But one major proposal in this category, the North Alabama Coal Gasification Consortium, promising 14,000 barrels of methanol a day in the late 1980's, awaits a review by the SFC in the spring.

By far the largest chunk of funds committed by the SFC has gone into one company's shale-retorting technology. Of around $5.6 billion committed or promised by letter to investors since 1981, around $4.8 billion has gone to two Colorado shale projects (the Union mine in Parachute Creek and the joint Occidental-Tenneco Cathedral Bluffs project), both using an above-ground retort developed by Union. Underground in situ retorting, once considered the bright hope of the shale industry because it was expected to be more efficient, has not been used in any large-scale projects. But one small project (Seep Ridge, in Utah, sponsored by Geokinetics) has been promised $45 million in SFC aid for a 1000-barrel-a-day pilot project using an in situ process.

Union originally won a price support and a purchase commitment from the Carter Administration to develop a 10,000-barrel-a-day plant in Parachute Creek. The SFC picked up this commitment, which set the price guarantee at around $45 a barrel. The oil was supposed to begin flowing in late 1983, but mechanical problems have developed. In the same week that Union announced the delay, it won a new price guarantee from the SFC to expand production by 40,000 barrels a day. Reflecting harsh experience, however, the new price was set at between $60 and $67 a barrel. With conventional oil selling at $29 a barrel, the agreement illustrates how uncompetitive the cheapest synfuel is.

In addition to these, the SFC has tentatively promised $465 million to a controversial peat-to-methanol project in South Carolina that faces strong environmental opposition; $47 million to a field refining plant for heavy oil in California; and $77 million to another California project using a proprietary steam-drive process to recover heavy oil. Each of these will produce less than 10,000 barrels of product daily.

Thus the SFC saved the hardest decisions for last. In the next few months it will have to decide just how adventurous it will be in promoting far riskier but, by its own definition, more important coal conversion projects.—ELIOT MARSHALL

National Science Board Rethinks Charter

NSB seeks to improve performance as policy board for NSF, also find ways to contribute to national science policy

On paper, the National Science Board (NSB) is accorded a powerful voice in U.S. scientific affairs. The charter of the National Science Foundation (NSF) gives the NSB the statutory responsibility not only of setting policy for NSF, but also of helping to make national science policy.* But just how it should discharge its broader responsibilities has never been clear, and its voice has consequently been muted. However, under its current chairman, Lewis M. Branscomb, the board has cautiously been trying to find a niche for itself in national science policy-making. So far, its efforts have met with mixed results.

Like its antecedants, the current board expends most of its effort in overseeing NSF. In fact, the board has never ventured very far into the science policy arena. In the foundation's early days it was judged imprudent for a fledgling agency to try to dictate to larger agencies with which it was in competition for funds. Later, Congress often egged on the board to take the lead on national science policy questions, but the Office of Management and Budget and the Office of Science and Technology Policy (OSTP) in the White House have by and large been cool to such initiative. An exception was President Carter's OSTP director and science adviser, Frank Press, who urged the board to involve itself in broad science policy matters. However, the current science adviser, George A. Keyworth, II, made clear from the start that he thought NSB should do a better job of minding its own business, which did not include global science policy.

Under these circumstances, it is not surprising that the board has proceeded cautiously and avoided actions that might provoke the Administration. Nonetheless Branscomb, IBM vice president and chief scientist, has led the board through a systematic consideration of its role and mission.

"Where we came out," says Branscomb, "is that the first priority was indeed to set policy for the foundation. Second, the board did have a responsibility to deal with the issues in their full national context." He emphasizes that the board feels that "we should limit ourselves to those national issues in which NSF has a significant stake. For example, I don't think we should try to invent a post-shuttle space strategy or create a breeder-reactor strategy."

Branscomb indicated that he saw the recent report of the board's Commission of Precollege Education in Mathematics, Science and Technology as a prime affirmation of the NSB formula. "I see the value of having taken an issue and dealt with it in its full context as a means of understanding what our piece of it should be in the foundation." He also is confident that the report, whose focus is much broader than NSF's program, will help other government agencies and nongovernment groups "to find an education strategy in general."

Other issues with which NSB is currently concerned that have obvious implications beyond NSF are international science, the problem of adequate access to computing for researchers, and the dissemination of science information.

Certainly, in essaying a broader policy role the board has not courted controversy nor challenged the Administration. For example, a proposal for establishing a Department of International Trade and Industry by a reorganization of the Department of Commerce would have significantly affected NSF; the NSB response was almost inaudibly low key. Under the proposal originating in the Senate and endorsed by President Reagan, the National Bureau of Standards and other technical agencies in Commerce would have been merged with NSF. The matter came up at the board's August meeting in a discussion that revealed a wide range of attitudes. Later, in a letter written in response to a request by House science subcommittee chairman Representative Doug Walgren

*In the latter case the charter says, "The board and the Director shall recommend and encourage the pursuit of national policies for the promotion of basic research and education in the sciences."

(D–Pa.), Branscomb noted that NSB members held diverse views on the subject but were agreed on fundamentals. In the circumspectly worded letter Branscomb expressed confidence that if such a merger occurred, the board "could manage its own responsibilities for policy and the foundation could, if asked by the President and Congress, manage the combined agency effectively."

