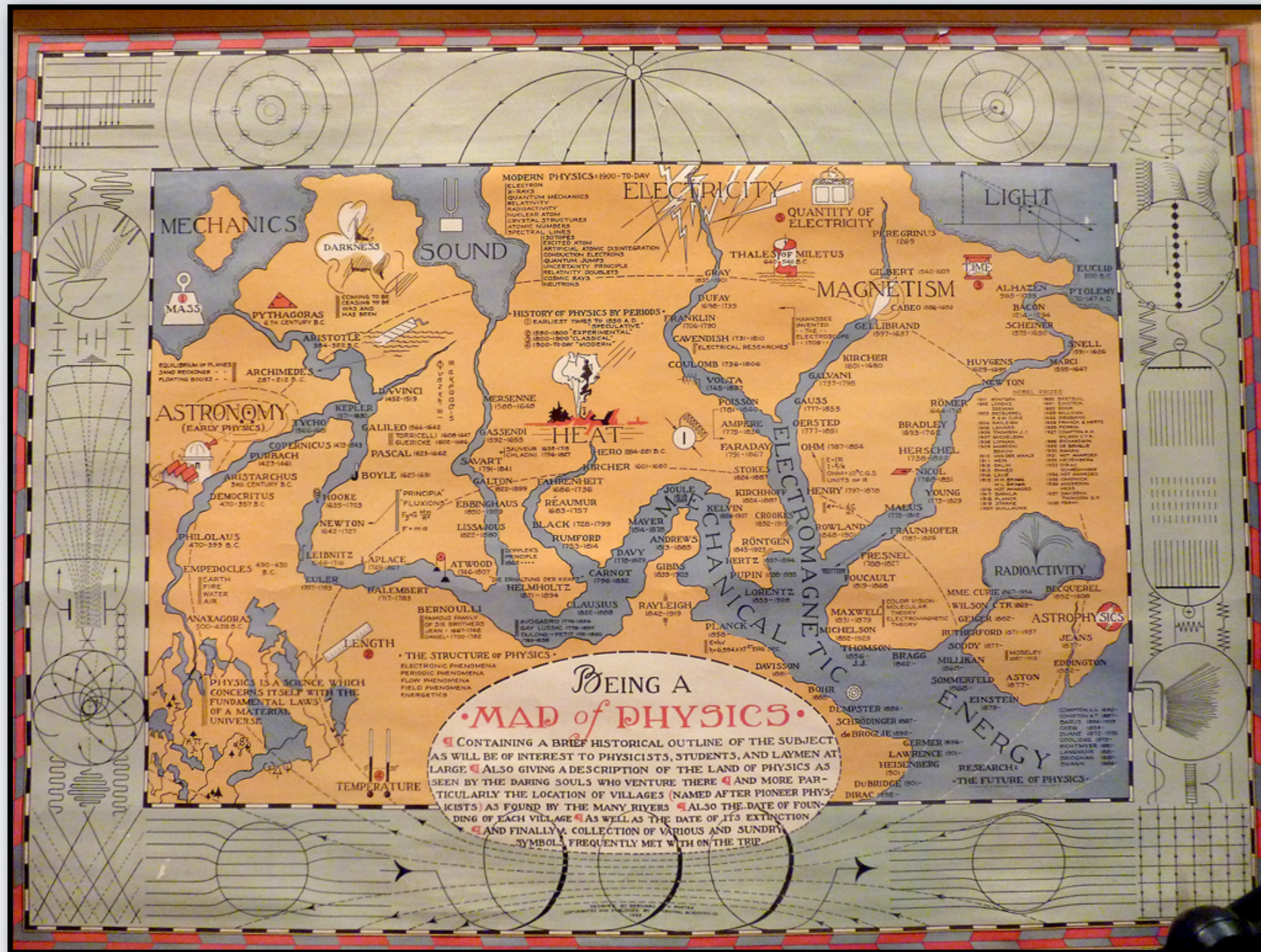


THE DIVERSIFICATION OF PHYSICS IN POSTWAR AMERICA: TOPICAL AND PROFESSIONAL FACTORS

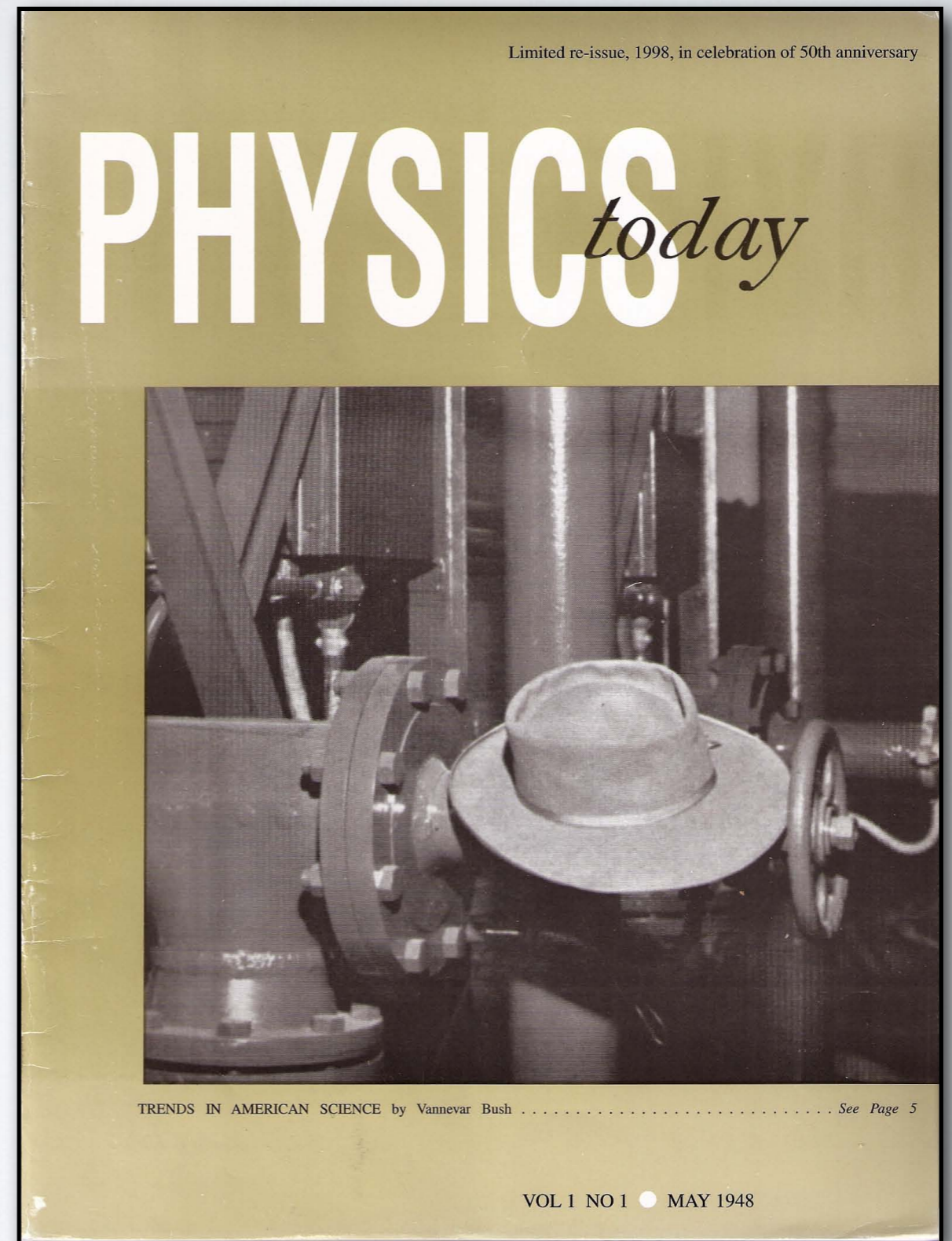


Joseph D. Martin, Michigan State University
TUI-3, Kavli Institute for Theoretical Physics, University of California, Santa Barbara
Santa Barbara, CA, 30 June 2015



