small, fragmented, and has little overall "visibility" to industry. A fuel technology directory would increase this "visibility" and would also be valuable to universities that are in the process of revising their curricula.

I would appreciate receiving the following information from those who teach or plan to teach courses in fuel technology: name of responder; title or position; department; institute, university, and address; fuel technology courses offered at present (course number, title, catalog description, and year); and fuel technology courses planned (title, brief description, and year). The directory will be circulated to all responders. I am also exploring means of distributing this information to relevant industries.

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Optical Brighteners

Deborah Shapley's report on the achievements of Björn Gillberg in Sweden (News and Comment, 12 Oct. 1973, p. 145) deserves some comment. We have recently been collaborating in an attempt to repeat some of Gillberg's published experiments on the mutagenic effects of optical brighteners (*1*). In our experiments we used the same genetic system and the same compounds as those used by Gillberg. We were unable to confirm that the suspected agents acted positively when incorporated in the growing medium of the organism (*2*). None of the several trials carried out produced a positive result. At a meeting in Stockholm at which one of us reviewed the genetic activities of optical brighteners, Gillberg himself admitted that he is now unable to obtain positive results with these compounds. In the second part of our experiments, in which nongrowing yeast cells were exposed to visible light in the presence of the brighteners, we were able to duplicate his findings of an apparent increase in mutation frequency. However, on closer examination, we were able to show that the entire effect could be attributed to selection of preexisting mutants under the treatment conditions. Because the changes studied by Gillberg and by us were probably cytoplasmic changes, that is, nonnuclear, we repeated the experiments measuring nuclear changes by the occurrence of gene conversion. In these experiments no positive results were obtained.

We do not think that our experiments indicate unequivocally that no danger exists from optical brighteners. The data are insufficient at present for this conclusion to be drawn. Several laboratories, our own included, are trying to obtain this information. We also do not wish to imply that public watchdogs, such as Gillberg, do not perform a useful function. However, we must be sure that a full-sized, hungry, four-footed wolf, with teeth, is coming before we start crying out about it. For environmental biologists, this means doing all in our power to be sure that the right experiments are done, positive results are reproducible, and any artifacts of method are excluded. It also means that data should not be taken out of context, but should be considered in the light of information from other sources. In the case of contaminating chemicals, this means that their distribution in the biosphere, their accumulation, their usage, and their persistence must be taken into account. If we startle the public too many times with sensational claims that are later retracted, we run a real risk of losing our most valuable ally if and when a real crisis comes.

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History of Life Sciences

The Division of Research Grants of the National Institutes of Health, citing insufficient workload, did not renew the charter of the History of Life Sciences Study Section for the 1973–74 fiscal year; therefore, the study section was terminated as of June 1973. This decision was made at a time when the peer review system was being critically examined throughout the federal establishment. A protest on the part of the members of the History of Life Sciences Study Section did not avert the decision, although it elicited the indication that, should the number of applications in the field grow to a point at which the panel could again be justified, the Division of Research Grants would consider reconstituting the study section. Scholars of the history of the biomedical sciences need to be informed that the abolition of the History of Life Sciences Study Section does not mean the termination of research funds in this field of scholarship. The National Library of Medicine continues to award research grants in the history of life sciences, and applications continue to be evaluated by the peer review system through ad hoc meetings of a special study section of the Division of Research Grants. Scholars interested in securing information about the eligibility of biomedical history projects or application forms should write to Ileen E. Stewart, Executive Secretary, Division of Research Grants, National Institutes of Health, Bethesda, Maryland 20014, or to Jeanne Brand, Extramural Programs, National Library of Medicine, Bethesda, Maryland 20014.

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FDR's Science Policy

Some words of elaboration are in order about Milton Lomask's account (Letters, 12 Oct. 1973, p. 116) of the origins of President Franklin D. Roosevelt's letter to Vannevar Bush requesting the report which became the famed *Science, the Endless Frontier* (*1*). Lomask's version is based upon the recollections of Oscar M. Ruebhausen, the highly able General Counsel of Bush's wartime Office of Scientific Research and Development (OSRD). A close examination of the contemporary documentary record yields an account which differs significantly in detail from Ruebhausen's and may also be instructive with regard to the considerations which go into the shaping of federal policy for research and development.

