playing groups of 10 or 20 spikes on the digital-display scope as shown in Fig. 9. If a quick visual observation of such successive portions of the record is adequate for classifying certain of the spikes into separate groups, the observer does so immediately with the light pen shown in Fig. 9. If he wishes comparison with a "template" wave shape, this can be done. If, after classifying a group, he wishes to redisplay all of a given class for reconsideration, this also can be done. The classification procedure adds a code number to the original digitized record; the central processing system can then use the record to process the separated data. It also provides a basis for training the computer to take over and classify a record after a preliminary period of classification by the human observer.

A computer, for example, can do a better job of identifying "smeared" records caused by closely spaced spikes than can a human being, if the computer is given the characteristics of all spikes that might be in the smeared record. Such a separation procedure has been used quite effectively in the studies of the insect ventral cord described in Fig. 4.

Conclusion

The experimental system described above has been in full-scale operation now for about one year. It has been possible in this short period only to begin the exploration of the potentialities of the system for aiding nervous system research. The most intensively developed programs have been those on the insect (*3*) and on human vision and eye movements (*5*). In both of these programs the facility has permitted new research techniques which have provided answers to important questions, answers which would have been unobtainable without such a data-processing and control system.

References and Notes

1. This multiplexer has magnetic-core memory to hold messages arriving from the many input channels long enough for the IBM 7040 computer to collect them.
2. G. D. McCann, K. J. Hebert, C. B. Ray, *Interstate Commerce Comm. Bull.* **3**, 71 (1964).
3. G. D. McCann and G. F. MacGinitie, *Proc. Roy. Soc. London Ser. B*, in press.
4. E. T. Burtt and W. T. Catton, *Proc. Roy. Soc. London Ser. B* **157**, 53 (1962); G. Fermi and W. Reichardt, *Kybernetik* **2**, 15 (1963); K. G. Goetz, *ibid.*, **2**, 77 (1964).
5. D. H. Fender, in *Neural Theory and Modeling*, R. F. Reiss, Ed. (Stanford Univ. Press, Stanford, Calif., 1964); D. Lehmann, G. D. Beeler, Jr., D. H. Fender, "EEG alpha activity during spontaneous fading of stabilized retinal images," presented at 18th annual meeting, American Electroencephalographic Society (1964).

News and Comment

The New Accelerator: Wide Open Race Under Way across the Nation To Provide Site for Vast Machine

The usually contentious Indiana General Assembly met last week in special session and quickly and unanimously voted to provide a $10-million lure for what the governor referred to as the "scientific prize of the century"—the $280-million, 200-bev accelerator for which the AEC is now seeking a site (*Science*, 19 March).

Meanwhile, at AEC headquarters in Germantown, Maryland, almost every mail during the past week or so brought detailed proposals propounding reasons why the "prize" should go to this or that region of the country. On Capitol Hill, Glenn T. Seaborg, chairman of the AEC, was closely questioned about the criteria that his agency would employ in selecting a site for the accelerator. And, this weekend, some 30 university presidents will meet at the National Academy of Sciences to complete arrangements for setting up a national corporation that will offer itself to the AEC as administrator of the accelerator. At the same time, an entirely separate committee appointed by the Academy was organizing itself to evaluate the site proposals after an initial screening by the AEC.

Quite clearly, never has a proposed scientific facility so stirred up the academic, scientific, and political worlds. And, in fact, the involvement and interest are of a magnitude which strongly suggests that regional interest, always there but often not very significant, is henceforth going to figure mightily in federal support of science. (Congressional hearings last week on the regional issue are discussed in another article in this section.)

As the costliest single scientific installation ever built, the $280-million accelerator—with operating costs estimated at about $50 million a year—could, of course, be expected to stir an unprecedented amount of agitation. But once the site decision, scheduled for the end of this year, is made, there will be some 40 or 50 also-rans who can be expected to sharpen and intensify their tactics when the next prize is announced.

