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## Physics in the Automotive Industry (APS/AAPT Topical Conference)

Edited by Frank E. Jamerson



**American Institute of Physics** 

## Physics in the Automotive Industry (APS/AAPT Topical Conference)





#### IN MEMORIAM

Dr. Daniel R. Gustafson 1937-1980 Chairman, Department of Physics Wayne State University

Dan Gustafson served as an untiring Secretary-Treasurer of the Organizing Committee of this Conference. Dan's sincere dedication and organizational ability significantly contributed to the success of the Conference. Subsequent to the Conference, Dan Gustafson died as a result of a water accident while on vacation. Dan's colleagues and friends will remember him as a thoughtful, dedicated man with a strong commitment to his professional field, physics.



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# Physics in the Automotive Industry (APS/AAPT Topical Conference)

Editor Frank E. Jamerson General Motors Research Laboratories

### American Institute of Physics New York 1981



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#### Conference Organization

An American Physical Society Topical Conference on Physics in the Automotive Industry was held at the Engineering Society of Detroit, Detroit, Michigan on May 15-16, 1980.

The planning for this Topical Conference was initiated in the Spring of 1979 by Dean William H. Kelly, Montana State University (then Chairman of the Physics Department at Michigan State University). Dean Kelly was charged by the American Physical Society via the Committee on the Applications of Physics to organize a Topical Conference relating to the automotive industry.

The objective of the Conference was: To introduce relevant physics within this industry to university and college faculty; to enhance the interaction between industrial and university researchers; and for university personnel to capture some of the research atmosphere in this industry. The Conference should be of interest to research students contemplating future industrial employment, faculty who are frequently asked about employment in industry, and to those actively pursuing or contemplating research in allied areas.

With this objective in mind, the members of the organizing committee and program committee developed the program now recorded in these proceedings. The members of these committees were:

#### Organizing Committee

- R. I. George, American Motors Corporation
- D. R. Gustafson, Wayne State University (Secretary-Treasurer)
- F. E. Jamerson, General Motors Corporation
- W. H. Kelly, Montana State University (Chairman)
- J. Lunan, Chrysler Corporation
- J. R. Reitz, Ford Motor Company
- R. H. Sands, University of Michigan
- P. A. Schroeder, Michigan State University

#### Program Committee

- D. R. Gustafson, Wayne State University (Chairman)
- R. E. Hetrick, Ford Motor Company
- F. E. Jamerson, General Motors Corporation

#### Sponsors

This Topical Conference was sponsored by the American Physical Society and the American Association of Physics Teachers. Wayne State University served as the host institution for conference planning and local arrangements. Additionally, the universities and corporations listed below were sponsors of this Topical Conference.

Income for this Conference was derived from generous contributions of a number of those automotive manufacturers and automotive supplier firms and universities shown as well as a nominal registration fee of \$35.

> American Physical Society American Association of Physics Teachers Michigan State University Montana State University University of Michigan Wayne State University American Motors Corporation Bendix Corporation Chrysler Corporation Ford Motor Company General Motors Corporation Kelsey-Hayes Rockwell International TRW

PREFACE

These Proceedings document the second meeting on Physics in the Automotive Industry. The first, a Symposium, was jointly sponsored by the American Institute of Physics and the Department of Physics, University of Michigan in 1938. Papers in that Symposium addressed the applications of physics measurement methods to processes such as combustion, materials, and mechanical structures. Of particular interest was Professor Richtmyer's talk at that Symposium on Physics in the Automotive Industry where he had some prophetic words, "Among the many fields of present-day physics which promise significant contributions to the automotive industry in the near future, is the physics of the 'solid state.'" Now, forty-two years later the automobile industry is producing vehicles with the electronic technology derived from the postwar explosion of solid state physics discoveries. Professor Richtmyer also closed his remarks with an emphasis on the "importance of better teamwork among pure scientists, applied scientists and engineers". He also was prophetic enough to know that, "When better automobiles are built, physics will help build them."

