, or both, the following year. The other possible choices are a system of 18 medium altitude satellites in random orbit (being designed by a team from A.T.&T. and RCA) and a system of 12 medium altitude satellites in controlled orbit (being designed by a team from I.T.T. and the Space Technology Laboratories). The medium altitude satellites would begin to be available about the same time—mid-1966—but would probably not operate as a complete system for another year.

Negotiating a Partnership

Whatever system is finally chosen will not be chosen by the American company acting alone but by a new international consortium created during the summer after many months of exceedingly difficult negotiations. Comsat's original hopes—more privately than openly held—that the satellite business could be run as an American show ran into determined opposition in Europe, where the satellite issue has become a political symbol of the insecurities raised by U.S. technological "imperialism." Instead of acquiescing in the American proposal that Comsat negotiate a series of separate bilateral business agreements with each European government (on the model of A. T. & T.), the Europeans formed a union of all their telecommunications authorities and insisted on bargaining as a united front. The next American scheme—that the role of the European

Table 1. Membership in international consortium. [From "Report on Satellite Communications" of the Military Operations Subcommittee, House Committee on Government Operations, October 1964]

Country	Designated operating entity	Percentage
United States	Communications Satellite Corp.	61.00
United Kingdom	Her Britannic Majesty's Postmaster General	8.40
France	Government of the French Republic	6.10
Germany	Deutsche Bundespost	6.10
Canada	Canadian Overseas Telecommunication Corp.	3.75
Australia	Overseas Telecommunications Commission	2.75
Italy	(To be designated)	2.20
Japan	Kokusai Denshin Denwa Co., Ltd.	2.00
Switzerland	Direction Generale des PTT	2.00
Belgium	Regie des Telegraphes et Telephones	1.10
Spain	Government of the State of Spain	1.10
Netherlands	Government of the Kingdom of the Netherlands	1.00
Sweden	Kungl. Telestyrelsen	0.70
Denmark	Generaldirektoratet for Post og Telegrafvesenet	.40
Norway	Telegrafstyret	.40
Portugal	Administracao Geral dos Correios, Telegrafos e Telefones	.40
Ireland	An Roinn Poist Agus Telegrafa	.35
Austria	Bundesministerium fur Verkehr und Elektrizitatswirtschaft, Generaldirektion fur die Post und Telegraphenverwaltung	.20
Vatican City	Government of the Vatican City State	.05
Total		100.00

countries could perhaps be restricted to ownership and operation of ground stations—was similarly rejected. Quintin Hogg, former Tory science minister, told an interviewer for an American magazine that it wasn't going to happen that way. "We won't be brought in on those terms," Hogg said. "We'd rather have one of our own and go bust" (*International Science and Technology*, September). Other countries evidently felt the same way, and it soon became apparent that the American corporation would have to share ownership and control of the space segment of the system if a sound international partnership were to emerge. The Europeans also insisted that the agreement be ratified by the signatures of the governments involved, not signed just by the negotiating business entities, as Comsat had hoped.

If the American negotiators had to concede a good deal on form, however, they came out pretty well on substance, for U.S. domination of the enterprise is frankly assured. The space segment of the satellite network is to be owned by the communications entities of each country in proportion to their contribution to the capital costs of the system (see Table 1). Comsat is the general manager, and has the power to spend consortium funds. Voting rights on the newly established Interim Satellite Communications Committee are distributed according to the same investment formula, with representation limited to those entities having at least a 1.5 percent share of the total, or of two or more entities whose combined ownership totals at least 1.5 percent. The Committee had its first meeting in October.

According to the agreements signed in August, a quorum for any meeting of the Committee is 8.5 votes more than the vote of the largest voter, which means in practice that Comsat, the British, and one other representative could hold meetings. Although the Committee is obliged to attempt to act unanimously, it need not necessarily do so, and, in the absence of unanimity, a majority—a polite way of saying Comsat alone—could take action. This power is qualified to a certain extent, for there is a list of 14 specific areas where Comsat must have the support of representatives whose votes equal 12.5 percent of the total, and these are the very basic areas, such as the choice of system, establishment of rates for satellite users, decisions relating to the access or withdrawal of members of the consortium, and several others. But even in these areas Comsat still has the major voice, for the agreement provides that a lesser number of votes can be determining if the 12.5 percent of votes fails to materialize within a certain period.

Another decision benefiting Comsat is the proviso that if new members join the consortium the investment quota (and hence the votes) of all members are reduced proportionately. Although it was agreed that new members should be limited to 17 percent of the total, European negotiators tried to arrange for the entire 17 percent to come out of Comsat's share. The Americans resisted, however, and the agreement for distributing the new shares proportionately insures that Comsat's share can never fall below 50.63 percent.

The limitation of new members to 17 percent of the total makes it unlikely that the Russians will consider joining the consortium, since their power would be so far below that of the U.S. Comsat officials were anxious to go on record as having invited Soviet participation—which they did—but apparently thought the possibility of Russia's joining too remote to warrant devising any enticements. With the exception of Japan (and the possible exception of a few other non-European governments who are considering joining), the "global satellite system" appears likely to be pretty much a Western show. The Western orientation does little to promote the goal of providing service to "economically less developed countries and areas," an explicit feature of Comsat's congressional mandate. But members of the consortium are responsible for over 90 percent of the world's international communications traffic, and however much they jockeyed for power among themselves, they appeared agreed on the unwisdom of letting such ideological considerations turn what was essentially a business deal into a miniature United Nations. The extent to which the poorer countries will become involved later on depends on how much they are willing to pay—in both cash and pride—for the western assistance that would be needed to build adequate ground stations, or on their skill in persuading other countries to introduce ground stations as a new category of "foreign aid."

