the carcinogenicity of Red No. 2. But what did that mean? *Any* evidence? *Significant* evidence? *Substantial* evidence? No agreement was reached, so the committee member who framed the question, W. Gary Flamm, of the National Cancer Institute, solved the problem by declining to add any modifier. The committee itself refused to take a yes-or-no vote; each member gave a brief personal answer using whatever definition he felt comfortable with. Observers from the FDA, the industry, and the journalistic pool kept their own informal counts, reaching a consensus that six committee members felt the experiment was so bungled it provided no evidence of carcinogenicity (or much of anything else for that matter), while only four committee members detected some evidence of carcinogenicity, however tainted it might be. The majority seemed to repudiate the significance of Gaylor's analysis that had triggered the banning of Red No. 2, and it undercut the FDA commissioner's assertion that the botched experiment had raised again "certain safety questions."

The committee members clearly felt uncomfortable about squabbling in public. Two even alleged that Gaylor's failure to attend the second day's proceedings was due to "embarrassment" over the way things were handled. But Gaylor told *Science* such allegations were absurd—he had to leave for a previous speaking commitment in Texas. As far as Gaylor is concerned, those who voted in the majority didn't fully realize that the errors in the botched experiment would tend to mask the harmful effects of Red No. 2—thus if there is a hint of carcinogenicity, Gaylor said, it should be considered even stronger evidence than if the experiment weren't botched. Gaylor also speculates that some members were antagonistic toward the analysis partly because "they were ticked off at being bypassed by the commissioner" in the decision to ban the dye, and partly because, like all scientists, they are enthusiasts for good experimental work and don't want to rely on a flawed experiment.

The practical effect of the majority's vote against Gaylor is expected to be negligible. An FDA attorney said that if even four of ten experts see a hint of cancer, it supports the commissioner's case, and an industry attorney agreed that the FDA came out ahead as a result of the various votes at the meeting.

In addition to the cancer issue, some committee members expressed concern that Red No. 2 might be having an adverse effect on the general health and mortality of test animals, and many were disturbed by hints that one of the metabolites of the dye might conceivably be mutagenic. But consensus was reached that the dye has no adverse effect on reproduction.

On the second day, yet another vote was taken. The committee agreed unanimously that, based on all the evidence from all the tests it had reviewed, it could not *approve* the safety of Red No. 2. All very well and good, but could the committee *disapprove* the safety of Red No. 2? asked an industry attorney, hoping to receive a negative answer that might strengthen his case that the FDA had no good reason to ban the dye. He got nowhere. The committee concluded it had talked long enough and taken enough votes. "My time is valuable," Smuckler said.

In the intermittent gripe sessions, various members complained that the chairman had been too rigid in pushing them toward votes, that they did not have time to fully debate the issues and argue among themselves, and that they were forced to respond to the perceived needs of the FDA—particularly its legal counsel—with little opportunity to frame issues in terms they thought desirable. "I don't feel we were allowed yesterday to discuss the issue of Red 2 in full open scientific debate," Tephly said. "I felt we were being pressured to say, Is Red 2 a carcinogen, possibly a carcinogen, not a carcinogen, or whatever," agreed Sheldon D. Murphy, associate professor of toxicology at Harvard School of Public Health. ". . . There seemed to be an implication that we had to define black and white questions and yes or no answers." Chairman Jennings pleaded guilty to "clumsy chairing," but he noted that there are occasions when the FDA simply has to put particular questions to its advisory groups whether they like it or not.

The clash of scientists and bureaucrats did not seem disabling. Despite all its grumbling, the committee managed to perform its tasks in a way that the FDA found useful, and that, after all, is the only point in having such a committee. Some of the complaints seemed to verge on the prima-donnaish, while others reflected a misconception that overtakes many advisory groups—the unconscious assumption that the advisory group should, in fact, be the decision-making group. The airing of gripes seemed to leave both sides in good humor. As a final gesture, after complaining bitterly about "poor communications" and "lack of information," the committee members heaped lavish praise on their FDA staff support for keeping them well informed.—PHILIP M. BOFFEY

NSF: Science Education Is Still in the Spotlight

It might be said of the National Science Foundation that for the last year the tail has been wagging the dog. Criticism of NSF's science education program has led to the most thorough examination of that program since the Foundation was established a quarter century ago. Spending on science education activities amounts to only about 10 percent of the NSF budget, and perhaps 10 percent of that is spent on the curriculum improvement projects which have drawn the criticism. But NSF has been embarrassed by evidence of serious lapses in management in these programs, and the matter has engaged the attention of Congress and heavily occupied the NSF hierarchy over the past year.

