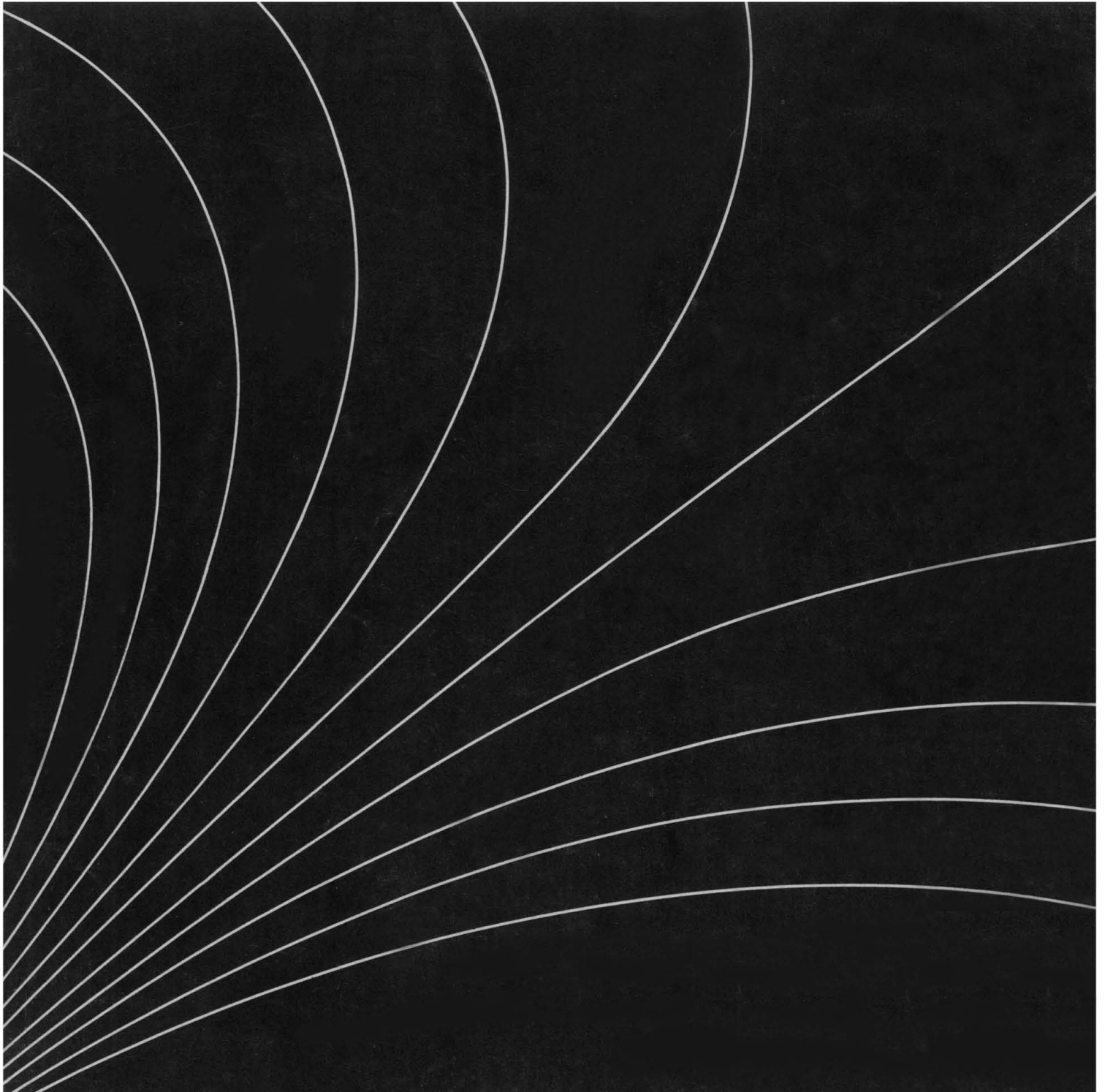


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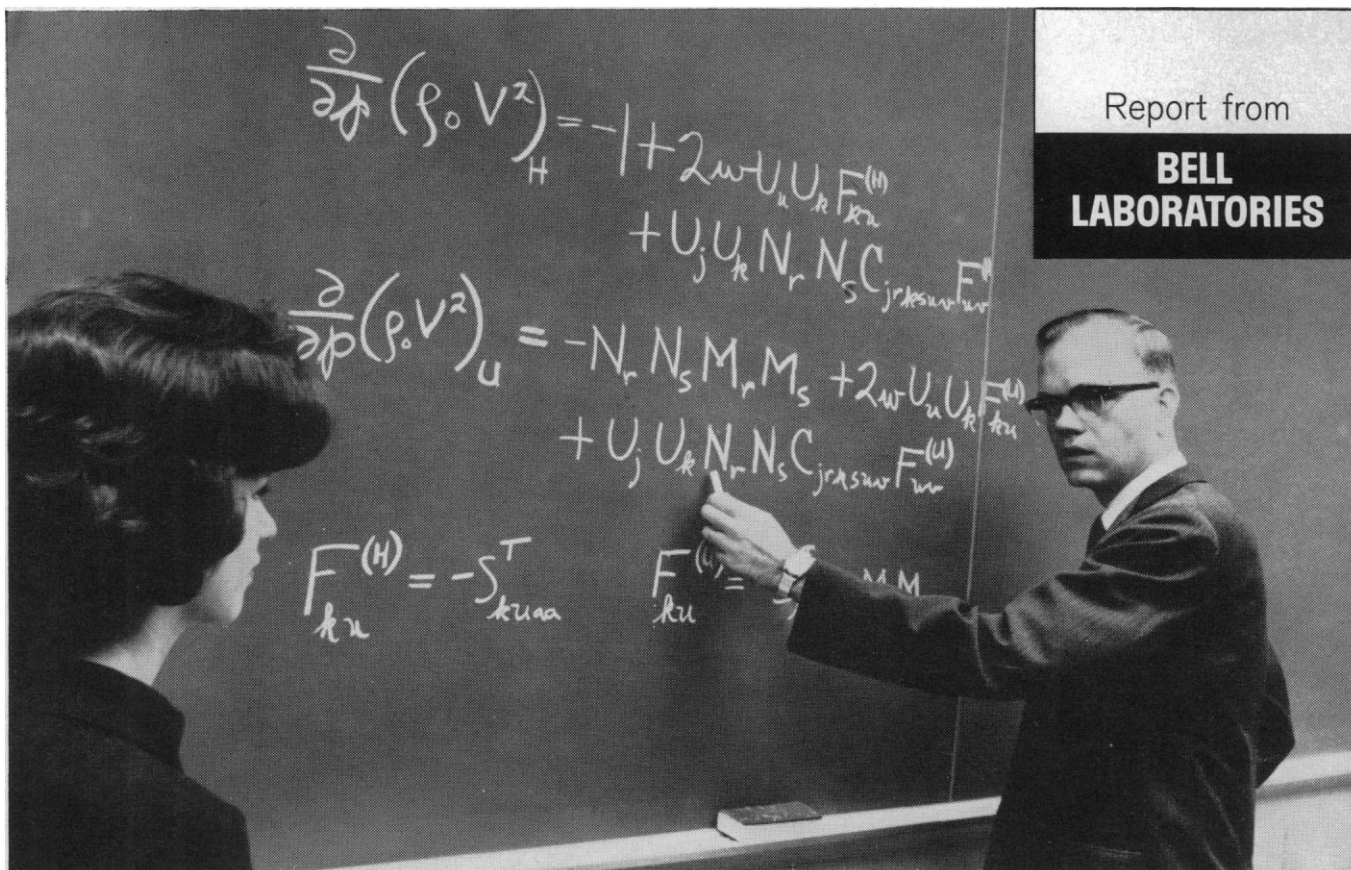
31 July 1964

Vol. 145, No. 3631

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE



INTEGRAL CURVES



Mathematician W. S. Brown and program design trainee Mrs. L. A. Needham discuss an application of ALPAK programming to wave propagation in crystals under pressure.

