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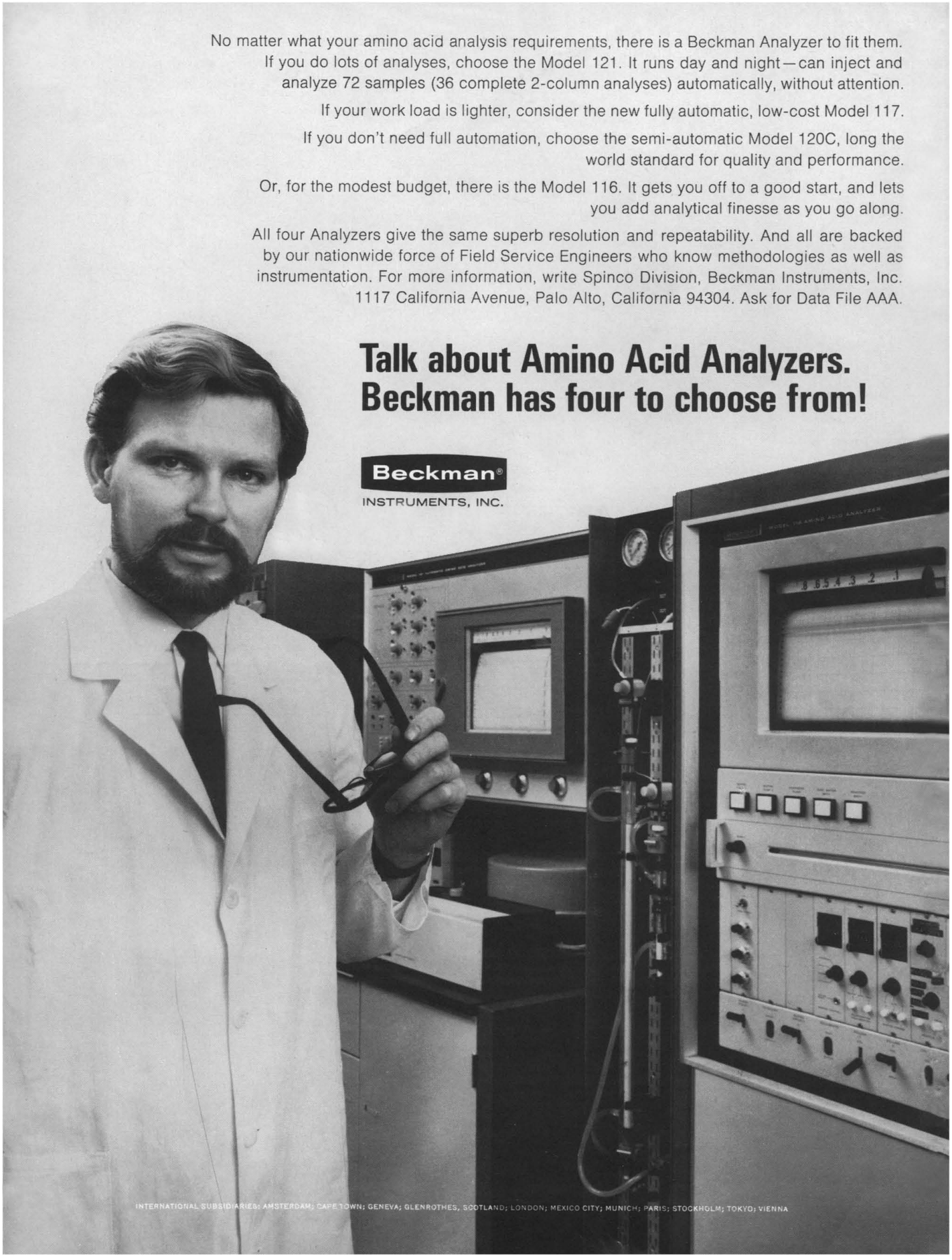