Ruebhausen may be right that the idea for a presidential letter came from Oscar S. Cox. In mid-October 1944, perhaps with an eye on the upcoming election, Cox and Harry Hopkins agreed that FDR should request a report from Bush. But it does not ap-

pear that Cox had in mind a report on postwar support for science. He wanted an assessment of how the technical results of defense research, the inventory of new technologies and new knowledge, could be used to create a higher standard of living and full employment in peacetime. Cox drafted a letter asking for a report on that subject and, on the afternoon of 24 October, discussed it with Bush and Ruebhausen (*2*).

The discussion soon turned to the legislation for postwar federal science introduced by Senator Harley M. Kilgore of West Virginia, who had been holding hearings on the issue since 1942. The latest draft of Kilgore's bill proposed to create a National Science Foundation which would support pure research in the universities. But Kilgore's NSF was, among other things, also to provide direct aid for research and development to small businessmen and entrepreneurs; and it was to be run by a virtually lay governing board that explicitly included representatives of small business, consumers, and agriculture. Moreover, Kilgore's overall program provided for the vesting of ownership in the government of all patents deriving from federally sponsored research and development since the declaration of national emergency in 1941 (*3*). While supported by many liberals, Kilgore's bill had provoked the vigorous opposition of the Army and Navy, the major trade associations, big business, and many high-ranking OSRD scientists, including Bush.

At the meeting on 24 October, Bush readily agreed that it would be appropriate to arrange for the expeditious release, consistent with military security, of classified scientific information that would be of potential peacetime use. Bush also registered his emphatic dissent from the postwar program of the Kilgore bill. But Bush did allow that he favored some sort of postwar government support of academic science. Since it seemed unlikely that the Kilgore bill would be acted upon before the new Congress convened in January 1945, Bush and Cox agreed that it would be worthwhile to develop an alternative legislative approach before then. To that end, Cox would attempt to have the President request Bush's views on the broad issue of postwar research and development, a request which would give Bush an opportunity to go on record with his proposals about what the government should do to advance science for the general welfare (*4*).

Promptly after this meeting Ruebhausen drafted a new presidential letter, one which reflected not only the original concerns of Cox but those of Bush and his closest OSRD aides, including James B. Conant, who had a special interest in the problems of scientific education and training. Opening with an extensive preamble that emphasized how well OSRD had done in the war, Reubhausen's draft asked for Bush's recommendations on the four points which appeared in the letter that FDR ultimately sent (*5*). On 27 October, after Bush and Conant had gone over the draft, evidently modifying it slightly, Cox sent the proposed letter to Harry Hopkins. Bush and Conant, he noted in a covering memorandum, wondered whether the release of the document ought not to be delayed until after election day, 7 November, since in their opinion its release beforehand might prejudice the job to be done. The day after the election, Hopkins having let the letter sit on his desk, Cox called his attention to it again in the context of urging that the President consolidate his national support by taking such concrete steps as sending and releasing the letter to Bush (*6*).

Hopkins responded that the letter was too long and contained certain points which required modification. The current draft mentioned the high "national toll from heart disease and cancer. . . ." Hopkins commented: "Remember, everybody has to die of something. . . ." The draft also declared that the government "can and should assist the research laboratories of both universities and industry in financing basic scientific research when such financing is not otherwise available." Hopkins argued that the letter might better suggest this point as a possibility. Hopkins also urged Cox to be careful not to claim achievements for OSRD with which industry might quarrel and to provide for military approval before the release of classified scientific information. All this aside, Hopkins considered the letter excellent and urged Cox to keep it to two pages (*7*).

Cox, who considered Hopkins' suggestions first-rate, quickly redrafted the letter. While some of Ruebhausen's prose was excised at this point, there was no major departure in substance from the original draft. Cox sent the new version back to Hopkins, who endorsed it enthusiastically over to Samuel I. Rosenman, FDR's leading wordsmith and adviser. Conferring with Bush and Conant, Rosenman spruced up the letter, making the language crisper and more in line with FDR's style, and got the President to sign it on 17 November (*8*).

The detailed origins of the letter suggest that at issue were considerations quite separate from any eagerness on Cox's part to adapt the OSRD arrangement for federal support of scientific research and development to peacetime uses. Whatever the disinterested concern of all the principals in that possibility, Cox and Hopkins also saw the letter as a way to win political support for the Roosevelt Administration. Bush, Conant, and perhaps Ruebhausen regarded it at least in part as a way to seize the initiative from Kilgore. By the fall of 1944, a consensus was emerging in Congress and the executive branch in favor of some sort of peacetime federal program of research and development. To gloss over the detailed origins of FDR's letter to Bush is to obscure the point that, in World War II, as in 1974, there were major and legitimate policy differences over just what such a program should be.

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