research. If pressures mount to cut costs by skipping directly to energies beyond 200 Bev, Brookhaven, with the plans, site, and staff, would find itself in a very strong position.

As for the Denver site, the Academy included it as a kind of dark horse, well endowed with suitable real estate, good transportation, and pleasant climate. But to the chagrin of the Colorado people, who are trying hard to build up their universities, the committee stated that Denver "has neither the university strength nor the existing design group that is considered desirable." Why was it included? The answer is not readily apparent, but if a deadlock should develop among the existing powers in high-energy physics, or if importance should be attached to the presidential directive for building new centers of academic strength, there sits Denver as a reasonable compromise.

The sixth site was the Sierra foothills, 20 miles east of Sacramento, a choice which pays court to some of the most painful sensitivities of high-energy physics. The much-contended-for 200-Bev machine is a creation of the Lawrence Radiation Laboratory, at Berkeley, which, until science fell into the pork barrel, had every reason to believe that the machine it was designing would ultimately be built in its own neighborhood. Such had been the prevailing pattern of design and construction with all other machines, and all along there were indications, though never promises, that LRL would get the machine on which its design staff, now totaling some 60 full-time persons, has been laboring for several years. In 1963, for example, a joint panel of the President's Science Advisory Committee and the General Advisory Committee of the AEC recommended a two-step approach to higher energies. This called for "construction *by*"—though it did not say *at*—the LRL of a 200-Bev machine and later design studies at Brookhaven for a 600- to 1000-Bev machine.

LRL's first choice was a site at Camp Parks, about 35 miles from Berkeley, but the Academy committee expressed some doubt about the geologic stability of the site, and gave its preference to LRL's fallback position, the Sacramento site, some 100 miles from Berkeley. In any case, the decision keeps LRL in the running, and eases some of the mortuary-like gloom which has been noted about the premises.

AEC commissioner Tape told the Joint Committee on Atomic Energy last month that he thinks the AEC will have a final site decision 3 to 6 months after the Academy recommendations are in. Money is in the budget to continue the design studies, but the AEC will have to go before the committee to seek authorization for money to move on to construction. Since Congress is pretty well through the budgetary process and recess dates are being discussed, this means that next January would probably be the earliest date for congressional consideration of the subject.

When the site issue is finally settled, there is the question of the administrative arrangements for running the machine. The only candidate at the moment is University Research Associates, Inc., a 34-university consortium whose organization was initiated by Academy president Frederick Seitz as a sort of ecumenical movement in high-energy physics. It stands ready to run the machine, and is likely to get the job, in the absence of any other candidates.

—D. S. GREENBERG

Pollution: NAS Report Examines Dual Aspect of the Problem

A well-placed governmental trend watcher recently observed that three of the most fashionable problems in Washington these days are the three P's—poverty, population, and pollution.

Pollution, like the poor, has always been with us. But population growth, urbanization, and a more-than-proportional rise in waste-making has produced an increase in pollution now recognized in Washington as a threat to health, an offense to the senses and sensibilities, and a cause for more decisive federal action.

A recent sign of this concern was the appearance of a report titled *Waste Management and Control* from the committee on pollution of the National Academy of Sciences–National Research Council .Genealogically, the report traces back to the early days of the Kennedy Administration, a period characterized by the expenditure of prodigious amounts of nervous energy and the start of more things than could be finished.

In March of 1961 President Kennedy asked the Academy to undertake "an evaluation of the present research on behalf of conservation and development of America's natural resources." By the beginning of 1963, six supporting surveys—on water, minerals, energy, marine resources, environment, and social and economic resources—plus a summary report had been published by the NAS–NRC committee on natural resources. Out of the experience of the committee grew the strong recommendation for a separate study of the problems of pollution, and early in 1964 an Academy committee on pollution undertook the job, with the support of the Department of the Interior and the Public Health Service.

Chairman of the committee is Athelstan Spilhaus, dean of the Institute of Technology at the University of Minnesota and a member of the Academy. He has a reputation as an idea man, and also as a man with an eye for unconventional projects and the energy to undertake them. Spilhaus, for example, was a central figure in the effort which converted the widely admired federal science pavilion at the Seattle fair into a regional science resource. And he is an advocate of "sea grant" institutions on the model of the land grant colleges and universities.

The new pollution report quite clearly bears the signs of having been produced under a strong chairman. Not only did Spilhaus write the foreword and long introduction which precede the appendixes, which make up the bulk of the report, but he is obviously responsible in large part for the approach to the pollution problem which makes the committee's report an unusual one among NAS reports. In addition to scientists and engineers, lawyers and social scientists were involved in study groups to a much greater extent than is usual in such Academy

projects. And the report gives detailed consideration not only to the technology of antipollution efforts but to what might be called antipollution politics.

In an introductory section on legal, legislative, and institutional problems, the attitude which governed the committee was set forth as follows.