Who Gets the Contracts?

How long the present agreement will actually satisfy the widespread European desire for a share of hardware contracts arising from the system is a little uncertain. The European governments, pressed by a transnational industrial lobby called Eurospace, pressed in turn for allocation of all procurement on a national basis. Again the

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corporation resisted, and although the language that was adopted pays fealty to the principle of international allocation, the basic operating principle that the corporation (acting as manager) is directed to follow is, "the best equipment for the best price." It is generally thought, in the words of one State Department official, that "it is very unlikely that for some years there will be any substantial European contribution to the procurement of this system."

The recent agreements are considered interim arrangements. They are scheduled to run until 1970, when a permanent institution will be established taking into account the gripes and difficulties that are certain to arise. Though the basic form of the international consortium is settled, however, Comsat itself still faces some pressing problems on the home front. A future article will report on the corporation's fight to secure exclusive ownership of domestic ground stations and on the demise of its hopes for a joint venture with the Department of Defense.

—ELINOR LANGER

Announcements

The University of Massachusetts has begun an investigation into the etiology of **"maple decline,"** a die-back disease of *Acer saccharum*. Persons who have observed the disease in their locality or who are engaged in research on the problem are invited to participate in this study. Information is available from Arthur H. Westing, associate professor of forestry, University of Massachusetts, Amherst.

The University of California at Riverside has initiated a new program of graduate study leading to the Ph.D. in **biology**. It will combine the fields of botany, zoology, and microbiology. Advanced graduate students will be able to pursue research in cellular physiology, plant and animal physiology, physiological plant and animal ecology, comparative metabolism, genetics, population genetics, cytogenetics, evolution, experimental plant taxonomy, behavioral taxonomy, developmental physiology and physiological ecology, invertebrate zoology and acarology, and parasitology. Special facilities for research in desert biology will be provided at the Philip L. Boyd Desert Research Center, which is also available for use by visiting investigators. Further information is available from W. M. Dugger, department of life sciences, University of California, Riverside.

Meeting Notes

The International Atomic Energy Agency is planning a symposium on **pulsed neutron research**, 10–13 May, in Karlsruhe, Germany. Papers are invited for presentation at the meeting; they may cover any phase of "theoretical and experimental research involving the use of neutrons pulsed-in-time as a means of studying the time space, and/or energy behaviour of neutrons in bulk media." Abstracts are required, of 250 to 350 words. Deadline: *4 January*. (J. H. Kane, International Conferences Branch, United States Atomic Energy Commission, Washington, D.C. 20545)

Grants, Fellowships, and Awards

The Lalor Foundation has announced its 1965 program of grants and awards for research on fundamental biochemical and physiological mechanisms of **reproduction**. Applicants must have a doctorate and be on the faculty or staff of a college or university; the age limit is 41. Grants of up to $8000 will be offered, depending on the duration and scope of the project; the work may be done at the recipient's own institution or elsewhere.

In addition, some postdoctoral fellowships are available for summer work at Woods Hole Marine Biological Laboratory, Massachusetts, and for short-term research at other institutions. Stipends are from $1150 to $1500. Application deadline: *15 January*. (C. L. Burdick, Lalor Foundation, 4400 Lancaster Pike, Wilmington, Delaware 19805)

Scientists in the News

Edward J. Masoro, research professor in the department of physiology and biophysics at the University of Washington, has been appointed professor and chairman of the physiology department at the Woman's Medical College of Pennsylvania, effective 1 December.

New members of the faculty at the University of Michigan are:

Raymond E. Counsell, former senior research chemist with G. D. Searle and Company, has become associate professor of pharmaceutical chemistry;

Theral T. Herrick, former director of the Michigan Council on Economic Education, has been appointed professor of economic education;

Manfred Kochen, formerly with the I.B.M. Corporation, has become associate professor of mathematical biology;

Gail L. Miller, a Nobel laureate, formerly with the Merck Institute of Therapeutic Research, has been appointed associate professor of microbiology.

Stephen H. Spurr, former dean of the school of natural resources, has become dean of the graduate school, succeeding **Ralph A. Sawyer**, who has retired.

Amos H. Hawley, professor of sociology, has taken a year's leave of absence to study the development of a population policy for Thailand under the direction of the Thai prime minister.

The following have joined the faculty as visiting professors for the 1964–65 academic year:

Louis Guttman, professor of social and psychological measurements at the Hebrew University, as professor of psychology;

Richard M. Karp, former research mathematician with the I.B.M. Research Laboratory, Yorktown, N.Y., as associate professor in the electrical engineering department;

Michael S. Laverack, of the University of St. Andrews, Scotland, as visiting associate professor of zoology, effective January 1965.

Joseph R. LaSalle, associate director of the Research Institute for Advanced Studies in Baltimore, has been named to head the recent created dynamical systems research center within the division of applied mathematics at Brown University. Working with LaSalle at Brown will be:

Solomon Lefschetz, formerly director of the RIAS mathematics center, who will become visiting professor of applied mathematics; and

Jack K. Hale, formerly with RIAS, appointed as a professor of applied mathematics.

Erratum: In the report "Pulse radiolysis of potassium bromide solutions" by B. Cercek, M. Ebert, J. P. Keene, and A. J. Swallow [*Science* **145**, 919 (28 August 1964)], the molar extinction coefficient given on page 920, column 1, lines 20–21, should have read "36,000 ± 3,000." Also, the citation of reference (*3*) on page 920, column 2, line 14, should have been omitted.