Index Issue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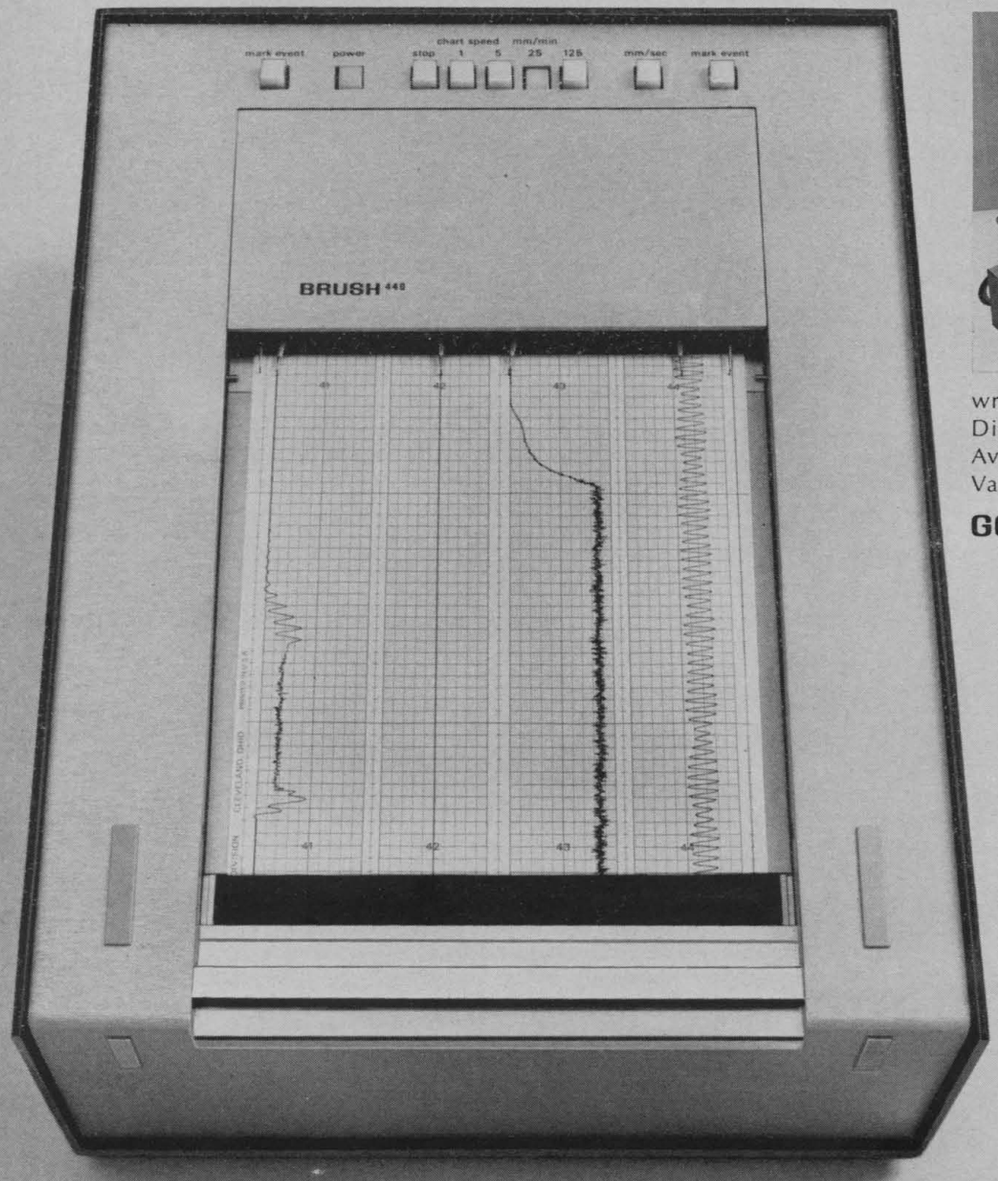