PLAN OF THE TALK

- I. Introduction
- II. Defining Physics
- III. The Early Days of Solid State Physics
- IV. Summary Reflections
- V. Epilogue: Contributing to the History of Physics



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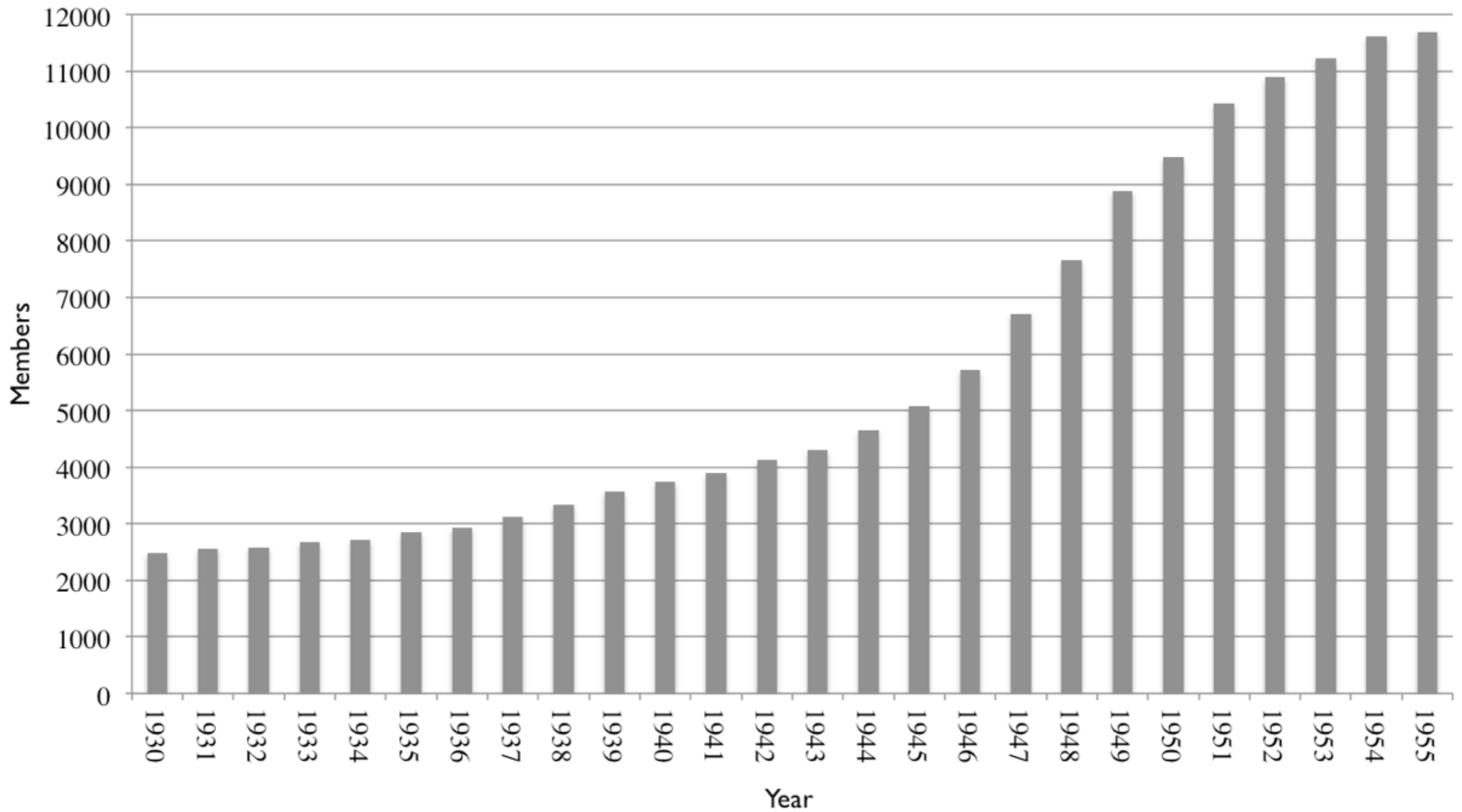
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I: INTRODUCTION