The action of the Indiana General Assembly is a good example of the escalation of agitation. Last year, after the White House turned down plans to build a high-intensity 12-bev accelerator proposed by a combine of midwestern universities, Indiana engaged in a postmortem examination of the decision. One product of this was a memorandum that Governor Roger D. Branigin sent to the General Assembly at the beginning of this month, under the title, "Why Indiana Must Go All-Out in Its Bid for the U.S. Nuclear Research Center."

Referring to a report by Elvis J. Stahr, president of Indiana University, the memorandum states that the 12-bev accelerator "was abandoned because, among other things, the Midwest never quite united behind it. In the case of the current 200 bev machine, he [Stahr] said, the major midwestern universities have agreed to support whatever midwestern site appears to be most in the running after the initial screenings. 'It is also important,' [Stahr] said, 'that we agree to support whatever is finally adjudged to be the best site. If a 200 bev machine—and later a 1000 bev ma-

chine—is to be built at all, it must be built somewhere, not everywhere. . . .' "

The memorandum pointed out that "to demonstrate its determination to win this 200-bev accelerator facility, Indiana must have more than an ideally feasible site. The Governor's advisers believe that the state must be ready to hand over the needed 3000 acres without cost to the AEC.

"This is because some of the other 20 major contenders for the research establishment are ready to offer such prime land cost-free." (The land which Indiana would make available for the accelerator is on the northwest edge of Indianapolis, about 50 miles from Indiana University and Purdue University and within 140 miles of Notre Dame and the Champagne campus of the University of Illinois. Meanwhile, another competing region disclosed this week that it will be able to offer the AEC a 3000-acre site for the accelerator. This was announced by members of the Ohio congressional delegation after the Defense Department agreed to make available a section of the 21,700-acre Ravena Arsenal, in southern Ohio, near Portsmouth.)

Seaborg Testimony

Another manifestation of the acute political interest in the $280-million installation appeared last week when AEC chairman Seaborg testified before the Senate Subcommittee on Employment and Manpower, chaired by Gaylord Nelson (D–Wis.). Nelson, who was probing into the effects of the geographical distribution of federal funds for research and development, repeatedly tried to pin Seaborg down on the issue of how much weight would be assigned in the site selection to the effects the accelerator might have on regional manpower and economic development. As a senator from a region that considers itself to be among the R&D have-nots, the question was uppermost in Nelson's mind. But Seaborg made it fairly clear that he didn't think $280-million accelerators were primarily instruments of economic development.

"I think our primary concern here," he said, "is to insure the success of both the building of the accelerator and the operation of the accelerator to obtain maximum research results. But if we find two situations where there is a direct balance or a close decision . . . concerning this primary aim . . . I think we would probably take into account its [the accelerator's] effect on the region where it is going to be built. . . ."

That was as close as Seaborg came to speaking openly on a particular aspect of the regional problem that is concerning many scientists and technically informed persons who are associated with the accelerator issue: There is a good deal of real estate in the United States that can accommodate the great machine, but there are very few people who know how to design, build, and run 200-bev accelerators, and most of them, at present, seem to be happily settled at one or another of the existing high-energy centers, particularly at California's Lawrence Radiation Laboratory (LRL), where the machine is being designed. Will they be amenable to a move to the rim of Indianapolis, or to the Boulder-Denver region, or to southern Ohio, or to any one of the numerous other places that, starting from scratch, in high-energy physics at least, hope to see themselves become the Brookhaven or LRL of the 1970's? Long and bruising experience with the construction of complicated research machines has led Washington's top science circles to the belief that the only way to succeed is to find men who can do the job and who are willing to commit long pieces of their careers, and their professional reputations, to attaining the objective. The opportunity to be associated with the world's most powerful accelerator will, of course, be a lure for talent, regardless of where the accelerator is to be constructed. But the relative handful of people who can perform the job can afford to be choosy, and without them the accelerator could easily become the gravest political embarrassment that the scientific community has ever known. It could make Mohole and cancer chemotherapy look like golden success stories.