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GOULD BRUSH

27 March 1970
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COVER

View of Washington Cathedral taken from the west end of the nave and showing the deviation of about 2 degrees of the nave axis from the axis of the choir at the east end. The architect intentionally designed this deviation, one of many in the cathedral, to enhance the visual effect. See letter by R. T. Feller, page 1669. [Gary Laurish Photography, Washington, D.C.]

institutes and universities after the symposium. The problems that Nussenzveig discusses are so severe and pervasive that they were visible even in my brief "outsider's" view.

Among the most discouraging things I saw were some nuclear particle accelerators, which were "gifts" from the United States. Such machines are given away because they are no longer capable of doing "competitive" research. The "gift" of such a machine appears to require of the recipient enormous expense (money for a building and installation costs) and effort (physicists, not engineers, must struggle under the conditions discussed in the article to get the machine running). After years of such struggle, the machine may be in operation, but the financial support for the "auxiliary" facilities—the counters, on-line computers, beam handling systems, and so forth, which now seem to cost about as much as the machine itself—is almost nonexistent. Under these conditions the laboratory is essentially useless for either research or training of graduate students, and the effort and expense have been wasted. This situation is hinted at by Nussenzveig, but I believe the problem should be strongly emphasized.

On the other hand, the *Instituto Venezolano de Investigaciones Cientificas* (outside Caracas) appeared to be relatively well off with respect to level and continuity of financial support and lack of government interference in its operations. The quality of the support is probably due in part to the relative wealth of the country as compared to its neighbors; and the lack of political intrusions is at least partly due to the geographic and organizational separation between the Institute and the large University in Caracas. Regardless of the reasons, though, this Institute has a reasonably supported, well-staffed, and well-motivated research program.

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Man's First Route to America

In "The earliest Americans" (7 Nov., p. 709), Haynes says, "Theories of the initial peopling of the New World are intimately related to sea level and glaciation during the late Pleistocene, because it is generally agreed that man passed from the Old to the New World *by way of an emerged Bering platform* [my italics] and thence through central Canada."

The Bermuda platform is tectonically stable and offers a potential reference section for Quaternary sea-level changes. Precise carbon-14 dates are now available and it appears that 37,000 years ago the Wisconsin-Illinois interglacial was at its climatic optimum, with, however, sea level at or slightly below present sea level. I submit that this, rather than at the height of the subsequent glaciation, was the most likely time for early man to have crossed from the Old to the New World, by island-hopping along the Kuril-Kamchatka-Commander-Aleutian chain or directly from the Chukchi Peninsula to the Seward Peninsula. The presence of early man in Northeast Asia during climatic optimum is much more likely than his presence at the height of a glaciation, when even today the southern limit of permafrost lies around 50°N in eastern Siberia, and conditions under a glacial regime must have been much worse.

As to whether such sea journeys were possible for early man, the initial entry into Australia by the ancestral Aboriginal group or groups is now placed at 30,000 years ago or earlier when sea level was little if any lower than at present, and man obviously came by boat as witnessed by the absence of large placentals, other than the dog, in Australia.

R. POCKLINGTON
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There is no evidence to preclude the speculations of Pocklington (and others as well). While some immigrants may indeed have taken such a route via boat, I and others, for lack of evidence to the contrary, believe that most (but not necessarily all) of the peopling of the New World took place by normal processes of human population expansion and diffusion across continental land masses such as Beringia during glacial periods because (i) there was paleolithic occupation of northern Siberia during the last glacial period; (ii) there was then an emergent Bering platform; (iii) large land mammals walked across this platform; and (iv) Paleo-Indian hunters followed game herds (*1*). Only future work will lead to a better understanding of the relative importance of population dispersal models for Paleo-Indian occupation of America.

The sea-level data present no conflict in that I believe in the Mid-Wisconsin high stand of sea level reported by others (*1*). The only difference of opinion here is that 37,000 years ago is a Mid-Wisconsin date and not that of the Wisconsin-Illinoian interglacial (Sangamon).

C. VANCE HAYNES
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Reference

1. *The Bering Land Bridge*, D. M. Hopkins, Ed. (Stanford Univ. Press, Stanford, Calif., 1967).

Shift of NSF Funds

In a report entitled "Toward a Public Policy for Graduate Education in the Sciences" (*1*), the National Science Board has made a number of official recommendations for changes in the "mechanisms of federal support" of research and graduate education. The most novel and controversial of these is to shift a large portion of the funds currently allocated by the National Science Foundation for the support of scientific research through many individual research contracts and grants to the funding of a much smaller number of large "institutional sustaining grants" to be administered by the various universities. Just what portion of NSF expenditures is to be devoted to such institutional grants is unclear except that it will be a very significant fraction of the current $400 million budget.