ALGEBRA ON A DIGITAL COMPUTER

○	PHI(3,0)				
○	NUMERATOR				
	A	A	A	A	Q
	4	3	2	1	
○	-288	0	0	0	3 3
	1152	0	0	0	3 4
○	-1896	0	0	0	3 5
	1656	0	0	0	3 6
	-816	0	0	0	3 7
○	-2	1	0	0	5 1
	1	1	0	0	5 2

A portion of the printout from an ALPAK computation: each row represents a polynomial term consisting of a coefficient and five exponents; the variable names appear as column headings. The first term is thus $-288A_1^3Q^3$. ALPAK can handle polynomials and rational functions in several variables, as well as truncated power series and systems of linear equations with rational-function coefficients.

Much laborious manipulation of routine algebraic expressions can be eliminated by a computer programming system devised at Bell Laboratories. Called ALPAK (Algebra PAckage), the new system makes it possible to perform algebraic calculations on a digital computer at ten thousand times human speed.

Digital computers work with numbers, not algebraic symbols. But algebraic expressions include numbers as coefficients and exponents. For example, the term

$$3x^2y^4z^5$$

can be written in the form

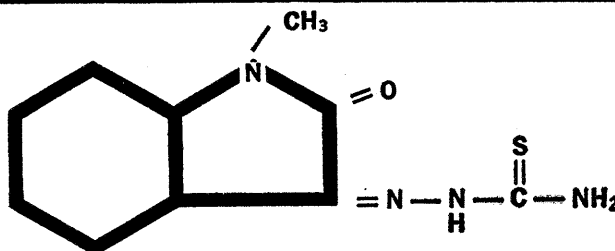
$$3 \ 2 \ 4 \ 5$$

where 3 is the coefficient and 2, 4, and 5 are, respectively, the exponents of x , y , and z . This numerical representation permits a computer to perform algebraic addition, subtraction, multiplica-

tion, division, substitution, and differentiation. The exponents and coefficients are reassociated with the variables at the output.

Unlike the human algebraist, the digital computer does not become weary and make mistakes. It can quickly carry to completion computations that hitherto seemed prohibitively long. For example, at the left is a printout of the result from a computation related to a telephone traffic problem. The problem involved 9 linear equations in 9 unknowns, with a total of over 800 terms. The computer running time was six minutes: the time required for a human mathematician to work the problem and check the answer would be approximately one year, BELL TELEPHONE LABORATORIES ...World center of communications research and development.





SIGNIFICANT ADVANCE IN SMALLPOX CONTROL

The first instance of successful prophylaxis of a virus disease by a synthetic chemical agent was reported recently by Bauer et. al. (1) (2).

MIBT N Methyl Isatin Beta Thiosemicarbazone was shown to be very effective protection for smallpox contacts regardless of vaccination status. In contacts who had primary vaccination, MIBT was more effective than revaccination in suppressing contact cases. It was also effective when contact was not detected in time for revaccination to offer protection.

Treatment of contacts began one day after admission as patients. They were observed for 16 days. During this time, only three mild cases of smallpox occurred among 1101 treated patients. Among a control group of 1126 untreated contacts, 78 cases of smallpox and 12 deaths occurred.

MIBT gave better results than were obtained with antivaccinal gamma globulin. And it can be made readily available and administered orally, thus simplifying administration to large groups.

Thompson, et. al. described antiviral activity of Isatin Beta Thiosemicarbazone in mice infected with vaccina virus (4). Easterbrook reported inhibition of infectious virus with IBT (1962) which resulted in immediate cessation of virus maturation and production. He suggested that IBT interfered with the process of maturation (5).