An awareness of this potential has contributed toward close relations between the AEC and the Academy vis-à-vis the accelerator. First of all, to provide guidance, as well as a buffer against the disappointed once the decision is made, the Academy has appointed an 11-member Committee on Site Selection,* chaired by E. R. Piore, vice president and chief scientist of IBM (*Science*, 7 May 1965). The function of this committee will be to evaluate the proposals received by the AEC and to make recommendations for a site. After the site is agreed upon, it is likely that another Academy-sponsored organization will come into play, a rather unusual association of university presidents which could very possibly become a major influence in the administration of federally supported scientific installations.

Virtually nothing has been said publicly about this organization, outside of some sketchy information that Academy and AEC witnesses gave the Joint Committee on Atomic Energy in response to questions last March at hearings on high-energy physics. But it actually is shaping up as an extraordinary development. The organization, initially consisting of the presidents or other representatives of 26 major universities,† met without public announcement last January in Washington at the invitation of Frederick Seitz, president of the Academy. Also attending were Leland J. Haworth, director of the National Science Foundation; Donald F. Hornig, presidential science adviser; AEC chairman Seaborg, another AEC commissioner, Gerald F. Tape; and several other persons who have long been influential in science and government affairs.

Out of this meeting there emerged a decision to create a national association of universities that would seek to assume administrative responsibility for the 200-bev accelerator. The organization would be patterned in many respects on Associated Universities, Inc. (AUI), the nine-university consortium that runs the Brookhaven National Laboratory under contract with the AEC. It was decided that the new organization would not be an expansion of AUI but would be an altogether separate and larger body, with which the AUI universities would most likely be individually associated. It was also agreed that the membership would be expanded from 26 to perhaps 30. (It appears

* Members of the committee in addition to the chairman, E. R. Piore, are as follows: Robert F. Bacher, physics department, California Institute of Technology; Harvey Brooks, dean, Engineering and Applied Physics, Harvard; Val L. Fitch, Palmer Physical Laboratory, Princeton; William B. Fretter, dean, College of Letters and Science, University of California (Berkeley); William F. Fry, department of physics, University of Wisconsin; John William Gardner, president, The Carnegie Corporation; Edwin L. Goldwasser, Physics Research Laboratory, University of Illinois; G. Kenneth Green, chairman, Accelerator Department, Brookhaven National Laboratory; Crawford H. Greenewalt, Chairman of the Board, E. I. du Pont de Nemours & Company; and Herbert E. Longenecker, president, Tulane University.

† The institutions represented were as follows: Chicago, Yale, Caltech, Johns Hopkins, Princeton, Pennsylvania, Wisconsin, Illinois, Notre Dame, California, Columbia, Duke, Cornell, Tulane, Michigan, University of Washington, Washington University, Rice, Colorado, Harvard, Indiana, M.I.T., Stanford, Rochester, Carnegie Institute of Technology, Minnesota, and Associated Universities, Inc.

now that another nine universities have joined.) Each participating university would be required to guarantee a contribution of about $100,000, for the cost of operating the association, but they would not necessarily have to put forth the full sum.

What is perhaps most significant is that the university association examined, but left open, the possibility that it might also seek to assume responsibility for federally financed facilities other than the 200-bev accelerator. Just what it had in mind isn't clear, but one possibility might be the Mohole platform, on which construction is soon to start. At present the National Science Foundation finds itself handling the Mohole project without any of the university links that traditionally exist between the Foundation and its projects.

At the same January meeting it was also proposed that the university association, in "consultation" with the AEC, should offer its advice on the location of the new accelerator, and that a governing body, derived from the association, should work out guidelines for making the machine available to various researchers. It might appear that the university association is in jurisdictional conflict with the Academy's site-selection committee; but as is often the case with matters of high policy in the scientific community, there is a good deal of institutional overlap of the two bodies, and it is extremely doubtful that the groups will go off in different directions.

