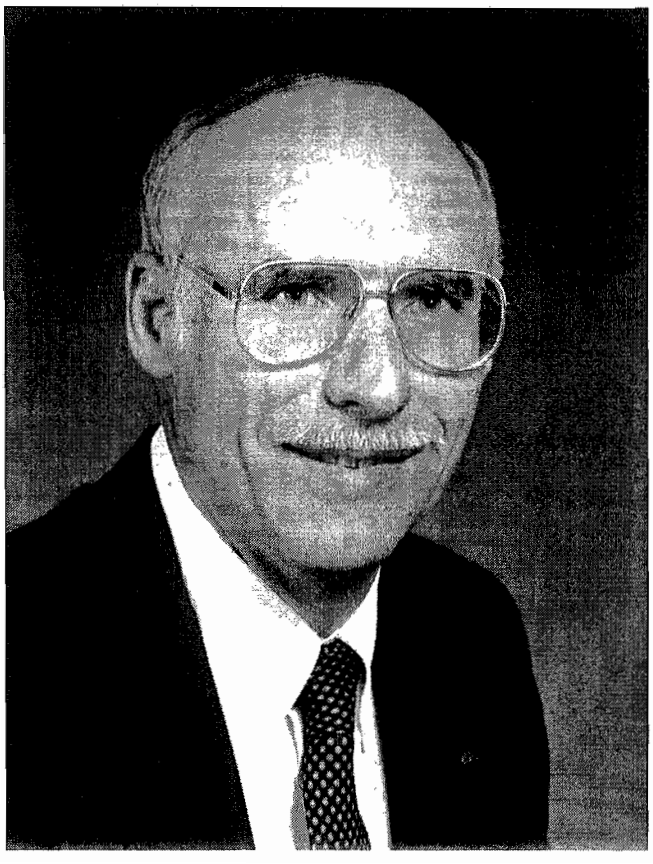
ARTHUR. E. BERGLES



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Professor Arthur E. Bergles has been one of the foremost articulators of the need for careful experimentation, appropriate numerical computing, and frequent interactions among various constituencies to achieve progress in the field of heat transfer. Indeed, drawing from the antecedents of pioneers in thermo-fluid sciences, for meeting the objectives of current research and practice, he has noted that "experimentation is necessary to resolve the complex problems that are encountered" [Bergles (1990a)]. Nevertheless, recognizing the increasing power and usage of computers, and their sophisticated application to complex problems, he continued "progress will depend on an expansion of capability in both experimentation and computation as well as synergistic interaction among practitioners in both arenas" [Bergles (1990a)] and among developers of information and users of information. Thus, his professional activities address fundamentals and practice, development and technology transfer, and education and training.

Born in Rhinebeck, New York on August 9, 1935, Arthur E. Bergles received his SB and SM degrees in 1958 and his Ph.D in 1962, all in mechanical engineering from MIT. He began is university career as a professor at the Massachusetts Institute of Technology (1963–1970), continued in this role at the Georgia Institute of Technology (1970–1972), at the Iowa State University (1972–1986), where he was Anson Marston Distinguished Professor of Engineering and department chair and at the Rensselaer Polytechnic Institute, where he has served as Dean of Engineering and is the Clark and Crossan Professor of Engineering. In addition, he has been a visiting professor at the University of Hannover and the Danish Technical University, and was Academic Guest at Lodz Technical University.

Art Bergles has earned numerous awards and honors for his professional contributions. He was elected to the National Academy of Engineering in 1992, and he is a Fellow of the ASME (1979), ASEE (1985), AAAS (1988), and ASHRAE (1992). Furthermore, his honors include the Alexander Von Humbolt Award (1979), ASME's Dedicated Service Award (1984), SAE's Ralph R. Teetor Educational Award (1984), ASEE's Benjamin Garver Lamme Medal (1987), the AIChE Donald Q. Kern Award (1990), the ASEE Centennial Certificate and Medallion (1993), and the ASME-AIChE Max Jacob Memorial Award (1995). Some of his other recognitions are Purdue University Hawkins Memorial Lecturer (1986), Foreign Member of the Polish Society of Theoretical and Applied Mechanics (1987), 50th Anniversary Award of the ASME Heat Transfer Division (1988), Fellowship Award of the International Center for Heat and Mass Transfer (1988), and Honorary Member of the Union of

Mechanical and Electrical Engineers and Technicians of Yugoslavia (1993). In 1996, he was elevated to the ASME grade of honorary membership which is ASME's highest grade of membership.

Professor Bergles is or has been an editor or on the editorial board of *Journal of Heat Transfer, International Journal of Heat and Mass Transfer, International Communications in Heat and Mass Transfer, Experimental Thermal and Fluid Science, Journal of Enhanced Heat Transfer, Heat Transfer Engineering, HVAC&R Research, Applied Mechanics Reviews, Heat Transfer–Japanese Research, Heat Transfer-Soviet Research, International Series in Heat Mass Transfer, Bulletin of the International Center for Heat and Mass Transfer, Journal of Engineering Physics, International Journal of Heat and Technology, European Journal of Mechanical Engineering, Journal of Thermal Science, Latin American Journal of Heat and Mass Transfer, Latin American Applied Research,* and *Springer Mechanical Engineering Series.* His contributions to the archival literature include more than 300 published papers, and over 20 books or edited volumes. In addition, he has lectured in or organized over 40 short courses for universities, professional organizations, and industries and has helped organize numerous international meetings. He has presented over 280 invited lectures and speeches at U.S. and foreign universities, industrial organizations and professional societies.

