

Trend in science funding assessed

I would like to endorse enthusiastically your editorial of October 1970 (page 92, "The fall elections need you!") but to take issue with you on some aspects of your more recent editorial of January 1972 (page 120, "Lost: our voice in Washington").

In the October editorial you pointed out that the most practical step a physicist on campus can take is to help make sure that physics gets at least minimum support, and to get involved himself in the fall election campaign. Some of us who thoroughly subscribe to this concept *did* get actively involved in that campaign (yours truly was a campaign coordinator in Hiram Fong's Senatorial race here in Hawaii). On a different but related view, I note with interest that the Cornell Symposium on Electrons and Photons was opened last August by Representative H. W. Robison of the House Appropriations Committee. Actually Victor Weisskopf had long ago endorsed the idea that scientists should act and use their political affiliations to further the cause of basic science. Even as early as last spring, he predicted with cautious optimism that the fiscal year 1973 may be the turning point, albeit slowly, in the battle for science funding—because there are more and more voices in Washington of those who plead for help in basic science.

How successful have our efforts been? The Office of Management and Budget (OMB) in Washington just released detailed statistics containing the breakdown of the President's science-related budget for fiscal 1973. These are contained in Special Analysis R (Federal Research and Development Programs) and a Special Release (NSF 72-106) concerning the National Science Foundation on FY-1973 budget figures and priorities. Random highlights include the statement:

"An important indicator of the extent of Federal support to assure the continued progress of science is the level of contract and grant funds to universities for research and development activities. The 1973 budget will provide a substantial growth in the total Federal support for the conduct of research and development at univer-



sities. Total obligations for this purpose will increase by 12% from \$2020 million in 1972 to \$2257 million in 1973."

Another key indicator is the statement that fundamental research support by the National Science Foundation will increase by more than 10% in 1973—an increase of \$28 700 000. This is to be contrasted with the overall *new* appropriation for NSF, which shows an increase of \$31 000 000 over the FY-1972 appropriation of \$622 000 000. The physical research budget of the AEC has been increased from \$268 million to \$283 million (high-energy physics had an 8% increase from \$116 million to \$125 million). Hence I believe it is fair to say that we have *not* completely "Lost: our voice in Washington" and that at least modest progress has been made towards turning around the decreasing trend in basic science funding of recent times.

I am afraid I must also disagree with your January 1972 editorial statement that men of technological experience (outside of science) are not qualified to function in government circles as spokesmen for the scientific community. Certainly the AEC physical-research budget has not done at all badly under James R. Schlesinger, an extremely able though pragmatic economist, during his very first year in of-

fice as Chairman of the Atomic Energy Commission. We must remember that except for the brief nuclear and sputnik era, the role of the scientist-scholar in high government circles in this country has traditionally been a rather limited one, unlike in Germany for instance. With the present mood of society towards basic science, the scientific community may well do better with men of strong technical experience as our spokesmen to the government—especially if they have at the same time powerful political ties with the OMB and other top political leaders in the administration! It goes without saying that scientists should continue to participate in a vigorous manner both in feeding relevant input to our spokesmen and along the lines discussed earlier in this letter.

I have no comment to make concerning your editorial statement that the OMB impounded \$32 million of the money already appropriated by Congress in 1972 for NSF's education programs. I had the impression that science educators throughout the country conducted a pretty effective campaign in Congress to get this appropriation restored to the FY-1972 budget. Perhaps a matching lobbying effort should have been carried out on the administration end. Note the high-energy physics research program of the AEC was originally supposed to be reduced from \$118 540 000 in FY-1971 to \$114 400 000 in the proposed FY-1972 Presidential budget. However, by the spring of last year the administration itself proposed a supplemental budget of \$2 million to be tacked on. The final figure of \$116 400 000 was the one approved by Congress. In a quiet way, our friends both in and out of Congress must have contributed at least partially to this cause.

