was Colgate's function. Kompfner is an expert in electronics, and Tuve is a pioneer in ionospheric studies. The only radio astronomer on the panel is Westerhout. Dicke himself is well known for the invention of a radiometer widely used in radio astronomy, most notably in recent studies of the so-called "fireball radiation."

One of Dicke's first steps, while he was out of reach on a Canadian vacation, was to direct the backers of each of the six projects to boil their cases down to five pages; this was no easy task, since many years and substantial sums had gone into the preparation of these proposals.

Then the panel assembled in Washington for an unusual set of hearings, which began 24 July and ran for 4 days. It was clear that the hearings, as well as the agonizing effort of boiling down complex cases into five pages, were intended as a kind of forcing house for American radio astronomy.

The representatives of each project were allotted half a day to explain their projects, after an opening day of explanatory statements by project leaders and by representatives of U.S. government agencies involved in radio astronomy.

The representatives were not heard in isolation. The men from the other projects were around throughout the presentation of their rivals' cases.

There was the opportunity for cross-examination, although the novelty of the procedure and the large issues involved are reported to have inhibited much sharp byplay.

After each day's meeting, the Dicke panel met in executive session. On 28 July, there was a full day of executive session, and then the panel agreed on its recommendations to NSF Director Leland J. Haworth.

More than the imminent autumn budgetary struggle within the Executive Branch lay behind the Dicke panel's speed. Most astronomers on the panel and in the six projects plan to be in Prague at the end of August for the triennial meeting of the International Astronomical Union.

With their colleagues from all over the world, the American radio astronomers could hardly have kept silent about the results of one of the most significant attempts yet made to fix priorities in a major field of science.

—VICTOR K. MCELHENY

Technology and the Environment: A New Concern on Capitol Hill

The list of afflictions man and his environment suffer from modern technology is long. Smog-filled skies, polluted rivers, noisy streets jammed with traffic, and dehumanized conditions of urban life that help promote riots—these are only a few of the most familiar. In Washington, Congress and the Executive Branch have been groping for means to cope with such problems. Laws and programs are enacted to stop pollution, untangle traffic, and rebuild downtowns. But by reacting to crises, instead of anticipating and avoiding them, the government has fallen behind in a difficult game.

A chief cause of this failure of foresight, many would agree, is that government and society generally have not taken an overall view of technology and its impact on the environment. It is this diagnosis that underlies current efforts in the Senate and House to have Congress take a more searching look and strengthen its powers of prophecy and control. The most advanced efforts of this kind are those led by Senator Edmund S. Muskie of Maine and Representative Emilio Q. Daddario of Connecticut.

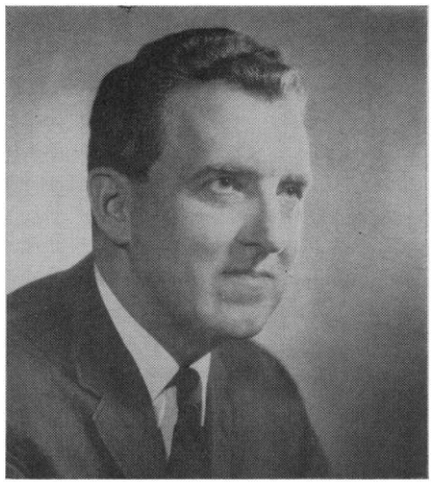
Muskie has aroused the sympathetic interest of some leading scientists both in and out of government by proposing that the Senate establish a temporary Select Committee on Technology and the Human Environment. An "insider" to the Senate establishment, Muskie may be well justified in believing that the Senate will act favorably on his proposal before the fall adjournment. Its chances of receiving bipartisan support seem good, for Senator Howard H. Baker, Jr., Republican of Tennessee and son-in-law of Minority Leader Everett M. Dirksen, is a keenly interested cosponsor.

The case for setting up the committee was developed in hearings held in the early spring by Muskie's Subcommittee on Intergovernmental Relations. The select committee—its 18 members drawn from six regular legislative committees (such as Interior, Public Works, and Agriculture)—would focus on the problem of how technological advance can be made more compatible with human needs and desires. Over a 3-year period it would hold hearings, conduct studies, and report on its findings. The result, Muskie believes, would be to illuminate a wide array of problems and possibilities which the legislative committees have neither the time nor the mandate to explore.