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25 grams . . gm. 1.95	5 grams . . gm. 1.90
5 grams . . gm. 2.00	1 gram . . gm. 2.25
1 gram . . gm. 2.35	

References: (1) D. J. Bauer, L. St. Vincent, C. H. Kempe, A. W. Downie, Lancet, II, 494, (1963). (2) Lancet, II, 501, (1963). (3) C. H. Kempe, C. Bowles, G. Meiklejohn, T. O. Berge, L. St. Vincent, B. V. Sundara, Babu, S. Govindarajan, N. R. Ratnakannan, A. W. Downie, V. R. Murthy, Bull. Wld. Hlth. Org. (1961) 25, 41. (4) R. L. Thompson, S. A. Minton, J. E. Officer, G. H. Hitchings, J. Immunol (1953) 70, 225. (5) K. B. Easterbrook, Virology, 17, 245, (1962).

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COVER

Integral curves of a first-order differential equation. The simplest problem in differential equations requires the determination of a family of curves from a knowledge of their tangents. These curves appear to be parallel in small regions but may diverge from one another in large regions. See page 451.

The American Association for the Advancement of Science was founded in 1848 and incorporated in 1874. Its objects are to further the work of scientists, to facilitate cooperation among them, to improve the effectiveness of science in the promotion of human welfare, and to increase public understanding and appreciation of the importance and promise of the methods of science in human progress.