The board has not taken an official position on the issue of pork barrel science raised this summer when Congress voted funds for several research facilities in end runs around the usual agency approval process. In none of the instances were NSF programs involved, but the potential impact is great on the research community, which is a board concern.

Caution is understandable in view of the fact that the board felt itself in deep disfavor at the start of the Reagan Administration. The Administration made sharp cuts in the NSF budget, abolished the science education directorate, and ordered drastic reductions in funding for social sciences research.

One NSB member at the time says the board was bitterly criticized in the academic community "for being too passive. But we were extremely close to the point where the Administration might have tried to have the board abolished. And they could have done it at the time."

Word got around that Keyworth and some members of his staff were caustically critical of the board. But subsequently, the Administration boosted basic research funds generously, relented somewhat on the social sciences cuts, and revived the science education program and the atmosphere lightened.

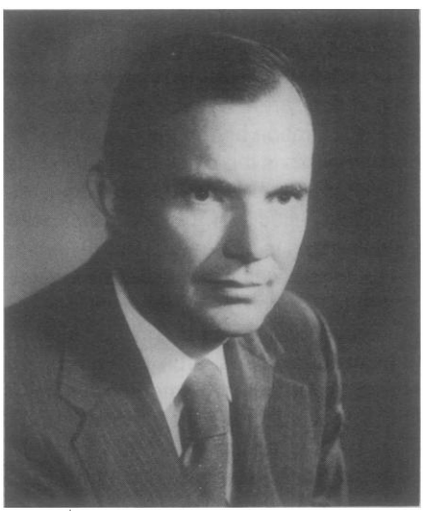
In a comment to *Science*, Keyworth acknowledged that in his early dealings with the NSB, he was frustrated by what he called the board's "lack of responsiveness." As an example he notes that he asked urgently for suggestions on a science education program from the board for the budget then being framed. The board's commission on the subject "delivered 2 years later," said Keyworth.

He also expressed concern about the effect on board membership of "trying to get representation from every conceivable sector of the scientific community." The result is so much diversity, says Keyworth, that it is hard to achieve consensus on an issue in time to matter.

Keyworth concedes that the board "has evolved and done some good things." In particular he cites the NSB policy statement that shaped the NSF current engineering initiative (*Science*, 9 December, p. 1101).

However, Keyworth feels that the board has inspired a "general perception of ineffectiveness for the last 15 years or so." Its influence on national science policy he regards as "negligible." More serious, he thinks is the board's failure to focus adequately on policy matters central to NSF, such as that of research manpower with which Keyworth is particularly concerned. He says his impression is that the board "spends too much time on particular grants and not enough thinking about the mission of NSF."

Depictions of the board as being bogged down in detail are not new. Crit-



Lewis Branscomb

Revising the agenda

ics characterize board members as part-timers who sometimes carry their institutional or disciplinary interests into their board duties and become absorbed in the minutiae of grant administration. Branscomb and others, however, say that the problem affects one NSB committee and exists in large part because of statutory requirements which specify that the board review grant commitments totalling more than $2 million or amounting to $500,000 in a single year. Inflation and the growth of the foundation budget impose a daunting task on the board's programs committee which is saddled with the review obligation.

A move to reform the review process is being led by Roland Schmitt, GE senior vice president for corporate research and development, who joined the board last year. In a 1 September memo to members of the programs committee Schmitt noted that "virtually all our efforts today centers on individual programs, chosen without reference to policy issues. . . . This inevitably leaves us in the position of spotting 'little mistakes' made by NSF management, overlooking broader issues of program balance and always being in a reactive mode when and if the Administration, Congress, or the scientific and engineering community raises such issues."

Schmitt is proposing changes in the law and adoption of new procedures and he appears to have general support on the board for action.

Under Branscomb, the board's committee structure has been simplified with his abolition of several special purpose committees. And board agendas have been recast to enable NSB to carry through and complete action on priority issues rather than diffuse its efforts on many items.

From a science policy perspective, NSF is a survivor from the postwar period when influential scientists believed that they and their peers should not simply be advisers but makers of policy for U.S. science and were able to get that belief translated into law. NSB is unique in that its 24 presidentially appointed members, most of whom are not government officials, share responsibility for running a federal agency. (The oddly phrased reference in the NSF charter says "The Foundation shall consist of a National Science Board and a Director. . . .") Through the 1960's, members of the scientific establishment on the NSB were drawn from the same pool as those who served on the President's Science Advisory Committee (PSAC). The closest NBS came to a clearly defined role in national science policy, however, was during the 1973–1976 interlude when the top science advisory functions were delegated by President Nixon to NSF. NBS in those years seems to have definitively proved itself unsuited to be what one NSF official called a "PSAC without portfolio."

NSB's examination of its role recently seems in part an attempt to come to terms with changed circumstances. In the past, NSB's dual responsibilities of being NSF's board of directors and the somehow more exalted task of helping to make national science policy were seen as separate and quite different. Now, it appears that the two are closely connected. Ultimately, the board's influence depends on the cogency of its advice and the willingness of primary policy-makers to take it. In a summary comment on the subject that gets to the essentials Branscomb said he feels that "the board's effectiveness fundamentally depends on whether it is a tool the [NSF] director feels he can use, and, indeed, that the science adviser feels he can use."

—JOHN WALSH