We believe this proposed changeover to institutional grants is not in the public interest. First, if the decision to allot the grants is left to the university administrations, research will receive less total funding than at present. Administrations are apt to be overresponsive to current student demands for more undergraduate teaching and less research and graduate education by the faculty. Moreover, they are under steady pressure to increase the financial support of undergraduate students. Second, an important purpose of graduate education is to bring the student up to the prevailing frontiers of knowledge, and this is inconceivable without a faculty steeped in active research. Peaceful periods of sustained activity free from interruptions, such as the summer vacation, are necessary to do this research. Any plan which reduces support for research, especially summer research, will be detrimental. Third, the system of "institutional sustaining grants" will create interdepartmental problems with regard to the sound apportionment of funds between individual members within departments. As it is, the universities and their departments are overburdened by questions of judgment and comparison of the relative merits of their faculty members. To this very time-consuming task would now be added the arduous one of evaluating individual research projects. Whatever arbitrary formula is followed, it will be less objective and fair than the present refereeing and reviewing system employed by the NSF, Office of Naval Research, and other research funding agencies. For instance, it might be decided to divide the funds allocated to mathematics uniformly over the whole department, giving summer research support to all who want it. This would lower the summer stipend below the two-ninths of the academic year salary which the NSF allows. Quality would suffer and mediocrity would be encouraged instead of a premium being placed on important projects. Reduced summer salaries would discourage young mathematicians who would interpret it as a sign of lowered priorities for research. Contrary to the opinion of many administrators, the hope of financial compensation cannot be dismissed as an incentive for stimulating good research. One need only contrast the weak position of research in most American universities of the pre-World War II period with the situation today to measure the importance of a national policy of sustained and direct financial support for individual research.

For these reasons we believe that the plan proposed by the NSB will create more problems than it will solve and will be inferior to the existing system which is working relatively well. If changes are necessary, then why not retain the existing system for funding the projects of the senior faculty, and support the research efforts of younger faculty members through departmental rather than institutional grants?

GORO AZUMAYA, ARLEN BROWN
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SEYMOUR SHERMAN, JOSEPH TAMPFLI
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Reference

1. *National Science Board Report* **69-1** (Government Printing Office, Washington, D.C.), pp. 41-50.

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The Next Industrial Revolution

We must have a new industrial revolution even if a few of us have to generate it. Other industrial revolutions have come about unplanned. The first was hailed as a way of ennobling human beings by substituting steam and electrical power for their muscles. This it undoubtedly did, but the generation of power brought with it side effects—including air pollution—which, far from being ennobling, were and continue to be degrading to human existence. In the second revolution the multiplication of "things" came about—"things" that at last could be mass-produced, so that people could have more and more of them. Thus was generated the solid-waste problem.

A third revolution was the tremendous growth in industrial chemistry, and the ability to tailor-make chemicals in vast quantities very cheaply, for all kinds of purposes—for example, pesticides intended to selectively destroy forms of life inimical to various groups of human beings. But these turned out not to be so selective; they have upset the little-understood ecological balance, and have polluted and poisoned the waters.

In preparation for the next industrial revolution, I suggest that we revise our vocabulary. For instance, there is no such thing, no such person, as a consumer. We merely *use* "things"; and, according to the law of the conservation of matter, exactly the same mass of material is discarded after use. Thus, as the standard of living goes up, the amount of waste and consequent pollution must go up.

I believe we must base the next industrial revolution—a planned one—on the thesis that there is no such thing as waste, that waste is simply some useful substance that we do not yet have the wit to use. Industry so far is doing only half its job. It performs magnificent feats of scientific, technological, and managerial skill to take things from the land, refine them, and mass-manufacture, mass-market, and mass-distribute them to the so-called consumer; then the same mass of material is left, after use, to the so-called public sector, to be "disposed of." By and large, in our society, the private sector makes the things *before* use and the public sector disposes of them *after* use.

In the next industrial revolution, there must be a loop back from the user to the factory, which industry must close. If American industrial genius can mass-assemble and mass-distribute, why cannot the same genius mass-collect, mass-disassemble, and massively reuse the materials? If American industry should take upon itself the task of closing this loop, then its original design of the articles would include features facilitating their return and remaking. If, on the other hand, we continue to have the private sector make things and the public sector dispose of them, designs for reuse will not easily come about.

We industrial revolutionaries must plan to move more and more into the fields of human service, and not leave such concerns to the so-called public sector. We have seen our food supply grow to abundance in the United States, with fewer and fewer people needed to grow it. We are seeing the automation of factories, with an abundance of "things" provided by fewer and fewer people. On the other hand, we have a shortage of human services and a shortage of people providing these services. It follows quite simply that, if private enterprise is not to dwindle, while the public sector grows to be an all-embracing octopus, then private enterprise must go into the fields of human service.

The next industrial revolution is on our doorstep. Let us be the revolutionaries who shape it, rather than have it happen—and shape us.

—ATHELSTAN SPILHAUS, *president, American Association for the Advancement of Science*

This editorial is adapted from a lecture presented at a recent National Industry Conference Board conference on Management and Man in the Computer Age, held in New York. The complete text appeared in the February 1970 issue of *The Conference Board Record.*

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