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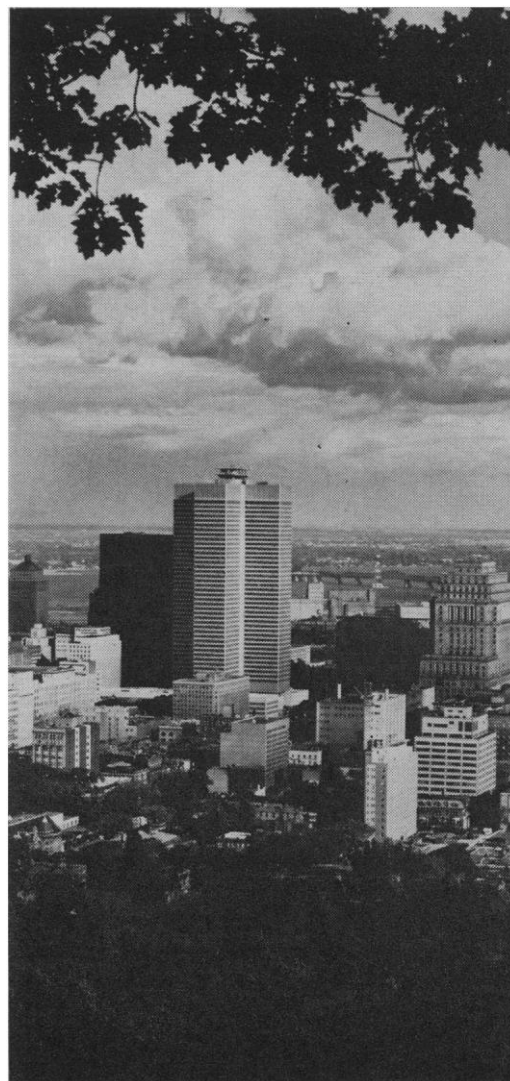
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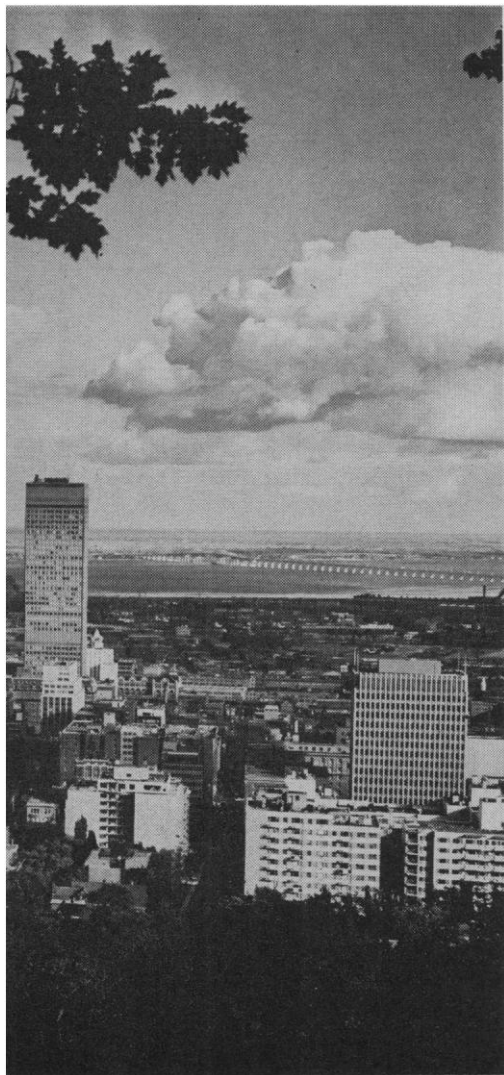