American Physical Society Membership, 1935–1950



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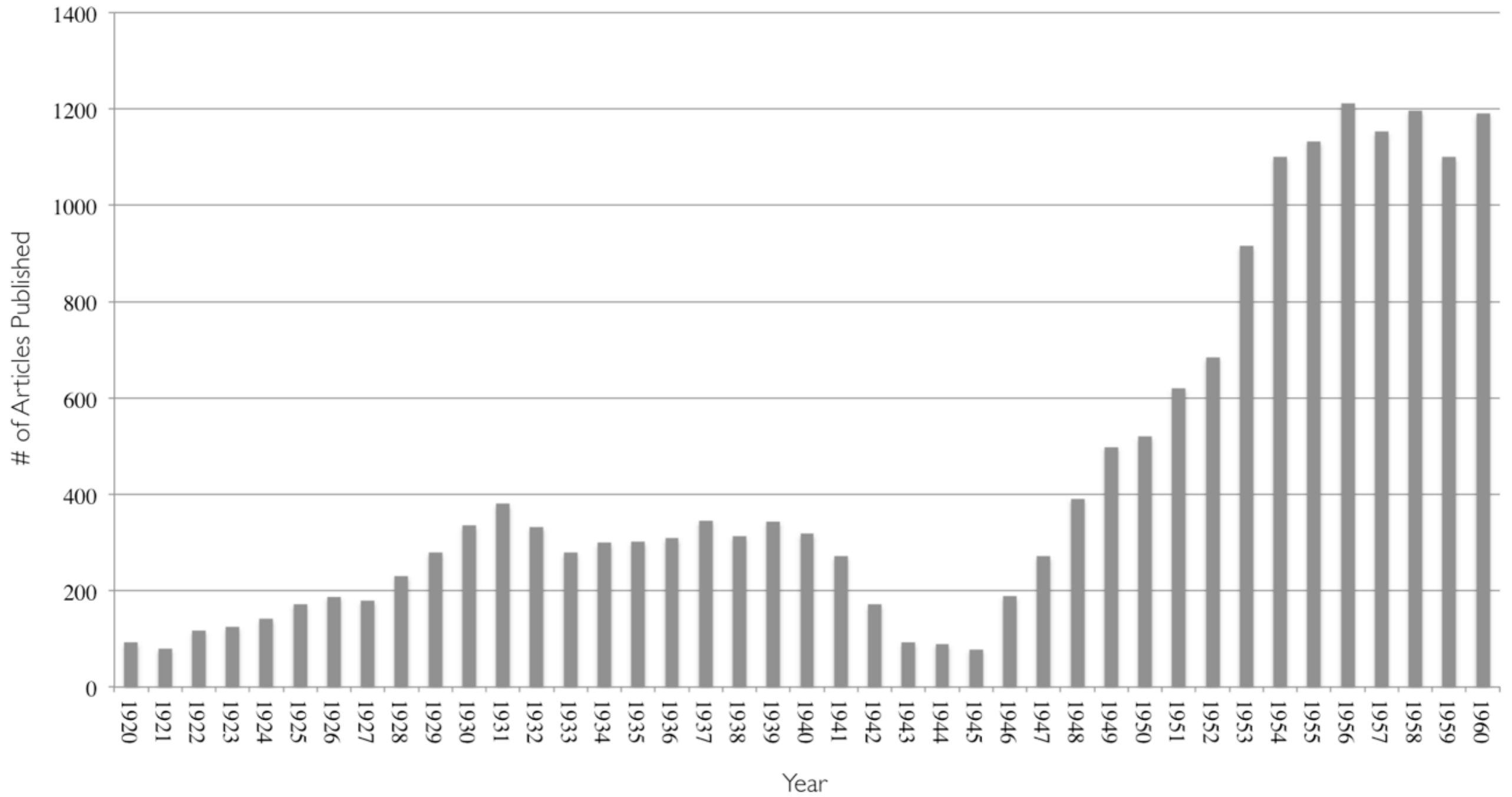
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I: INTRODUCTION

Articles in *Physical Review*, 1920–1960



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I: INTRODUCTION

Journal of Applied Physics

Volume 15, Number 2

February, 1944

Physics in 1943

BY THOMAS H. OSGOOD

Michigan State College, East Lansing, Michigan

IN 1899, during the Boer war, *Nature* remarked that "The scientific lessons of the war are crowding upon us. We have already referred to the blunder made by our military authorities, in not sending Marconi apparatus to South Africa among the first equipments. We now learn indeed, after the investment of Ladysmith is drawing to a close, that Marconi apparatus is being sent out. . . . We have been informed on good authority that some time ago the importance of a locomotive search-light in operations of war was strongly represented to the military authorities; but they would have none of it. Fortunately, however, the naval force in Natal has now provided the army with one. It is certain to do good service.

"There can be little doubt that the presence of another scientific instrument, the balloon at Ladysmith, has saved the situation. A moment's consideration of what this touch of science can do for us will indicate that the above expression is well grounded. . . . The telephone of the balloon will inform the gunners how the shell has been dropped, and any directions regarding range can be given. It will therefore be impossible for the rebels, thanks to the balloon, to form in daylight in any large numbers for an attack on the camp, without rendering themselves liable to the searching fire of the guns. . . . Seeing then how important scientific instruments are in the struggle, in which millions are freely spent, we

return to our question, how is it that there is no scientific committee to advise the Government in such matters, even if only to anticipate scientific applications? and how is it that from the Grand Council of the nation, the Privy Council, men of science are rigorously excluded?"

Forty-four years later we find every resource of science mobilized to help the fighting forces of our own country and of our allies. Physics has an importance it never possessed before. But whatever his part in the present conflict, it is the duty of every physicist to see that his profession also plays its full part in the stabilization of the postwar peace.

I. NEUTRONS

The lack of the electric charge which encumbers most of the other fundamental particles enables slow neutrons to penetrate with peculiar ease through the network of electric fields which hold the particles of a solid together. Nevertheless, the neutrons' considerable magnetic moment, -1.9 nuclear magnetons each, makes their transmission through matter susceptible to control by magnetization in a way that has no counterpart in the case of other particles. Not that this control extends over a wide range—it does not, for the difference between the transmission of neutrons through magnetized and through unmagnetized iron amounts to only a few percent. Yet the phenomenon offers a new method of

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“[T]echnical physicists have known too little about the work in which their academic colleagues are engaged; and an even more lamentable ignorance of the practical problems of the age which are being solved by physicists in industry has been displayed by those who train students in the rudiments of physics.”

Thomas H. Osgood, "Physics in 1943," *Journal of Applied Physics* 15, no. 2 (1944): 106.

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IV

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I: INTRODUCTION



Karl Darrow (L) and Henry Barton (R)

I: INTRODUCTION



Karl Darrow (L) and Henry Barton (R)

“The Council is disinclined to favor [a Division of Industrial Physics]. One of the things most greatly to be desired is a unification of the physicists called ‘academic’ and the physicists called ‘industrial’ [...] A ‘Division of Industrial Physics’ would work in exactly the opposite direction.”

Karl K. Darrow, “Current Trends in the American Physical Society,” *Journal of Applied Physics* 14, no. 9 (1943): 437.

