

A Sixteenth Successful Year for *JTHT*

SUPPORT from the thermophysics and heat transfer community for the *Journal of Thermophysics and Heat Transfer (JTHT)* continues to be good. However, the downturn in the aerospace industry continues to cause a reduction in the number of submissions. Between October 31, 2001 and November 1, 2002, 133 papers were submitted to *JTHT* with 41% originating from technical meetings. During this same time period, over 290 reviews were completed by volunteers to ensure the quality of *JTHT*. The average time between the receipt of a manuscript and the Associate Editor's decision to accept or revise was 3.7 months for the articles appearing in 2002. The average time between final acceptance and publication was 5.3 months. The total number of pages was 606, and all four issues of Volume 16 were on schedule.

A Full-Spectrum Publication

It should be re-emphasized that *JTHT* is a full-spectrum publication in the field of thermophysics and heat transfer, a breadth illustrated by the following list of pertinent topics:

<i>Aerothermodynamics</i>	<i>Radiative Heat Transfer</i>
Re-entry	Surface interchange
Thermal protection	Absorbing-emitting media
Low density	Multiple scattering
Laser interaction	Nongray analysis
Ablation	Multidimensional
Plumes	Coupled with conduction
Computational	Coupled with convection
<i>Thermal Control</i>	<i>Conduction/Phase Change</i>
Heat pipes	Contact conductance
Thermal modeling	Composite materials
Electronics cooling	Inverse problems
Large space structures	Conjugate problems
Contamination	Nonlinear problems
Cryogenics	Analytical techniques
Insulation	Melting/solidification
<i>Nonintrusive Diagnostics</i>	<i>Convective Heat Transfer</i>
IR signatures	Forced convection
Remote sensing	Natural convection
Laser techniques	Mixed convection
Particle sizing	Internal/external flows
Scattering techniques	Boiling/condensation
<i>Thermophysical Properties</i>	<i>Numerical Heat Transfer</i>
Thermodynamic	Finite difference
Transport	Finite element
Optical/radiative	Parallel processing

A discipline-oriented publication, *JTHT* presents both original contributions of a fundamental nature and application-type papers. Analytical, numerical, and experimental approaches are all encouraged. Papers on the topics of aerothermodynamics, thermal control, and numerical heat transfer are especially encouraged. Although *JTHT* is published by AIAA, papers are not restricted to aerospace topics. Authors from the international thermophysics and heat transfer community are invited to submit papers.

Accuracy and Ethics

The AIAA Publications Committee approved the following: "The AIAA journals will not accept for publication any paper reporting (1) numerical solutions of an engineering problem that fails to adequately address the accuracy of the computed results or (2) experimental results unless the accuracy of the data is adequately presented." The purpose of this statement is to reiterate the desire to have high quality investigations with properly documented results

published in the AIAA journals and to clarify acceptable standards for presentation of numerical and experimental results. The editors and reviewers will remain the final judges. An ethical standards document was also approved by the Publications Committee and is reproduced in its entirety elsewhere in this issue. Prospective authors and reviewers are encouraged to study it carefully.

Manuscript Submission

Authors are requested to prepare their manuscripts electronically to reduce publication delays. AIAA is developing a web-based manuscript tracking system called WriteTrack™. Sometime, early in 2003, authors will be able to submit their manuscripts to *JTHT* using WriteTrack™. Please check AIAA's Web site at www.aiaa.org for more details.

2002 AIAA Thermophysics Award Recipient

Dr. Frederick Blottner, Distinguished Member of Technical Staff



at Sandia National Laboratories in Albuquerque, New Mexico, was selected as the 2002 recipient of the AIAA Thermophysics Award. Dr. Blottner was chosen for his distinguished career; outstanding contributions toward the development of accurate numerical techniques for high-speed, chemically reacting boundary layer and Navier–Stokes flows which form the basis of modern compressible

fluid dynamics and heat transfer prediction techniques for supersonic and hypersonic flows; and mentoring of young engineers. The AIAA Thermophysics Award is presented for an outstanding singular or sustained technical or scientific contribution by an individual in thermophysics, specifically as related to the properties and mechanisms involved in thermal energy transfer and the study of environmental effects on such properties and mechanisms. The Thermophysics Award was presented to him at the 8th AIAA/ASME Joint Thermophysics and Heat Transfer Conferences in June 2002 at St. Louis, Missouri.