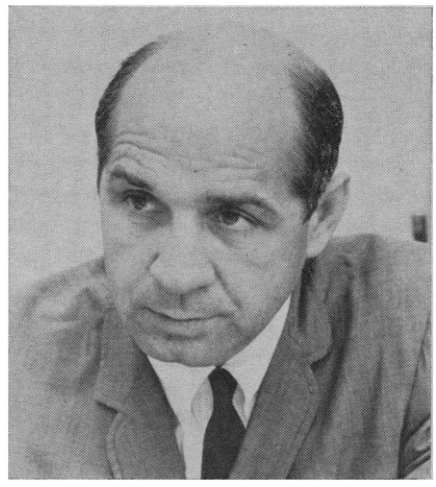
Daddario's plans are, at this point, less well-formed than Muskie's, but they aim in the same general direction. As chairman of the Subcommittee on Science, Research, and Development, Daddario is taking the first step toward establishing a program of "technology assessment." In March, the congressman introduced legislation to set up an independent board to help Congress identify potential technological advances and problems. He has since concluded, however, that the technology-assessment concept should be refined through a long-range study before a mechanism is proposed to carry it out.

Accordingly, in July Daddario said his subcommittee would undertake a three-phase program—hold hearings and seminars; initiate studies to be conducted by the Library of Congress' Science Policy Research Division; and explore the possibility of having the National Academy of Sciences and the National Academy of Engineering arrange for some technology-assessment projects to be carried out on a pilot basis.

The general view of the scientists who testified before the Muskie subcommittee was that the answer to problems resulting from the impact of technology on the environment is more



Edmund S. Muskie



Emilio Q. Daddario

technology. Some spoke of the "technological fix," a concept elucidated by Alvin Weinberg, director of the Atomic Energy Commission's Oak Ridge National Laboratory, in an article last December in the *Bulletin of the Atomic Scientists*. The idea is to devise technological solutions—now becoming increasingly available—to social problems which, sometimes because of selfishness, indifference, and a variety of other human weaknesses, yield slowly or not at all to the usual attempts at political solution.

For example, water shortages develop because people make prodigal use of water, as in the case of Arizonans who sprinkle millions of gallons of it on lawns and golf courses in order to have lush, green spots in the desert. In many areas the technological fix for water shortages will be, in Weinberg's vision, the availability of a cheap, inexhaustible supply of desalinated seawater, produced with low-cost nuclear energy.

Glenn T. Seaborg, chairman of AEC, shared with the Muskie subcommittee his vision of a technological fix for two major contemporary problems—society's prodigious production of solid wastes and its gradual exhaustion of mineral resources. He described a huge, highly automated industrial complex, far from any city and run by only a handful of people, where cheap nuclear energy would be used to convert scrap materials into new products. Harrison Brown, professor of geological sciences at Caltech, described an even grander vision—a nearly self-contained city, nuclear-powered and "feeding on the oceans, air, rock, and the soils which surround it." All wastes, including water, would be recycled.

Whatever the possibilities for remedying existing problems and avoiding

Air Pollution: Where the Problems Are Worst

The U.S. Public Health Service's National Center for Air Pollution Control published a report on 4 August showing the relative severity of pollution in the nation's 65 largest industrial urban areas. The ranking is based on combined measurements of suspended particulates, gasoline consumption and automobile emissions, and the concentration and emission of sulfur dioxides. According to the Center, none of the 65 areas can afford to be complacent. Ranked in order of the severity of their problem, the areas are:

1. New York
2. Chicago
3. Philadelphia
4. Los Angeles-Long Beach
5. Cleveland
6. Pittsburgh
7. Boston
8. Newark
9. Detroit
10. St. Louis
11. Gary-Hammond-East Chicago
12. Akron
13. Baltimore
14. Indianapolis
15. Wilmington, Delaware
16. Louisville
17. Jersey City
18. Washington, D.C.
19. Cincinnati
20. Milwaukee
21. Paterson-Clifton-Passaic
22. Canton
23. Youngstown-Warren
24. Toledo
25. Kansas City
26. Dayton
27. Denver
28. Bridgeport
29. Providence-Pawtucket
30. Buffalo
31. Birmingham
32. Minneapolis-St. Paul
33. Hartford
34. Nashville
35. San Francisco-Oakland
36. Seattle
37. Lawrence-Haverhill
38. New Haven
39. York
40. Springfield-Chicopee-Holyoke
41. Allentown-Bethlehem-Easton
42. Worcester
43. Houston
44. Chattanooga
45. Memphis
46. Columbus, Ohio
47. Richmond
48. San Jose
49. Portland, Oregon
50. Syracuse
51. Atlanta
52. Grand Rapids
53. Rochester
54. Reading
55. Albany-Schenectady-Troy
56. Lancaster
57. Dallas
58. Flint
59. New Orleans
60. Fort Worth
61. San Diego
62. Utica-Rome
63. Miami
64. Wichita
65. High Point-Greensboro

new ones through technology, the "fixes" themselves often will demand important political decisions—frequently requiring painful shifts in the perceptions and values of public and private decision-makers. Major new institutional changes are likely to be necessary, with increasing power being vested in regional, national, and even international authorities. Resistance to these changes by people accustomed to conventional political forms, which often leave important decisions concerning zoning, pollution controls, and the like to the attention (or inattention) of local and state officials, is certain.