II. DEFINING PHYSICS



Daniel J. Kevles

II. DEFINING PHYSICS

“Physics is what physicists do



Daniel J. Kevles

II. DEFINING PHYSICS

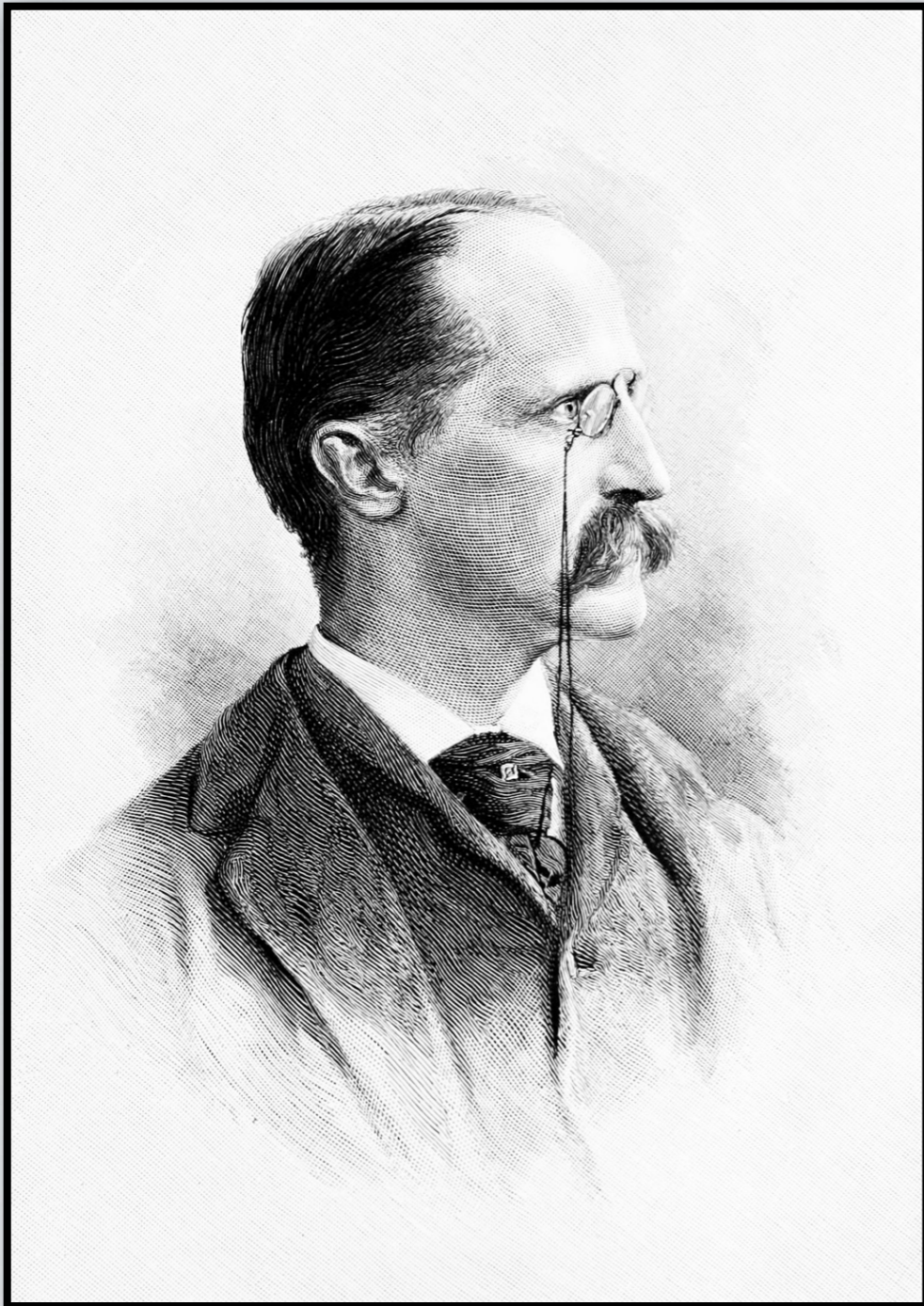


Daniel J. Kevles

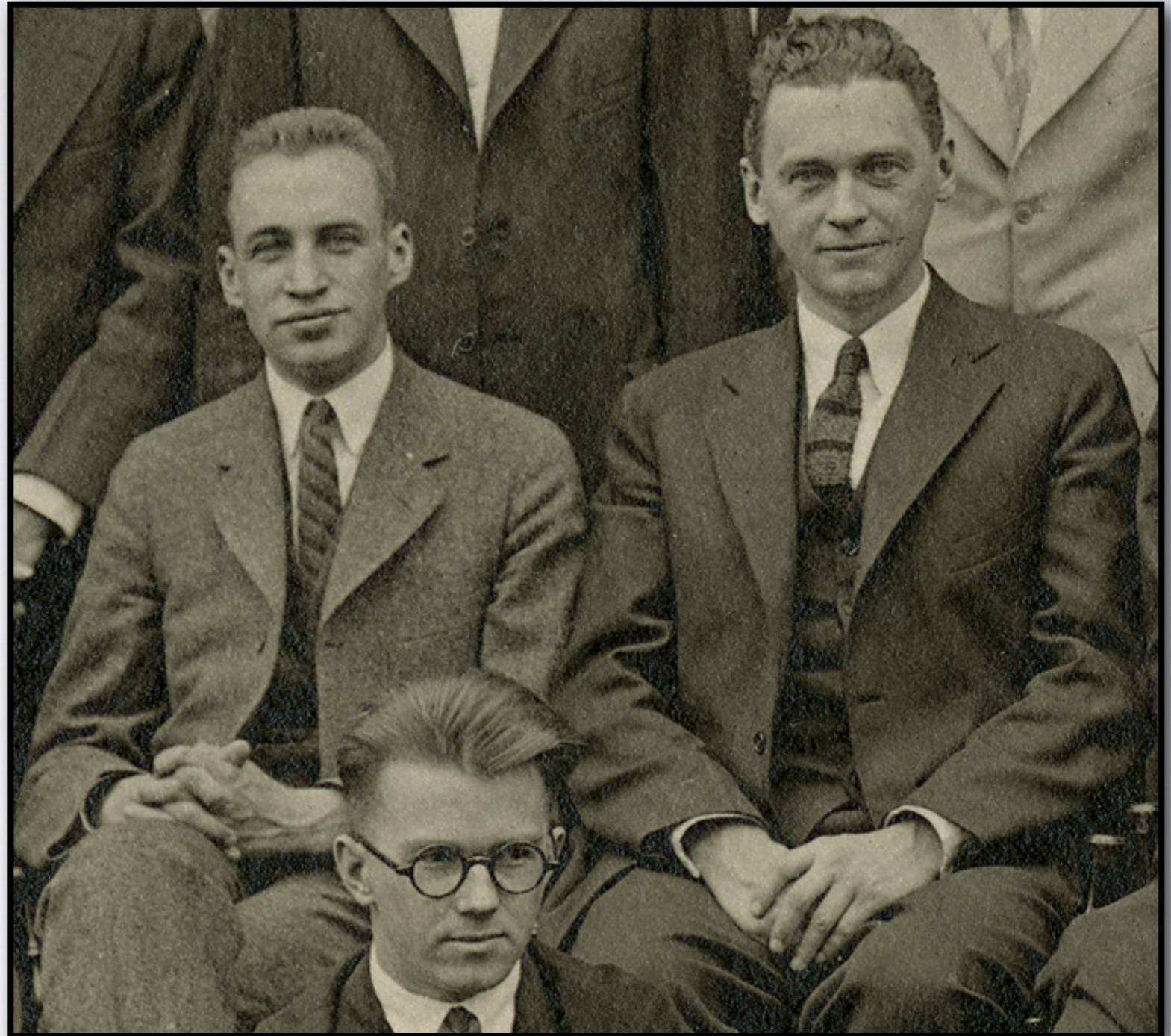
“Physics is what physicists do—or have done. The history of postwar physics is to be found not only in the great accelerator laboratories but also—perhaps even more—in the R&D installations of industry such as the Bell Telephone Laboratories and in the laboratories of the federal government.”