"Although the many scientific and technological problems of pollution are complex and challenging, their solution may well be less difficult and time consuming than those associated with public policy and institutional patterns. Pollution occurs largely because certain activities alter the environment to the detriment of other activities. When the deleterious effect of pollution is borne by someone else, the pollutor has no economic motive for eliminating the cause, and may not be greatly influenced by other motives. There must, therefore, be public action to protect those affected by the harmful consequences of pollution. This action typically involves both legislation and institutional responsibility."

This emphasis on the politico-legal aspects of the problem does not mean that technological questions have been slighted. Five of the eight appendixes, in fact, deal with these: pollution processes in ecosystems; criteria, instrumentation, and monitoring; the transport system; the residue situation—current and future; and pollution abatement technology. And with this double emphasis, the academy report is probably the best introductory antipollution handbook now available.

The NAS report follows by a few months publication of *Restoring the Quality of Our Environment*, a report of the environmental pollution panel of the President's Science Advisory Committee (*Science*, 19 November 1965). The PSAC report covers much of the same ground as the NAS report. But while the title of the PSAC report suggests a battle for a lost cause, the Academy report's title, *Waste Management and Control*, implies an effort to make the best of things. In fairness it should be noted that the PSAC committee rec-

Speaker Ban: Suit Asserts a "Right To Listen"

The American Association of University Professors (AAUP) is hoping that a pending court test of North Carolina's amended "speaker-ban" law will establish, once and for all, the principle that members of an academic community have a "right to listen."

On 31 March the president of the student government and other student leaders at the University of North Carolina at Chapel Hill brought suit in the U.S. District Court at Greensboro against the university's board of trustees; its president, William Friday; and the acting chancellor of the Chapel Hill campus, J. Carlyle Sitterson.

Joining as plaintiffs in the suit are two ultra-leftists whom Chancellor Sitterson refused to permit to speak on campus, though recognized student groups wished to invite them—and did invite them for off-campus appearances in March (*Science*, 1 April 1966). They are Herbert Aptheker, an avowed Communist and director of the American Institute of Marxist Studies, and Frank Wilkinson, who has been chairman of the National Committee to Abolish the House Un-American Activities Committee and who once pleaded the 5th Amendment when asked by a California legislative committee whether he was a Communist (Wilkinson has been identified as a Communist in sworn testimony by two undercover agents of the FBI). Chancellor Sitterson has twice denied the two speakers the right to appear, the last time by his decision of 31 March, which led immediately to the suit. On the other hand, Sitterson has agreed to permit two scholars from Iron Curtain countries to speak on campus, and at U.N.C.'s Raleigh campus, Chancellor John T. Caldwell has approved a speaking invitation to Gus Hall, chairman of the Communist Party of the United States.

As enacted by the North Carolina General Assembly in 1963, the speaker-ban law prohibited the appearance on state-owned campuses of "known communists" and persons who have pleaded the 5th Amendment in loyalty investigations. As amended last fall, the law delegated to the boards of trustees of state institutions the authority to decide whether speakers in the above categories should be allowed to speak. However, the law was amended only after the boards of trustees—as part of a compromise intended to settle the speaker-ban controversy—had adopted a speaker policy proposed by a special study commission which Governor Dan Moore had named. The policy said, in part, that the appearance of speakers of the kind the speaker-ban law had proscribed should be "infrequent" and would be acceptable only when it would serve "educational purposes."

The suit, on which an early decision seems unlikely, contends that the amended speaker-ban law and the trustees' policy meant to implement the law would deprive U.N.C. students and the two speakers, Aptheker and Wilkinson, of constitutional rights. In addition to alleging denial of Aptheker's and Wilkinson's right to freedom of speech and "equal protection," and of Wilkinson's right to invoke the 5th Amendment without being penalized for doing so, the suit asserts that the U.N.C. students have been denied their right to listen to speakers of their choice.

It will be argued that in *Lamont* v. *Postmaster General*, decided in 1965, the Supreme Court already has pointed the way to a further ruling that the 1st Amendment protects the right to listen as well as to speak. Lamont protested that the Post Office Department had no right to refuse to deliver third class mail from Communist nations, containing their propaganda, unless he wrote a postcard requesting delivery. The Supreme Court found in Lamont's favor. Justice William Brennan observed that "it would be a very barren marketplace [of ideas] with all sellers and no buyers."

The North Carolina Conference of the AAUP is raising money to support the suit. The AAUP's national organization is now considering whether to file a supporting "friend of the court" brief and to assist in other ways. "We hope for a decision establishing clearly the right of members of an academic community to listen to speakers they choose to invite," an AAUP spokesman said earlier this week.—LUTHER J. CARTER

ognizes that reuse of resources rather than restoration is the key to effective antipollution action, but the Academy report reflects a more clearly defined engineering approach, and the two reports may be fairly described as complementary.

In a comment to *Science*, Spilhaus said that pollution can be defined as "an excess of anything" and noted that pollution problems today are the inevitable effect of an "overconcentration of people."