That Symposium was a very successful one and it was "hoped that it will bring about more applications of physics in the automobile industry."

There have been great advances in physics and in the automotive industry since this first Symposium but the need for a second Conference has only recently been raised. Communication between industrial and academic physicists has been enhanced in recent years through activities such as the Committee on Applications of Physics of the American Physical Society and the Corporate Associates of the American Institute of Physics. In addition, the American Association of Physics Teachers has been intimately involved in the APS Visiting Physicists program where company physicists visit college and university physics departments. The Committee on Applications of Physics has used the Topical Conference format for enhancing industrial/ academic interactions by organizing conferences for specific industries at locations in which these industries are prominent. The first such Topical Conference was held at Akron, Ohio, May 16, 1979 on Physics in the Tire Industry. In 1979, the Committee suggested that a Conference be held on Physics in the Automotive Industry and to be organized by Professor William H. Kelly, then Chairman of the Department of Physics, Michigan State University and also Vice-President of the AAPT. An organization committee was established that included representatives from universities and the automotive companies in the area around Detroit, Michigan where the conference was to be held.

In addition to invited talks, the conference provided for tours of the General Motors Research Laboratories and the Ford Scientific Laboratory as well as a panel discussion by representatives of the automotive industry. Moreover, the status of the automobile industry in 1980 was presented in the evening talk by Mr. Howard H. Kehrl, Executive Vice President of General Motors Corporation. Considerable opportunities were provided for the industrial researchers and faculty to interact and become acquainted with each other. The presented papers, discussion, and tours all served extremely well to fulfill the objective of this Topical Conference.

In 1938, the industry was using the physics tools of that period, such as absorption spectra of flames. Today we see the industry contributing to research at physics frontiers, in their application of new laser methods for combustion studies and theoretical studies of surface structure. This significant increase in depth and breadth of physics research, particularly at General Motors Corporation and Ford Motor Company, suggests that opportunities are available for fundamental as well as applied physics research in this industry. Although 1980 marks a year of significant economic stress for the automotive industry, the research physicists at this conference spoke with enthusiasm about how the results of their research would make a significant contribution to their company as well as to science. The present and future challenges in energy and materials impact greatly on the automotive industry, and it is clear that physics and physicists will have a significant part to play in the development of new technology. Beyond that, we believe it will be to the betterment of physics in both industry and academe if personal interactions such as those that took place in this conference were to be continued. We are pleased to learn that similar topical conferences on Physics in the Oil Industry and Physics in the Steel Industry are being planned.

Such a conference makes use of the generous time and talents of many people in the organizations that were involved. We appreciate the great deal of assistance and advice that William W. Havens, Jr. of the Americam Physical Society gave us in drawing the Conference together and for arranging for the publication of these Proceedings. We also wish to acknowledge that the design of the Conference logo was done by Oscar Fernandez of the School of Arts at Montana State University. However, we especially appreciate the efforts of Gayle Chlebnik of Wayne State University and Jane Fiebelkorn of General Motors Research Laboratories in making the conference itself run smoothly as well as in attending to the details of this Proceedings.

William H. Kelly

Frank E. Jamerson October 1980



Front: (L-R) John R. Reitz, William H. Kelly, Daniel R. Gustafson Back: (L-R) Frank E. Jamerson, William W. Havens, Robert E. Hetrick, James Lunan, Peter A. Schroeder



Panel Discussion (L-R) Patrick N. Keating, Frank E. Jamerson, George A. Ball, Roger I. George, John R. Reitz



William H. Kelly, Montana State University; Daniel R. Gustafson, Wayne State University; W. Dale Compton, Ford Motor Company; Nils L. Muench, General Motors Corporation (left to right).



Conference Attendees at Morning Session Engineering Society of Detroit



Evening Reception at Howard Johnson's, Detroit, Michigan



Lobby Conversations, Engineering Society of Detroit Detroit, Michigan

WEDNESDAY, 14 MAY 1980

Evening Reception

#### THURSDAY, 15 MAY 1980

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