Daniel J. Kevles, “Cold War and Hot Physics: Science, Security, and the American State, 1945–56,” *Historical Studies in the Physical and Biological Sciences* 20, no. 2 (1990): 263.

II. DEFINING PHYSICS



Henry Rowland



John H. Van Vleck (L), Edward Hill (C), John T. Tate (R)

II. DEFINING PHYSICS



II. DEFINING PHYSICS

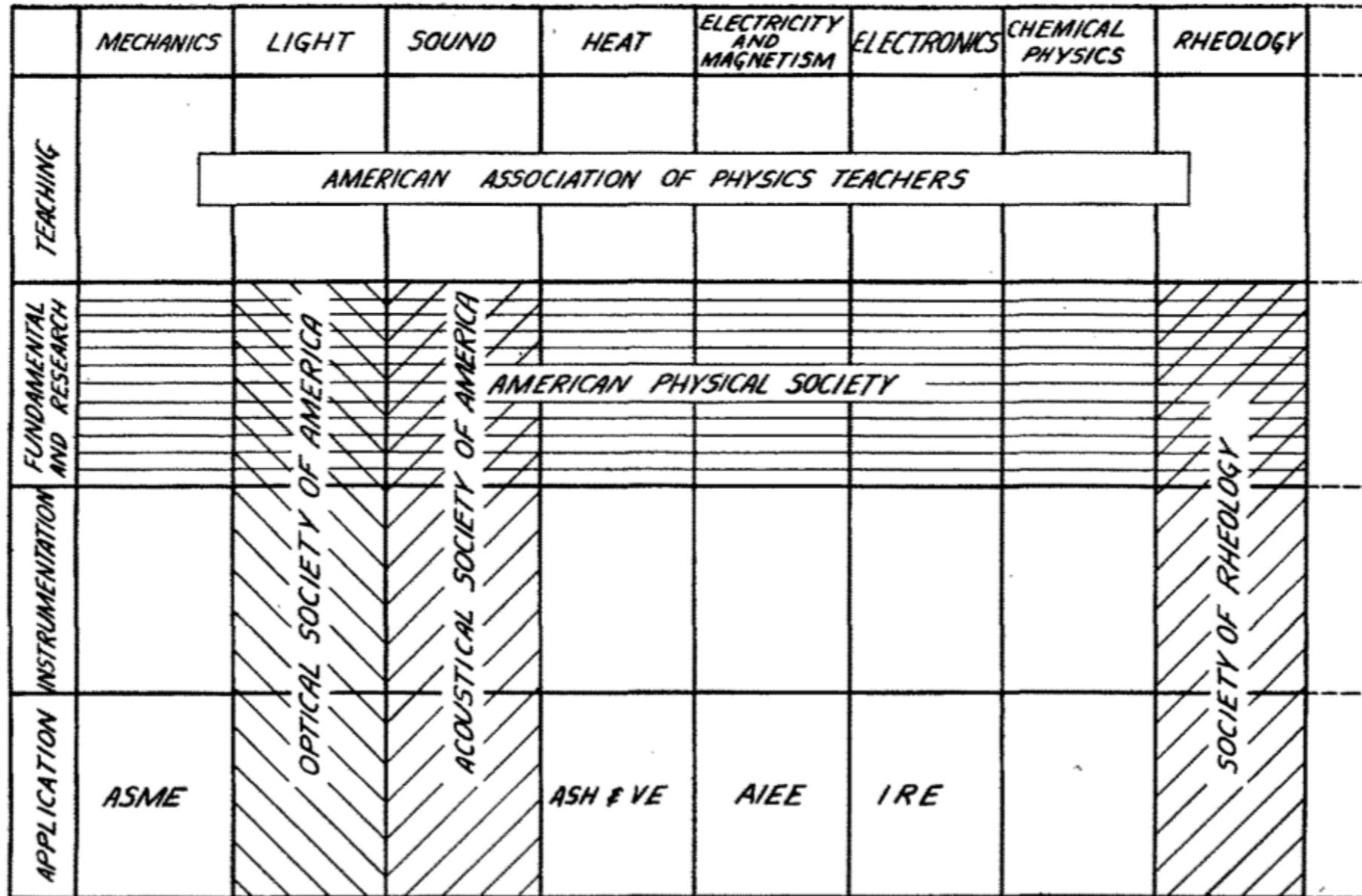
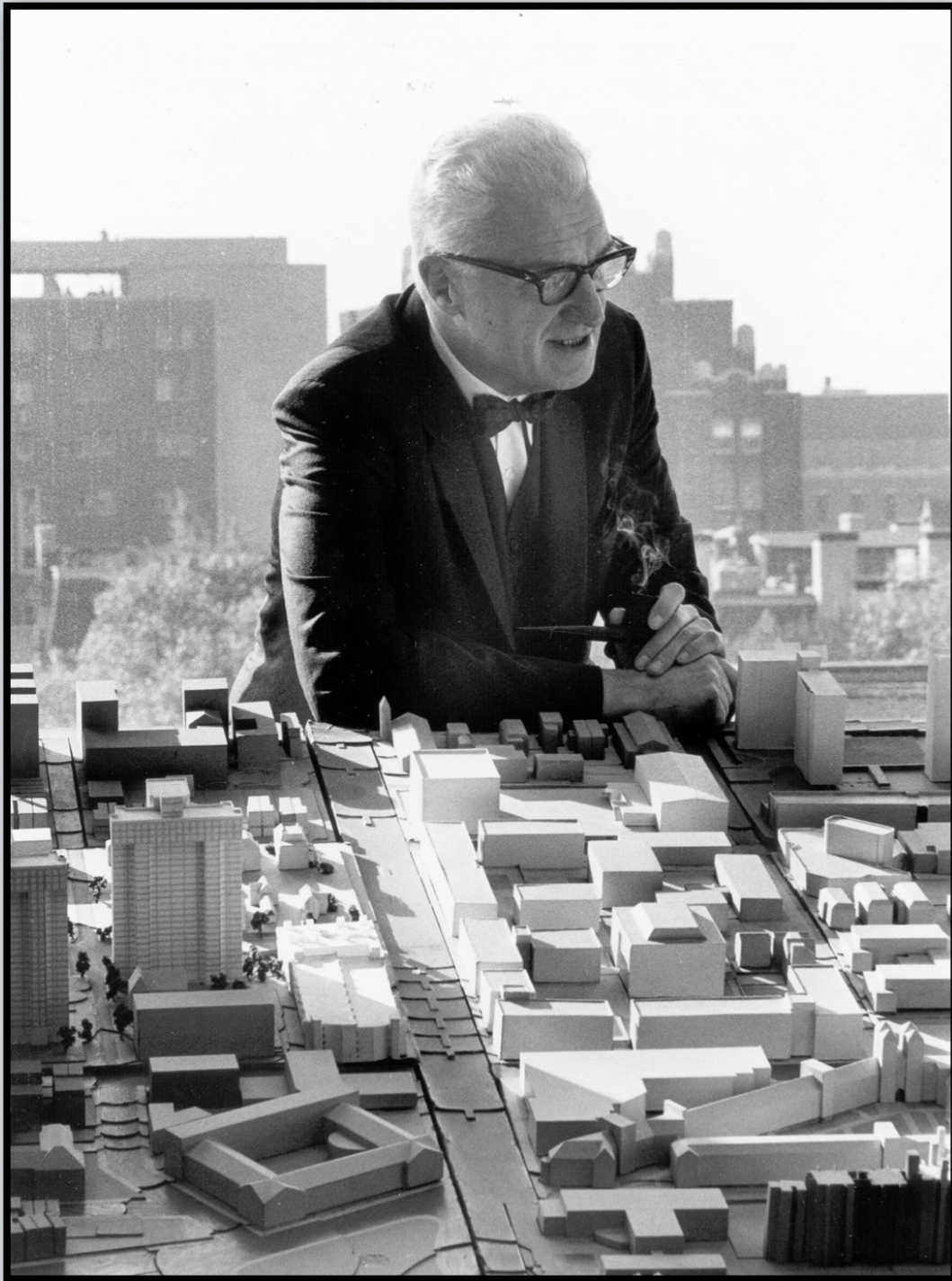