As the first returns on the new congressional budget processes are posted, however, it appears that NSF's troubles have not seriously damaged its budget prospects. The House Science and Technology Committee on 9 March approved and sent to the House of Representatives an authorization bill (see box) providing just $1 million below the $802 million requested in President Ford's budget, and including a substantial increase next year for basic research. As for science education, the House committee, in fact, proposed that funds be increased by some $9 million over last year to $74 million, although it recommended some cuts

and shifts in funds in the precollege curriculum programs that are enmeshed in controversy.

The House recommendations on the precollege projects reflected a major NSF review of the program. This Foundation reappraisal resulted in NSF taking an uncharacteristically hard line on work in progress. After the detailed review in December of 19 precollege curriculum projects, NSF told Congress that five of the projects should not be reviewed and several should be significantly modified.

At this point, at least, it appears that the congressional committees with jurisdiction over NSF are inclined to go along with the Foundation's actions on the precollege programs. Not surprisingly, however, the decisions are causing pain and confusion among grantees, particularly among those whose projects were terminated and it seems very possible that the action may be challenged.

The House panel that handles the NSF authorization—the subcommittee on science, research, and technology, which is chaired by Representative James W. Symington—had the results of the NSF review in time to take them into account in the final subcommittee "markup" of the bill on 9 March before forwarding the bill to the full committee for action. The panel generally followed the NSF recommendations, but made some significant alterations.

Cuts in Precollege Program

Most dramatically, the committee bill calls for a reduction in funds for "elementary and secondary school materials development testing and evaluation" from the $4 million requested in President Ford's budget to $1.4 million. In practical terms, this $2.6 million cut is substantially offset by allocation of $2.5 million to a newly created category of "basic research in education." Some programs that formerly were financed under the precollege budget will be funded under the new category.

Perhaps surprisingly, a broad-gauge high school science course titled "Individualized Science Instructional System (ISIS)," which had been a major target of NSF critics in recent months not only came through the NSF review with colors flying, but had $970,000 requested in its behalf by NSF, by far the largest amount requested for surviving curriculum development programs. Even this would involve a "slow down" for ISIS. NSF recommends that the project produce only 60 to 65 "modules" or minicourses rather than the roughly 80 originally planned. The authorization subcommittee apparently concurred on continuing ISIS but did indicate that funds for the year should be limited to a lower figure—about $750,000.

ISIS recently has been singled out for attention by Representative John B. Conlan (R–Ariz.), NSF's most devoted critic, who a year ago called attention to the blemishes on the science education program when he attacked an elementary school behavioral science called Man: A Course of Study (MACOS). Conlan's badgering led to hearings last summer on NSF's peer review system and to a spate of internal and external studies of the science education directorate which produced,

NSF Authorization Over One Hurdle

The NSF authorization bill reported to the House by the Science and Technology Committee on 9 March carries virtually the same total figure as requested by President Ford (*Science*, 6 February)—$801 million in the House bill as compared with $802 million in the Administration request—and also provides a similar substantial increase for funds in basic research. The House bill provides an increase of roughly $85 million over the current fiscal year with most of the additional funds channeled into basic research. The House bill, however, shifts $9 million to science education programs from basic research, providing a total of $601.6 million compared with $610.6 million in the President's budget request.

In general, however, the committee concurred with the Administration argument for substantial increase in basic research—that, in terms of constant dollars, basic research expenditures increased steadily between 1960 and 1968 and then began a downward trend which has continued through the current fiscal year and that this trend needs to be reversed.