As things now stand, the university association is to meet this weekend to settle on bylaws, and it is expected that it will be incorporated as an independent organization within a few weeks. What happens then is in no way certain. But clearly, a nationwide organization of university presidents, closely associated with the Academy and the major granting agencies, has the potential for exerting enormous influence. The motive for establishing the organization was a laudable one—to dampen regional strife by getting universities across the nation to cooperate in the administration and use of the costly machines of science. It is perhaps unfortunate, though, that it was organized without any public notice or discussion. Traditionally, that's the way of doing business at the summit of the scientific community, but it's not the way to inspire public or congressional confidence, especially when the principal business of the association is expected to be the administration of taxpayer-supported science.—D. S. GREENBERG

Congress and Science: New Probe by Senate Unit Reviews Evidence on Spread of Government Funds

A new entry was made this month into the growing society of congressional committees carving jurisdictions out of the lately discovered topic of "science and politics." The latest arrival into the ranks of congressional investigators goes under the somewhat unlikely official title of the Subcommittee on Employment and Manpower of the Senate Committee on Labor and Public Welfare. In actuality, however, the prime mover is a single subcommittee member, Gaylord Nelson (D–Wis.), a former state governor serving his first senatorial term, to whom subcommittee chairman Joseph Clark (D–Pa.) gave authorization to conduct hearings. In 7 days of intensive hearings on "the impact of federal research and development policies on scientific and technical manpower," which began 2 June, Nelson got token support from his subcommittee colleagues in the form of perfunctory appearances by Jennings Randolph (D–W. Va.), Claiborne Pell (D–R.I.), Jacob Javits (R–N.Y.), and Edward Kennedy (D–Mass.). But these visits have had more the appearance of senatorial courtesies than of genuine interest, and for the most part Nelson has been in the reviewing stands alone.

Coming so soon after the intensive studies of federal research and development policies by the Elliott and Daddario committees of the House, Nelson's hearings so far seem to have drawn a "so what else is new?" response both from the press, where coverage has been scanty, and from officials of federal science agencies, who have had to spend long hours preparing data for Nelson's perusal (some agency documents have run up to 120 pages) and in answering his detailed questions. At times it has seemed that a vast energy-consuming enterprise has been set in motion solely for the edification of Nelson himself. Nonetheless, though the element of repetition is undeniably present, both Nelson's purposes and his position diverge considerably from those of former congressional students of federal R & D, and he seems to be moving in a somewhat different direction. Nelson is starting from the now well-documented "uneven" geographic distribution of federal funds, which has resulted in extreme concentrations, notably in Massachusetts, California, and New York, and asking two hard questions. First, in perpetuating this condition, are federal agencies literally doing what most of them claim, and, as the phrase goes, just "putting the money where the competence is"? And second, what is the connection between the concentration of federal R & D money and local economic development? To what extent have federal grants and contracts been responsible for the industrial booms along Boston's Route 128 or in the Los Angeles or San Francisco Bay areas? "We hope to learn," Nelson said in his opening statement, "why the present distribution of Federal research and development funds is what it is, to what extent this is inevitable or useful, to what extent it promotes the development of various regions, or hinders the development of others, to what extent it derives from established policies, to what extent it is the result of initiative or lack of initiative in given regions, to what extent existing policies are serving the national goal of wise utilization of our manpower and wise employment of all of our resources, and to what extent new policies might be in order."

Now, this is an exceedingly large order, and in carrying it out Nelson is hindered in several ways. First, there is the fact that any investigation of federal R & D funds, particularly if it is led by a representative of a "have-not" region, inevitably raises the suspicion that beneath all the fancy talk and difficult diagrams lies the familiar motive: pork-barrel politics. It is plain that some of the federal witnesses, as they carried their briefcases and charts up Capitol Hill for the umpteenth time, were wondering, "would we really be here now if it hadn't been for MURA?" And it is true that Nelson's interest in the topic of geographical distribution is in part related to his intimate involvement in the attempt in 1963 to save the Midwestern Universities Research Association nuclear accelerator, which was to have been located at Stoughton, Wisconsin, from Johnson's budget-pruning.

To his credit, Nelson attempted to confront the pork-barrel issue squarely and to establish his credentials as an impartial seeker after fact. It seems to be his feeling that pork-barrel politics have already overtaken decisions on the location of federal installations, and that such pork-barreling can only be combated with a clear national policy; "more and more states are worried about this issue," he pointed out in his opening statement, "and . . . unless we devise wise national policies, we shall