Diagram to illustrate the relation between the member societies of the American Institute of Physics to each other and to other related societies.

Wallace Waterfall and Elmer Hutchisson, "Organization of Physics in America," *Journal of Applied Physics* 15, no. 5 (1944): 408.

II. DEFINING PHYSICS



Gaylord Probasco Harnwell

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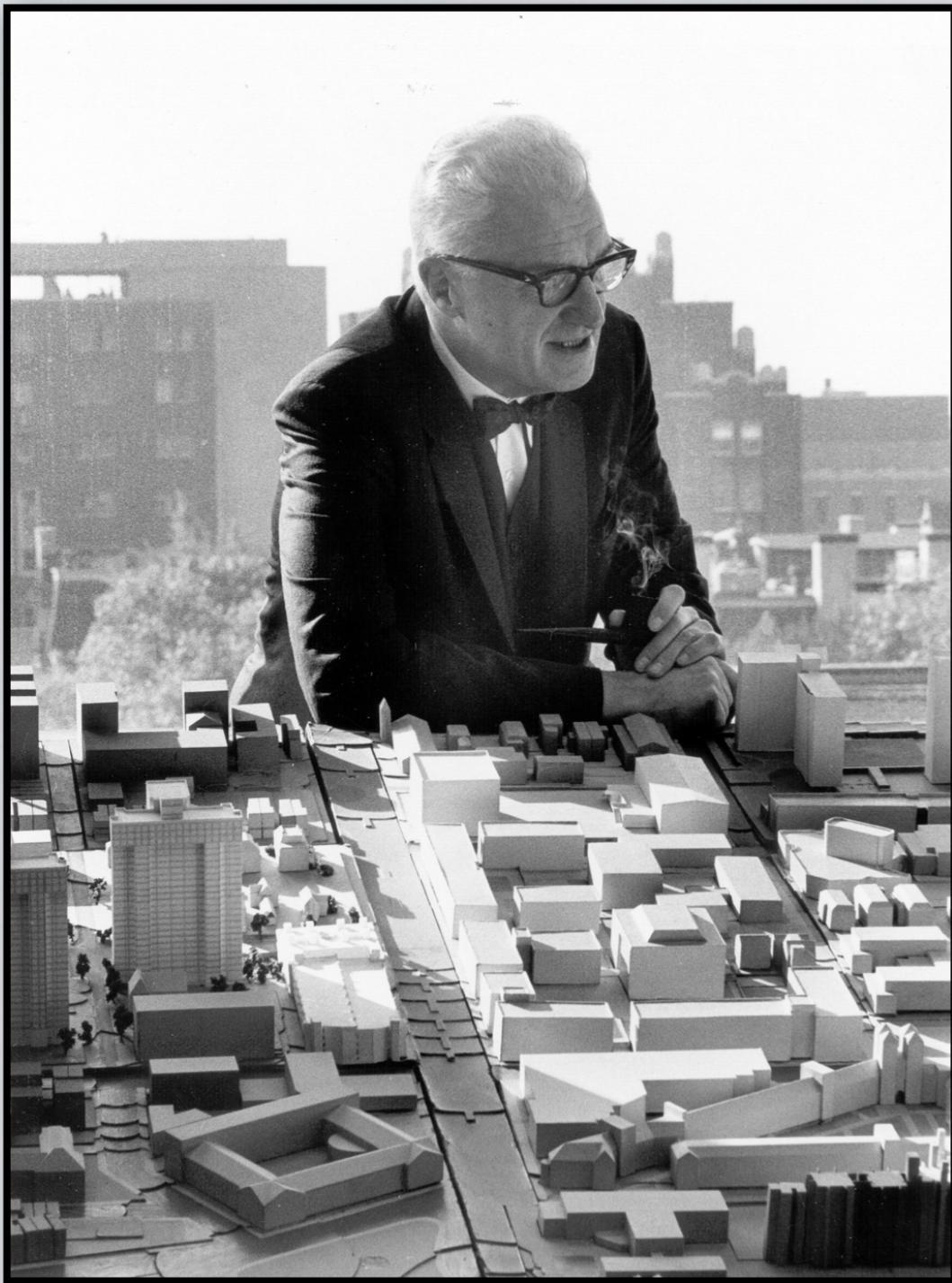
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II. DEFINING PHYSICS



Gaylord Probasco Harnwell

“There will be more physicists after the war, but the great majority of them will have the technical or craftsman's attitude toward the science rather than the professional or academic point of view.”

Gaylord P. Harnwell, “Research in Physics in the Postwar Period,” *Review of Scientific Instruments* 14, no. 8 (1943): 232–233.