The House bill is expected to be scheduled for floor action around 30 or 31 March. The Senate subcommittee with jurisdiction over NSF authorization, headed by Senator Edward M. Kennedy (D–Mass.), is not expected to take up the Senate version of the bill until after floor action in the House. And neither House nor Senate appropriations committees, which deal with NSF, is near action.

Legislative routine in Congress is being heavily influenced this year by the new congressional budget process. The 1974 act that created budget committees for both houses requires Congress to set specific revenue and expenditure figures. The new procedures require that all committees report by 15 March to the budget committees on spending contemplated and revenues to be generated through legislation under their jurisdiction.

The committee markup session on 9 March was conducted in a hurried, harassed atmosphere, generated by the difficulty of assembling and maintaining a quorum of members necessary for a formal vote to send the bill to the full House. The early deadlines created by the new budget process not infrequently create conditions under which congressmen who serve on several subcommittees must shuttle between committees engaged in definitive action on several bills. The effects of a morning snowstorm and the absences of members afflicted by the flu compounded the problems of mustering a quorum so that the NSF bill was gaveled through after minimal discussion and in virtually the form presented by the subcommittee.

Under the House bill, the total $601.6 million for basic research would be divided among three major research areas as follows: mathematical and physical sciences and engineering, $230.4 million (down $2.9 million from the Administration request); astronomical, atmospheric, earth, and ocean sciences, $242.7 million (down $2.3 million); and biological, behavioral, and social sciences, $128.5 million (down $3.8 million). For NSF's RANN (Research Applied to National Needs) program, the House bill contains $63.9 million, a reduction of $1 million from the figure requested by the Administration. The subcommittee report cites the criticisms raised in a National Academy of Sciences study of social and behavioral sciences research conducted as part of RANN (*Science*, 19 March). The report also refers to questions about management procedures in RANN raised by a General Accounting Office report last year and urges the Foundation to "re-examine the RANN program and make such changes as may be necessary."—J.W.

among other things, the embarrassing sidelights on the management of ISIS (*Science*, 27 February).

In the reappraisal of its precollege curriculum conducted by NSF in December, ISIS emerged with generally favorable reviews. ISIS is intended to be a 3-year interdisciplinary science curriculum designed for students not attracted to courses in specific science disciplines that are generally part of the college preparatory curriculum. ISIS was seen as a flexible curriculum which fit the needs of a middle group of students for whom available courses are either forbiddingly demanding or too easy. There were criticisms of ISIS, which is being developed at Florida State University. The reviewers asked that the minicourses be better integrated and that materials being used in pilot modules be developed more fully before they are sent out for testing. One of the 20 or so minicourses to be dropped was one on human sexuality which Conlan had quoted from disapprovingly in detail at last summer's hearings. NSF officials say that the materials were in a rough form then. At any rate, the module has now been banished.

NSF has obviously been counting on the credibility of the special review to carry its case with Congress and potential critics. The review, indeed, is an unusual, probably unprecedented measure for NSF to take. It was organized by Harvey Averch, acting assistant director for science education, who was assigned to the science education directorate in September as a troubleshooter by NSF Director H. Guyford Stever.

Averch brought in 73 outside reviewers—scientists and mathematicians, professional educators, experts on child development, commercial publishers, and representatives of the general public, including parents and students. The reviewers were nominated by a variety of organizations including some with conservative views that might in fact be opposed to federal activities in support of curriculum development.

The group met from 8 to 12 December and divided into panels to consider the 19 projects. These were asked to consider a series of questions ranging from whether they thought there was a market and a need for the materials in question to whether the content was scientifically correct and educationally sound. The costs of materials and of implementing the courses was also to be considered.

NSF officials have issued a draft report on the evaluations, which includes summaries of the panel reports on the individual projects. The officials have made clear, however, that decisions on the precollege programs including decisions on terminations were not based on the panel evaluations alone but on other evaluative material, considerations of availability of funds and educational priorities.

NSF officials note that the review was carried out in accordance with instructions from the National Science Board, NSF's policy-making body. The review was an unusually thorough and public one. Implementation of the Foundation's plans for precollege curriculum development, however, may encounter some resistance.