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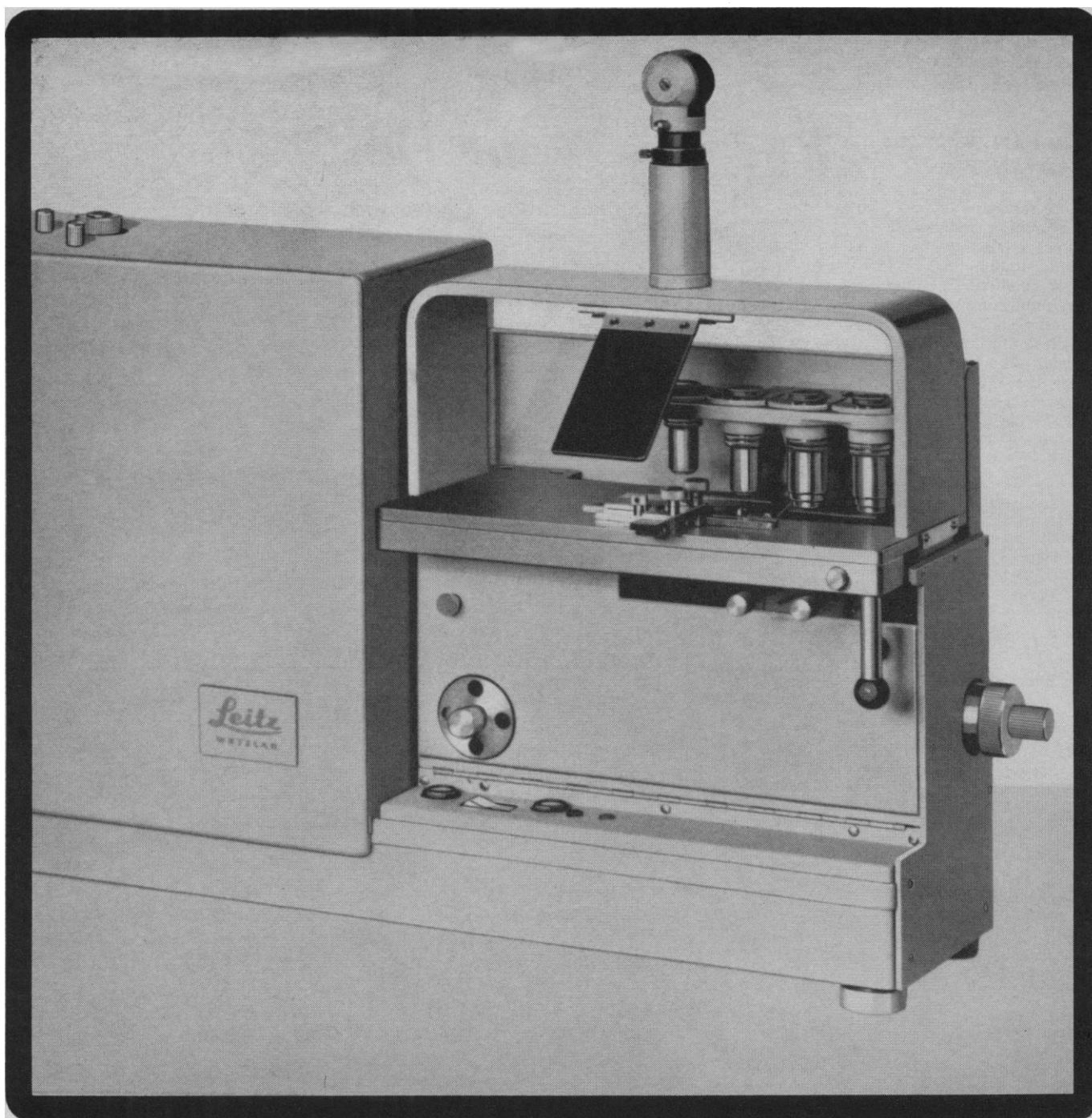
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National Humanities Foundation