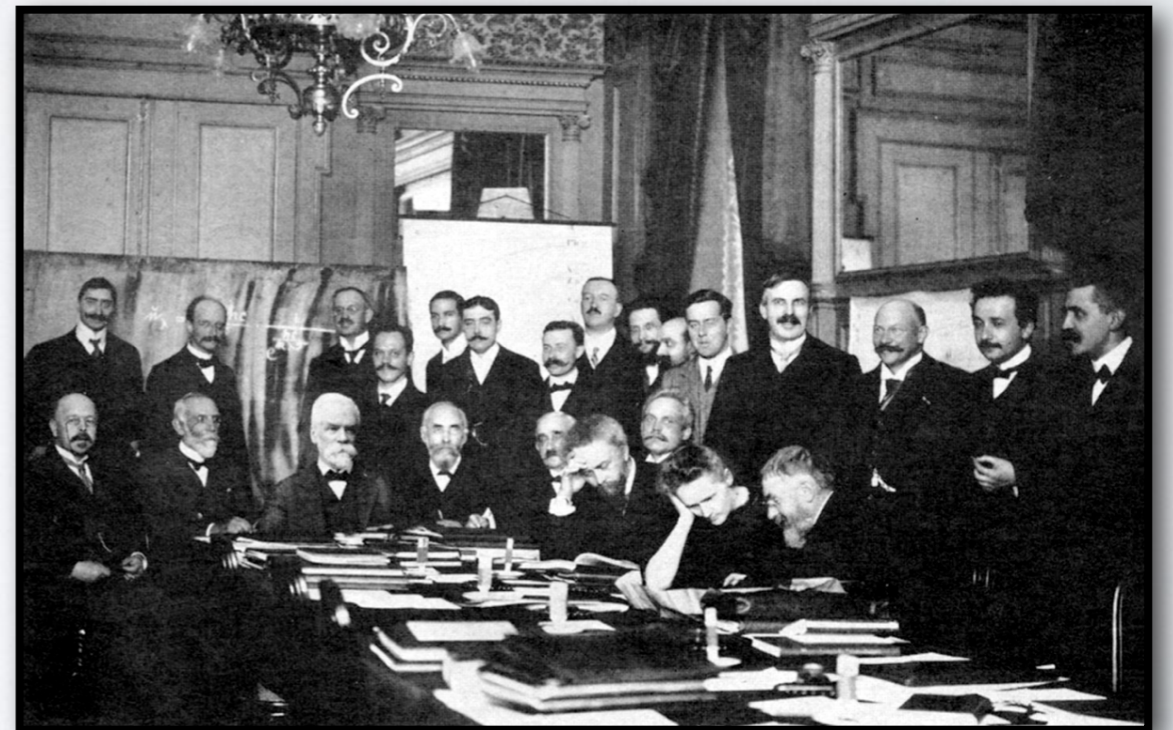
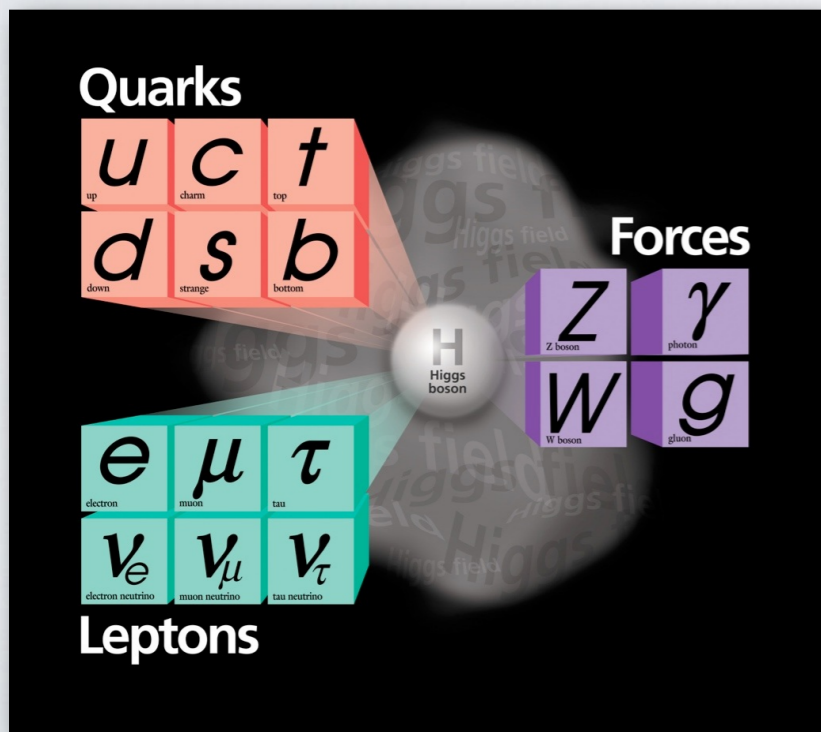
II. DEFINING PHYSICS

Naturalistic definition

Physics, *n.* – Empirically accessible, mathematically describable regularities in non-living systems.
(What physicists investigate.)

Community definition

Physics, *n.* – A community of scientists study non-living systems and the questions, methods, etc. they understand as their purview.
(What physicists do.)



III. THE EARLY DAYS OF SOLID STATE PHYSICS



Roman Smoluchowski, ca. 1944

III. THE EARLY DAYS OF SOLID STATE PHYSICS



Roman Smoluchowski, ca. 1944

Roman Smoluchowski, 1943:

“We can expect [...] a development of various branches of Pure and Applied Physics, and we would like them to remain branches of physics rather than to become new ‘pure sciences’ or new types of ‘engineering.’”

III. THE EARLY DAYS OF SOLID STATE PHYSICS

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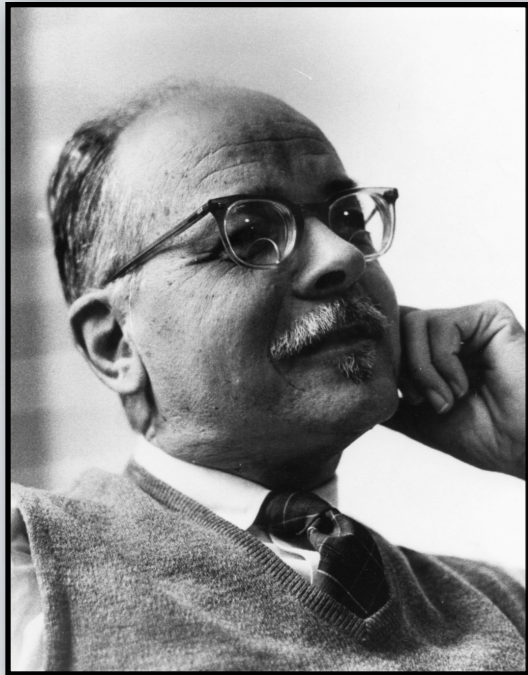
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III. THE EARLY DAYS OF SOLID STATE PHYSICS



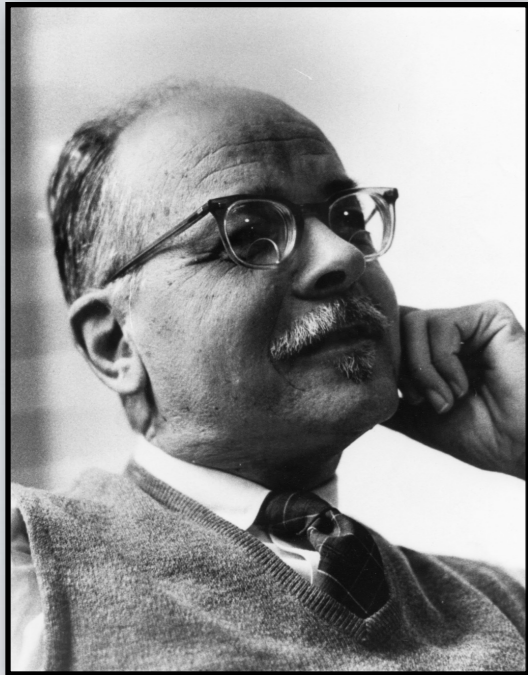
Gregory Wannier

Gregory H. Wannier, 1943:

“Solid state physics sounds kind of funny.”