Arthur Bergles' research has spanned the field of convective and ebullient heat transfer. His publications cover single- and two-phase flows in a variety of flow configurations, regimes, and applications. While Art and his students have performed some numerical and analytical studies, most of his work has been directed toward experimental investigations. One of his major strengths is the ability to extract and deduce from experimental data the physics governing a process. This insight has provided the starting point for other researchers to investigate the process farther. A detailed review of Art's wide-ranging contributions to the field is not possible in this short summary (an extended discussion is provided in the article by Professor S. G. Kandlikar). However, two areas of heat transfer in which he has made very significant contributions can be pointed out. These are in enhanced heat transfer and electronics cooling. Art has played a pivotal role in both fields.

Professor Bergles produced the first large review of enhanced heat transfer and developed the taxonomy for the classification of the various enhancement techniques. For the evaluation and use of these techniques, he has performed numerous fundamental and applied studies and he has relentlessly pushed for the adoption of enhancement technologies by the industry. As a result of this effort over the past

three decades, work in "heat transfer enhancement has grown at a rapid rate to the point where it can be regarded as a major field of endeavor, *a second-generation heat transfer technology*," [Bergles (1988a)] with many new and exciting developments reported in the literature. However, "of greatest significance perhaps is the extent to which the more effective and feasible techniques are graduating from the laboratory to full scale industrial equipment" [Bergles (1988b)]. In fact, Art truly has defined the field of enhanced heat transfer and his philosophical focus on this important subject is perhaps articulated by the logo used in the Heat Transfer Laboratory at the Rensselaer Polytechnic Institute. Furthermore, he was one of the first researchers to become involved in electronics cooling. His foresight was remarkable, as it is now recognized that many of the electronic devices/computers we take for granted could not operate as designed without significant cooling. This is reflected, for example, in his observation that "thermal problems [in electronics cooling] are so pervasive that they are spotlighted" and "research and development will be increasingly important to provide adequate thermal control for future microelectronic devices of extremely small scale" [Bergles (1990b)]. His leadership in this field is credited not only to his research accomplishments, but also to his interactions with industry.

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Through his work, Art has always emphasized the applied aspects of fundamental research. He has strived to discover why something occurred, but at the same time he has endeavored to show how the results ultimately might be applied in industry. This balance in his work is continuing evidence of his desire to encourage more and better interactions between researchers and universities on the one hand, and designers and industrial organizations on the other. He recognizes the need for this cooperation for the betterment of the U.S.A., and the larger global community.

Professor Bergles' career has been spent in universities. During this time he has supervised over 88 PhD dissertations, MS theses and research reports. A list of his students is provided herein at the end of this brief biography. He has always balanced the need to educate and train his graduate students with the demands of the research

project. He would push them to achieve more and to delve deeper into the process or phenomena under study, while at the same time he would engage in extended discussions and explanations so that the students could grow professionally. This educational approach is evident not only in his research, but also in the many courses he teaches to both undergraduate and graduate students; his lectures are always well prepared with clear explanations of major points, and they reflect his keen desire to pass on his knowledge. Art's commitment to education extends beyond the classroom through the many short courses he has offered to industry, professional societies, and universities.

In the area of leadership and service to the field of heat transfer few can match Art's accomplishments. He has been active on numerous committees of the ASME, AIChE, ASHRAE, ASEE, and other professional organizations. He has been chair of the ASME Heat Transfer Division, a representative to the Assembly for International Heat Transfer, and chair of the NSF Advisory Committee for Chemical, Biochemical, and Thermal Engineering, among others. He was chosen to be the chair of the U.S. study group to develop a cooperative program in heat and mass transfer with the former U.S.S.R. He is the current chairman of the International Center for Heat and Mass Transfer. His leadership has extended beyond the heat transfer field, as evidenced by his activities in the ASME (president of the society in 1990–1991, member of the Board of Governors, and other offices), and membership of the NSF Advisory Committee for Engineering. He has been tireless in the giving of his time and efforts to advance the field of heat transfer, and of engineering in general.

Because of his numerous research and service activities, Art is recognized worldwide as a leader in the field. His recent election to the National Academy of Engineering and elevation to Honorary Member of ASME are tributes to the high regard felt for Art by his many colleagues and friends. This esteem is not just based on his technical achievements, but also on the manner in which he has conducted himself throughout these years. He is patient, encouraging and supportive, has a calm demeanor, and is a thorough gentleman at all times. This has won him many friends around the world. On behalf of these friends and colleagues, we wish him well.

REFERENCES

Bergles, A. E., 1988a, "Some Perspectives on Enhanced Heat Transfer – Second-Generation Heat Transfer Technology," *Journal of Heat Transfer*, Vol 110, 1082–1096.

Bergles, A. E., 1988b, "Enhanced of Convective Heat Transfer –Newton's Legacy Pursued," Essays in honor of the 50th anniversary of the ASME Heat Transfer Division, ASME, New York, NY.

Bergles, A. E., 1990a, "The Role of Experimentation in Thermofluid Sciences," *Experimental Thermal Fluid Sciences*, Vol 3, 2–13.

Bergles, A. E., 1990b, *Heat Transfer in Electronic and Microelectronic Equipment*, Hemisphere Publishing Co., New York, NY.

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