Nuclear Foes Fault *Scientific American*'s Editorial Judgment

The great nuclear debate continues to trigger explosions wherever friends or foes of nuclear power see ground to be won in the fight to determine the nation's energy future.

A recent arena of conflict is the world of scientific publishing, where leaders of the Union of Concerned Scientists, a Massachusetts-based group that has campaigned vigorously against the hazards of nuclear power, are skirmishing with the editors of *Scientific American*, a magazine that circulates to more than half a million educated laymen and scientists.

The point at issue is whether the magazine has adopted a double standard of editorial judgment by rejecting an article with an antinuclear slant—written by Henry W. Kendall and Daniel F. Ford, the two key leaders of the concerned scientists' group—while accepting an article with a pronuclear bias, written by Nobel laureate Hans Bethe.

The publication of Bethe's article in the magazine's January issue led Kendall and Ford to write a letter to *Scientific American* complaining about unfair play. And that, in turn, provoked Gerard Piel, the magazine's publisher, to send a curt reply accusing Kendall and Ford of making an ad hominem attack on Bethe. The correspondence was made available to *Science* by Kendall, who is dismayed that Bethe's article has become a visible factor in the nuclear debate. "We're having it thrown back at us all the time," he says.

The dispute dates back to 1974, when *Scientific American* rejected an article it had commissioned Kendall and Ford to write on nuclear reactor safety, an issue on which the authors had publicly challenged the old Atomic Energy Commission. Their article discussed various hazards, notably a possible failure of the emergency core cooling system leading to core meltdown and possible emission of large amounts of radioactivity. It concluded that, for a variety of reasons, the public might well question the wisdom of a massive commitment to nuclear fission.

After sitting on the manuscript for several months, the editors eventually rejected it on the grounds that it reflected an "adversary" viewpoint. A letter from editor Dennis Flanagan said the article had been sent to "a few" reviewers, none of whom were in the nuclear power business or the AEC; all agreed that the article was "factually correct" but that its estimates of the probability of nuclear accidents were "at the extreme end of a spectrum of pessimism." Although conventional scientific journals publish extended debates showing conflicting viewpoints, Flanagan said that *Scientific American* is not such a journal; it prefers articles that take "more a judicious position than an adversary one." If *Scientific American* published the Kendall-Ford article, he added, it would have to publish an opposing viewpoint as well, thereby contravening the magazine's usual practice and confusing the reader.

Rejection of an article—even one that is commissioned—is a common occurrence in the world of scientific publishing. Such decisions are usually considered the prerogative of the editorial managers, who seldom have to answer to anyone for their judgment. That is particularly true of *Scientific American*, which is not attached to any professional society.

The rejection disappointed Ford and Kendall, but they later said they could "understand and sympathize" with the magazine's position. Until this past January, that is, when they were surprised to see Bethe's article appear under the title "The necessity of fission power." The article surveyed the various possible sources of energy, concluded that nuclear fission is "the only major nonfossil

NSF says it intends to negotiate with grantees whose projects have been terminated or cut back so that a usable product will emerge. Termination of a project does not signal an immediate guillotining, since the way Foundation funding works, money committed to a project is likely still to be in the pipeline, making it possible to wind up a project in an orderly way.

The five projects earmarked for "nonrenewal" are three mathematics projects, a Human Behavior Curriculum Project (HB) for high school students, for which the "performing institution" is the American Psychological Association (the project is centered at Carleton College in Minnesota), and Unified Science and Mathematics for the Elementary Schools (USMES), for which the performing institution is the Education Development Center, Inc. (EDC).

The process of negotiation was just beginning as this was written, but it is understood that the developers of HB and USMES are taking strong exception to the NSF action. Reportedly the HB group feels that the materials on which the project was rated in the review did not fairly represent the current state of the project, and the USMES group was nonplussed because of the generally favorable remarks by the review panels.