Correspondence of Roman Smoluchowski, 1943–1947, Niels Bohr Library and Archives, Box 1, Folder 3.

III. THE EARLY DAYS OF SOLID STATE PHYSICS



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Gregory H. Wannier, 1943:

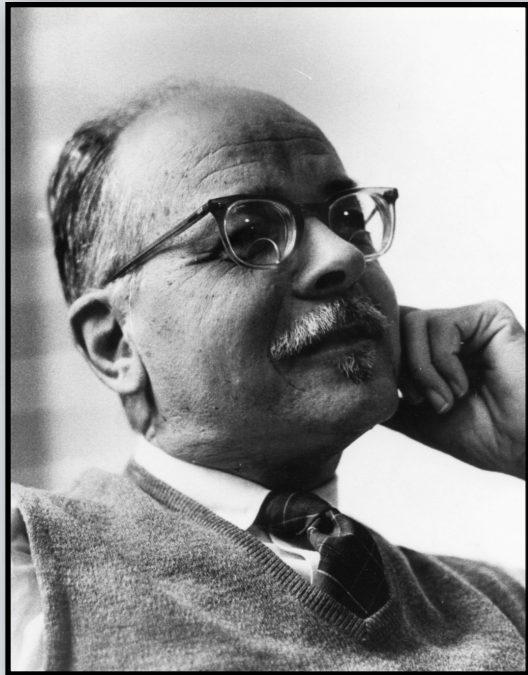
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Dwight Gray

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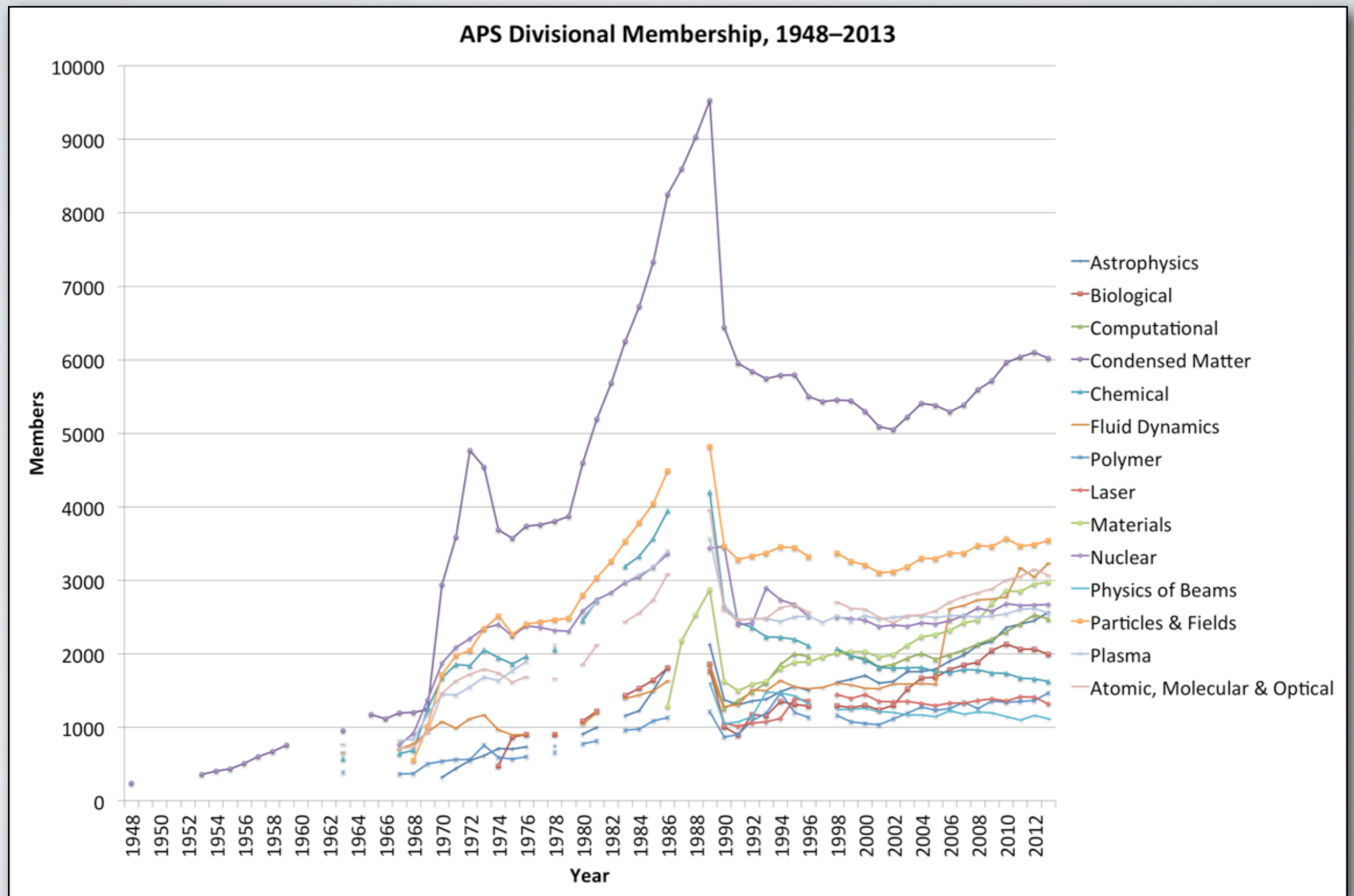
Dwight Gray

Dwight Gray, 1963:

“Adding [solid state] to the conventionally labeled group of mechanics, heat, acoustics, and so forth is ... like trying to divide people into women, men, girls, boys, and zither players.”

Dwight Gray, “The New AIP Handbook,” *Physics Today* 16, no. 7 (1963): 41.

III. THE EARLY DAYS OF SOLID STATE PHYSICS



IV. SUMMARY REFLECTIONS



V. EPILOGUE

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V. EPILOGUE

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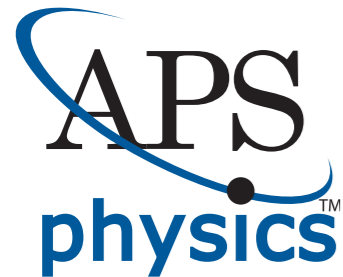
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