Finally, and this is an *important* point, I believe we members of the scientific community should spend a little more time on public relations with the society at large and Congress and the Executive Branch in particular. For instance, a reading of the Congressional Hearing Records in recent years would indicate that the chairman of the

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powerful Senate Appropriations Committee, Allen Ellender of Louisiana, had suggested that science would compete more favorably for public support if it contributed more effectively to international cooperation with the Soviet Union. Likewise, Senator Fong, a friend of science and another member of the Appropriations Committee, is understandably interested in future development of scientific exchange with China. Basic sciences, like astronomy and high-energy physics, are particularly relevant to international exchange, since these fields at least do not have to worry about classified material.

S. F. TUAN
University of Hawaii
Honolulu

THE EDITOR COMMENTS: For a different view of the budget see our news story on page 69.

Minority groups

I am working on a project to publish a directory listing the scientists and the technically trained professionals representative of the Spanish surnamed and the American Indian communities. This project is a personal attempt to assist in the development of opportunities for scientific and technical training for members of these minority groups. Often programs designed to offer such training have been ineffective, or have not been implemented because the professionals needed to relate to such programs were not identified and could not be consulted. The problem has arisen in both government and industrial efforts. Hopefully the directory planned will help remove this obstacle.

I have solicited information from approximately 800 individuals, who were identified by analysis of membership listings of societies or associations of which I am a member. However, to make this effort more complete, I ask that anyone not yet contacted, who feels he should be included in the directory, should write me.

J. V. MARTINEZ
464 Furnace Road
Ontario, New York 14519

Superconductors

The article by Bernd Matthias on "The search for high-temperature superconductors" (August 1971, page 23) unfortunately gives a rather parochial view of the field. The latter part of the article, which attempts to deal with the more challenging questions of higher-temperature superconductivity, is particularly

disappointing. This results from a number of imprecise statements, omissions and trivial errors, some of which we wish to point out here.

First, following a reference to my work on the possibility of superconductivity occurring in organic structures, he states that instead of becoming superconductors, "the compounds" become ferroelectric semiconductors and backs this up by quoting the work of L. I. Buravov *et al.*¹ While the compounds studied by Buravov bear a superficial resemblance to those required by our theory, this is not sufficient. A careful study of the theory would show that there are precise criteria that must be satisfied before one could hope to test the basic concept. The problem of synthesizing the compounds that we believe are needed is comparable in degree of difficulty to the total synthesis of a complex natural product. This study is opening up new areas of organic and metal-organic chemistry, and while progress has been good, it would be naive to expect a solution to so difficult a problem in only a few man-years. In addition, many theoretical questions remain to be answered, and some of these answers depend upon material parameters that are not yet available. In view of these problems, some of which are analogous to the prediction of the classic crystal phases, it is curious that Matthias should so uncritically consider the example above as a proof of the stability of the ferroelectric phase relative to the superconducting phase.

Secondly, through a serious omission Matthias gives a misleading impression of W. L. McMillan's² beautiful work on the theoretical reasons for an upper limit on T_c . After criticizing earlier those who are unwilling to deal with instabilities in superconductivity, Matthias quotes McMillan's figure of 40K for the predicted maximum T_c for V_3Si -like compounds. Unfortunately, however, he failed to note that McMillan very clearly states that this figure is based on the assumption that in this structure the phonon frequency can be decreased indefinitely. In fact, McMillan goes on to say: "Of course, this is not the case. We are likely to drive some phonon mode unstable, so the metal prefers a different crystal lattice. . . . This would set an upper limit on the coupling constant that one could obtain experimentally and provide a stronger upper bound on T_c ." These instabilities are, of course, well known and have been extensively studied by all serious contributors to this field.

Thirdly, Matthias appears to believe that the exciton theory of a possible high-temperature superconductor has been disproved theoretically by the work of J. P. Hurault.³ This conclusion is the result of a rather trivial error in Hurault's paper, which has been pointed out

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