One obvious difficulty is that there are really no precedents for the current situation and, therefore, no ground rules. NSF has been developing an appeals process which under certain circumstances can be used by disappointed grant applicants, but that process is not designed to accommodate actions on work in progress. In the case of the precollege curriculum projects, NSF has been working to correct management problems which have developed over the years, and the present awkward situation is, in one sense, a result of the effort at improving management.

On the question of the future of curriculum development activities at the Foundation, Conlan has made it clear that he favors a drastic curtailment of NSF's role in that area. He had been expected by some observers to propose such a curtailment at the markup session but was absent because of a bout with the flu. Now it is anticipated that Conlan will propose substantial changes in the curriculum sector of the bill when it is debated on the House floor.

It will be remembered that it was in last year's debate of the NSF authorization bill that Conlan's attack on MACOS paved the way for the amendment by Representative Robert Bauman (R–Md.) which would have given Congress broad review powers over individual NSF research grants (*Science*, 25 April 1975). The amendment did not survive a House-Senate conference, but it did contribute to putting NSF's feet to the fire.

Action on the authorization bill appears to indicate that the House committee feels NSF has made progress in remedying some glaring defects and should have more time to continue putting the curriculum development program in order. Floor action will show whether or not the full House feels the same way.

—JOHN WALSH

in Publishing a Recent Article by Nobel Laureate Hans Bethe

power source" that can be relied on for decades, reviewed a host of criticisms of nuclear power, and gave Bethe's reasons for rejecting all but one of those criticisms (the danger of proliferation of nuclear weapons, which he thinks can be overcome by appropriate safeguards).

Angered at what they considered unfair editorial treatment, Kendall and Ford fired off a letter to Piel complaining that Bethe's article is "plainly 'adversary' and, indeed, is written by the leader of the effort within the scientific community advocating reliance on nuclear energy."

That appears to be a reasonable description of where Bethe stands on the issue. He told *Science* he considers himself on the "pro" side of the nuclear debate. As an example, he noted that early last year he drafted a petition, signed by more than 30 eminent scientists, which argued that, with oil and gas supplies running out, both coal and nuclear power would be needed; the objections to nuclear power were outweighed by the need for it. Bethe told *Science* he drafted the petition because "I saw hundreds of people on the antinuclear side screaming at the top of their voices and not a single independent person coming out *for* nuclear. The pronuclear side was made up entirely of people from government and industry. It seemed to me necessary that some independent people come out on the pronuclear side." As to whether it was appropriate for a proponent to write the article for *Scientific American*, Bethe referred that question to the magazine.

Piel told *Science* Bethe was asked some 18 months ago to write the article because of his "great judgment and honesty." Piel does not consider Bethe's work a piece of advocacy. He said there was "a hell of a big difference" between the rejected manuscript by Kendall and Ford and the published piece by Bethe. Kendall's article was "a tendentious discussion of the hazards" which "argued to one conclusion," Piel said, whereas Bethe's was an article that "reviews all the facts" and arrives at "a reasoned conclusion" supported by evidence.

Examination of the two pieces indicates that there was, indeed, a significant difference in the way they were written. Bethe's article generally states the position of the antinuclear side, then tells why he disagrees with that position. The Kendall-Ford manuscript for the most part just presents their argument without stating the other side.

But from the viewpoint of scientists who are opposed to or skeptical about nuclear energy, the Bethe article appears slanted. "In my judgment, it's a strongly biased paper written obviously by a dedicated supporter of nuclear energy," says George B. Kistiakowsky, professor emeritus of chemistry at Harvard and former science adviser to President Eisenhower.

Similarly, John P. Holdren, associate professor of energy and natural resources at the University of California at Berkeley, a member of the National Academy of Sciences committee that is studying nuclear power, asserts: "The Bethe article was a piece of advocacy. It sweeps all the tough questions under the rug. I was outraged by its publication."

In their letter of complaint, Kendall and Ford had asked whether *Scientific American*, in view of its previously enunciated policy on adversary articles, would now feel obliged to publish "the other side of the nuclear power debate." That notion was quickly scotched by Piel, who retorted by letter: "We do not consider that we have published here the work of an 'advocate.' It follows that we do not find ourselves under any obligation to publish 'the other side.' "—P.M.B.