The world of learning is always kept off balance by the achievements of individual scholars, the special needs of time or place that direct resources and interest toward one field rather than another, or the special opportunities that arise as a result of some fortunate circumstance. Scholarship never moves forward uniformly over its entire frontier. Nor should it. Perfect balance—if we knew what that means—could be achieved only by letting the slowest set the pace. Yet always there is recognition that the imbalance should not become too great or last too long, and in recent years many scientists, whose fields have been prospering greatly, have recognized that special effort should be devoted to nurturing the humanities and arts. Four years ago the President's Science Advisory Committee wrote:

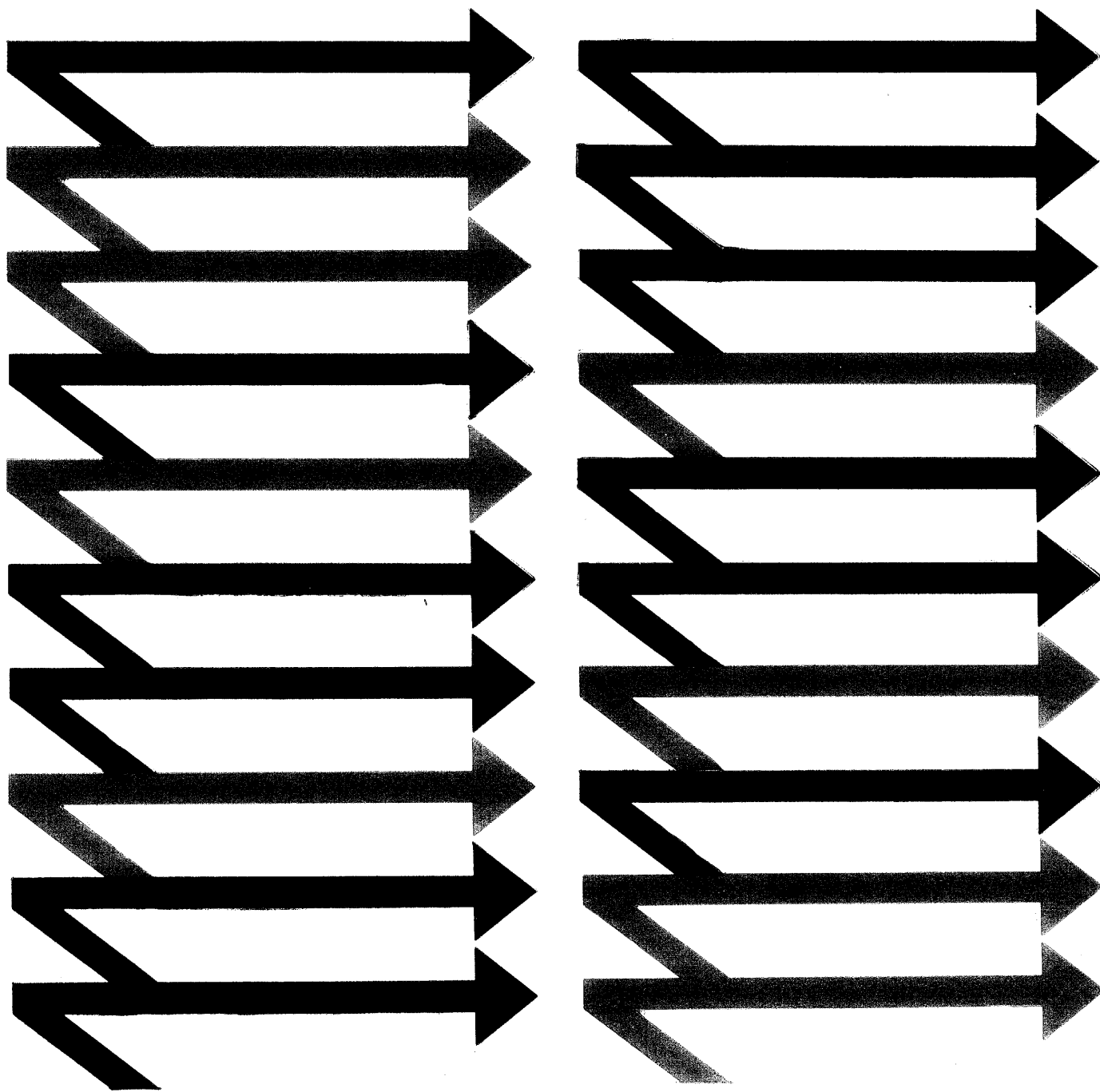
"We repudiate emphatically any notion that science research and scientific education are the only kinds of learning that matter in America. The responsibility of this Committee is limited to scientific matters, but obviously a high civilization must not limit its efforts to science alone. Even in the interests of science itself it is essential to give full value and support to the other great branches of man's artistic, literary, and scholarly activity."

In 1963 the Commission on the Humanities was created by the American Council of Learned Societies, the Council of Graduate Schools in the United States, and the United Chapters of Phi Beta Kappa. The commission has now reported that it recommends a National Humanities Foundation patterned after the National Science Foundation and intended to do for the humanities and the arts what the NSF has done for the sciences: support research, offer fellowships, provide opportunities for the improvement of teaching, improve facilities, and, in general, give to scholars those types of aid that will best enable them to advance their fields of research and study.

It will not be easy to persuade Congress to establish a National Humanities Foundation. It took 5 years of effort to bring the National Science Foundation into being, and it does not appear that a National Humanities Foundation will be any easier to establish. Humanists themselves will in some cases have to become convinced; congressmen will have to be persuaded; support must be generated from a variety of sources. All of this is a considerable undertaking, and it is not certain that the final outcome will look much like the goal now envisioned. Some critics have doubts or oppose the plan. Others contend that, as a result of the NSF experience, it should be possible to devise a better pattern of organization and to plan a better program of activities.

However these disagreements are resolved, a lively discussion of alternative goals and plans will be helpful. Scientists can well take part in this discussion, for the recommendations of the Commission on the Humanities—and scientists helped to write those recommendations—are of concern to all scholars, including scientists. That greater support for the humanities and arts would be desirable is hard to question. That the nation can afford it is clear. It would aid the humanities to have scientists understand and support their needs, just as it aids science to have its needs appreciated and supported by scholars in other fields. And "even in the interests of science itself it is essential to give full value and support to the other great branches of man's artistic, literary, and scholarly activity."—DAEL WOLFLE

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