

Preface

Research in two-phase flow and heat transfer with change of phase currently emphasizes the dynamics of two-phase flows, flow boiling, and flow condensation. This work is motivated in large part by the great need to understand better the physical phenomena taking place in various conventional and nuclear energy conversion/production systems. This research is directed to developing the capability to improve thermal efficiency and to optimize the design of such systems, and more precisely evaluate the safety aspects of these systems. Major research programs are being conducted in government, industry, and university laboratories in both Japan and the United States. The Japanese work is characterized as rather fundamental whereas the U.S. workers have a tendency to deal with more applied work.

The importance and value of a joint Japan-U.S. seminar was recognized in 1979 when the first seminar on Two-Phase Flow Dynamics, cosponsored by the Japan Society for the Promotion of Science and the U.S. National Science Foundation, was held at the University Seminar House in Kansai. Five years later, the second seminar similarly cosponsored was held in Lake Placid, New York. During these intensive interaction periods, a valuable exchange of information occurred in the technology of multiphase dynamics. As a result of these seminars, considerable collaborative research and much interchange between researchers in the two countries was initiated.

The research field on two-phase flow had grown in the four intervening years to the time when this Third Japan-U.S. Seminar on Two-Phase Flow Dynamics was held in July of 1988 at Lake Biwa, Japan. This seminar, too, was jointly sponsored by the JSPS and the USNSF. Emphasis had been on developing a better understanding of the physics of the phenomena and improvements in dynamic analysis of normal transient or accident situations. Therefore, the holding of this third seminar was especially appropriate and beneficial to all parties. This volume, therefore, represents a distillation of the research reported during this meeting.

The seminar featured a broad review of the status of research relating to two-phase flow dynamics both with and without phase change. The papers fall into several categories which formed the natural grouping for the seminar, and for this volume, These major groupings are:

1. Fundamental equations and closure laws;
2. Flow regime modeling and dynamics;
3. Phase separation and distribution phenomena;
4. Wave and shock phenomena and critical flows;
5. Forced convective and post-dryout heat transfer.

In the final analysis, the value of any gathering such as this can only be judged in relation to the lasting effects as evidenced in the direction and quality of research which follows. The exchange of information by these two active nations is expected to substantially enhance progress in many areas of energy conversion including power plant efficiency, reliability, and safety. Ultimately, it is hoped that the seminar will lead to an improved understanding of process and system behavior, which in turn will lead to improved safety, longevity, and optimization of operational efficiencies of future energy conversion systems which utilize multiphase flows.

Finally, the organizers of the Japan-U.S. Seminar on Two-Phase Flow Dynamics would be remiss if they did not acknowledge the vision and foresight of Professor Arthur E. Bergles, Dean of Engineering at Rensselaer Polytechnic Institute, and Professor Seikan Ishigai, Professor Emeritus of Osaka University who jointly conceived and organized the first seminar a decade ago. It was through their efforts that this has become a successful series of quadrennial events. The second seminar in 1984 was jointly organized by Professor Koji Akagawa, Professor Emeritus of Kobe University, and Professor Owen C. Jones of Rensselaer Polytechnic Institute. In addition, the editors of this volume would also be negligent if they did not recognize the kind support of the Japanese Society for the Promotion of Science and the United States National Science Foundation, and for all institutions and companies which provided support for members of their organizations to participate in the seminar. This support provides extremely high leverage for continued collaboration and progress in the field.

In closing, the editors would like to express thanks to members of their respective organizations who provided valuable assistance and support in the planning, preparation, and conduct of the seminar. This support was the key to conducting a successful seminar and developing what we hope will be a useful compendium of research papers in the field.

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