With regard to the management of man-made waste, the Academy report makes the point that the term *consumer* is a misleading one since, in fact, the more the consumer uses the more waste he creates.

The report notes that current production of solid wastes in this country amounts to an average of 8 pounds a day per person; that in many areas of high population density, pollution of the air, which is the "sink" for one sort of waste, is at the extremes of tolerable levels; and that, at projected rates, our effluents by 1980 will be sufficient to consume all the oxygen of all the dry-weather flow of the 22 major river basins in the United States.

Mass production techniques and the mass market have resulted in less reuse and bigger and bigger junk heaps. Automobiles—to take the beautifiers' bête noire—cannot be economically salvaged because of the problems of separating a junked car's ingredients. With the humble beer bottle, the pattern is even more typical. The old deposit bottle was succeeded by the "tin" can made of steel, which rusted away quite satisfactorily when discarded. Then this gave way to the aluminum can, which has much greater staying power, and the so-called throwaway glass bottle, which will be around in vast numbers to bore the archeologists of distant tomorrows.

The point, says Spilhaus, is that a reversal of thinking is necessary. The assumptions that prevailed when labor was expensive and containers were made to be both durable and reusable must be revised now that we make containers durable but throw them away after a single use.

This reversal obviously will require some radical rethinking by industry. Very little research has been done on making wastes reusable or more easily "degradable." Such research must be done, and ways should be found to give private industry a profit incentive to do it.

The control of pollution just as obviously will require "public action" of the kind alluded to in the report's foreword. Two panels convened by the committee on pollution, one on legal and public administration aspects and another on public policy and institutional arrangements, explored the obstacles and the avenues to such action.

In analyzing the problems of pollution control the legal-administrative panel summed up two main sets of difficulties under the heading "legalism and localism." Pollution control in the United States has evolved largely through the handling by the courts of cases involving property rights. A compromise between private and public interest has been sought in much the same way that control of land use has developed—through planning, zoning, and the setting of standards. Regulation of pollution is typically a local matter.

The committee's public policy and institutional arrangements panel examined the making of decisions which bear on the quality of the environment, focusing on (i) the effective participants in the decision and (ii) the decision-making process.

Three main participating and sometimes contending groups are private industry, public agencies, and the increasingly important semipublic organizations, which may represent large segments of people and the general welfare or may seek to further special interests. The lag in antipollution can be ascribed to the cumbersomeness of policy-making machinery and to lack of vigor and competence in many regulatory and enforcement agencies as well as to resistance from groups opposing change. But the difficulty of acquiring information necessary to construct an adequate management and control system is a further factor.

The committee found this out when it attempted to give "meaning and realism" to the study by making a comprehensive study of the Delaware River Basin as "a source of data and, if possible, as a model by which the interacting elements of the system could be better identified and studied." The study group discovered that "the political and institutional barriers to the compilation of sensible regional data and to the coordinated management of regional programs are formidable. Although existing data for pollution are impressive in quantity, they frequently were found to be unprocessed, or not to bear on the problem in a useful way."

The case history did not meet the committee's hopes, but the experience did not shake the group's conviction that "a broadly based systematic regional approach [to pollution] is needed and could be rewarding."

Implementation of the regional principle and encouragement of innovating experiments in waste management are urged in the report's main recommendations. The lead recommendation, in fact, is the bold one that "a full scale experimental residue-control system be planned, designed and constructed in a new city—this system to embody the newest and best principles of re-cycling, re-using, and recovering residues, and to be used as [a] demonstration model."

One problem is that municipal authorities are reluctant to spend public money on waste treatment and disposal systems of anything but conventional, time-tested design and that, therefore, no great leaps forward can be expected.

The committee's other main recommendations elaborate the not unfamiliar conclusion that "the initial impetus to resolve the difficulties inherent in the economics, politics and law of the situation can be generated most effectively at the federal level." As is probably inevitable, the federal government is cast in a "catalytic" role as a patron of needed research, supporter of demonstration projects, gatherer of data, setter of standards, and source of incentives as well as giver of laws.

Waste Management and Control is not the last word on the subject. The sections on legal and administrative problems are descriptive and generalized and offer no easy formula for resolving the conflicts they identify. And the expectations placed on federal leadership seem somewhat overoptimistic in view of the performance of federal agencies in the pollution field so far, a performance which can charitably be described as lackadaisical. But, in clearly stating the dual nature of the problem, the report puts pollution problems in much truer perspective.

In doing this the committee definitely departed from Academy conventions concerning limits to the advice it gives. Adhering to the doctrine of hot pursuit, the committee followed pollution problems into politico-legal fields and made hard recommendations on subjects which other Academy committees have usually avoided. Some Academicians feel strongly that science advice is polluted by any sort of comment on political matters. It would be interesting to know how the precedent-cracking report is being received.—JOHN WALSH