The inquiries and evaluations that Muskie and Daddario have proposed would be designed to help Congress and the public perceive the new imperatives of public policy arising from the impact of technology on the environment. In fact, they would be expected to play an educational and evaluative role of a kind duplicated nowhere else in the government. For example, if the new Senate select committee lived up to the hopes of its sponsors, it would stimulate an enlightening public dialog between Senators and experts on technological and environmental problems from industry, government, and the universities.

The National Academy of Sciences, the President's Science Advisory Committee, and certain other groups have engaged in studies of the impact of technology on the environment, but, generally, these studies have been more narrowly confined than those contemplated by Muskie. Moreover, neither NAS nor PSAC, for all their prestige, has as great a potential for attracting public attention as a skillfully directed congressional inquiry; nor is this their role.

However, in the evolution of U.S. economic policy over the past generation, one can find evidence of the limitations as well as the potentialities of special committee inquiries of the kind Muskie and Daddario contemplate. The inquiry by the Temporary National Economic Committee (TNEC) of the late 1930's and early 1940's brought together members of Congress and representatives of the Executive Branch for the most sweeping examination of economic policy ever undertaken up to that time. Thus, in this way, TNEC (headed by the late Senator Joseph C. O'Mahoney of Wyoming) provided a precedent for the establishment in 1946 of the Joint Economic Committee and the Council of Economic Advisors—potentially two extremely important bodies. However, the influence of these bodies has ebbed and flowed. For example, the Council of Economic Advisors at times has been virtually ignored. Not until the 1960's and the Kennedy Administration did the council reach the peak of its influence. The moral, of course, is that to offer good advice is not enough—it's also necessary to have a President and a Congress ready to listen and to act.

If either the Muskie or the Daddario inquiries should be run-of-the-mine Congressional endeavors, its influence, of course, would be minimal. Both Muskie and Daddario have proven to be men of diligence and capacity, however. Muskie has gained national recognition through his record as chairman of the Senate Public Works Subcommittee on Air and Water Pollution. Senate approval of his proposal to set up the select committee would itself be a tribute from his colleagues. Proposals to create new committees in a body already having dozens of them usually are looked upon dubiously, especially by the chairmen of the standing committees, who do not want their authority diluted.

If the inquiries planned by Muskie and Daddario should produce major results, this will be in part a consequence of the fact that the problems being investigated are real and urgent. In his comments before the Muskie subcommittee, Seaborg underscored the urgency. ". . . The year 2000," he said, "is not waiting for the fulfillment of our Utopian dreams. In less than 33 years, it will be here with a vengeance, and whether we welcome it in jubilation or despair will largely depend on how much we can learn and how wisely, boldly, and quickly we can act in the coming years."

—LUTHER J. CARTER

Clocking Science: Army Lab Puts Meters on Research Equipment

Staff members of an Army-operated research center told a Congressional committee on 9 August about a meter system for determining the lengths of time that various items of laboratory research equipment are actually in use. The system, which has been used on a trial basis at the Army's Natick Laboratories, Natick, Massachusetts, was initiated after a laboratory administrator concluded that large amounts of equipment "appeared to be unused and unneeded." The meters had originally been installed for purposes of maintenance and calibration.

Testimony about the Natick program was presented to Rep. Henry S. Reuss's (D–Wis.) subcommittee on Research and Technical Programs during a hearing on "Procurement and Use of Scientific Research in Federal Laboratories."

Natick Laboratories does some scientific research and is responsible for the Army's research and engineering on textiles, body armor, clothing, insecticides and fungicides, and other items. The laboratory is estimated to have about 15,000 separate items of R & D equipment.

Prior to the hearing, the subcommittee asked the General Accounting Office (GAO), which is Congress's fiscal watchdog, to study equipment-management methods in five federal R & D laboratories. Natick was not included but was later scheduled for testimony because of its meter system. Laboratories studied were: the National Bureau of Standards, Goddard Space Flight Center, Brookhaven National Laboratory, Naval Research Laboratory, and Cambridge Research Laboratory.