2003 Editorial Team

The editorial team includes Associate Editors and members of the Editorial Advisory Board. The Associate Editors are responsible for the technical evaluation of manuscripts, and the burden of maintaining quality rests predominantly with them. John T. Howe has retired from the Editorial Advisory Board after serving for 16 years. Photographs and biographies of the 2003 team are included in this issue. I encourage you to discuss your views of *JTHT* with members of the editorial team.

Chang-Lin Tien

Professor Chang-Lin Tien, a member of the *JTHT* Editorial Advisory Board since 1987, died on



October 29, 2002 after a prolonged illness. He was known for his pioneering work and visionary leadership in thermal radiation, thermal insulation, and microscale heat transfer. Professor Tien was the second recipient of the AIAA Thermophysics Award and a Fellow of AIAA. He will be missed by his many friends in the thermophysics and heat transfer community.

Appreciation

I would like to express my personal thanks to the authors who have chosen *JTHT* as the vehicle for their research work. I also want to thank the reviewers who have contributed their time to ensure the success of *JTHT*. Their names are listed in this issue. Finally, I would like to express my appreciation to Luke McCabe (Managing

Editor), Nancy Hulan (Techbooks), and Norma Brennan (Director of Publications) for their help in keeping *JTHT* on schedule.

Alfred L. Crosbie
Editor-in-Chief

Editor-in-Chief



ALFRED L. CROSBIE, Curators' Professor of Mechanical Engineering at the University of Missouri-Rolla, received his B.S. from the University of Oklahoma in 1964, his M.S. in 1966, and his Ph.D. in 1969 from Purdue University, all in mechanical engineering. He joined the faculty of the University of Missouri-Rolla in 1968, where he was promoted to Professor in 1975. He has been an active researcher in the field of radiative heat transfer since 1964. His current research interests include multidimensional radiative heat transfer, multiple scattering, numerical heat transfer, and laser interaction. Dr. Crosbie has served as a member of the AIAA Thermophysics Technical Committee (1976–78), Technical Program Chairman for the AIAA 15th Thermophysics Conference (1980), Editor of two thermophysics volumes in the AIAA Progress in Astronautics and Aeronautics book series (1981), Associate Editor for the *AIAA Journal* (1981–83), and Chairman of the AIAA Thermophysics Technical Committee (1984–86). He is a Fellow of AIAA, AAAS, and ASME, a recipient of the AIAA Thermophysics Award (1987) and the ASME Heat Transfer Memorial Award (1990), and an Associate Editor for the *Journal of Quantitative Spectroscopy and Radiative Transfer* (1979–2005). He was a member of the Editorial Advisory Board for *Heat Transfer—Recent Contents* (1996–2000). Dr. Crosbie is the author or coauthor of over 80 papers in archival journals.

Associate Editors



RICHARD O. BUCKIUS, Professor of Mechanical Engineering and Head of the Department of Mechanical and Industrial Engineering at the University of Illinois at Urbana-Champaign (UIUC), received his B.S. in 1972, M.S. in 1973, and Ph.D. in 1975 from the University of California, Berkeley, all in mechanical engineering. He joined the faculty of UIUC in 1975, where he was promoted to Professor in 1984. He served as Program Director of the Thermal Systems and Engineering Program at the National Science Foundation (1987–88). His research interests include radiative heat transfer, Monte Carlo methods in scattering media, and scattering from rough interfaces. Dr. Buckius was a member of the AIAA Thermophysics Technical Committee (1984–87), Technical Program Chair of the AIAA 22nd Thermophysics Conference (1987), and an Associate Technical Editor of *ASME Journal of Heat Transfer* (1987–92). He is a Fellow of ASME and an Associate Fellow of AIAA. He is a member of the Editorial Advisory Board of *Microscale Thermophysical Engineering*, *Heat Transfer Research*, and *Heat Transfer—Japanese Research*. He is author or coauthor of over 80 papers in archival journals and a textbook on thermodynamics.



PING CHENG, Professor of Mechanical Engineering at the Hong Kong University of Science and Technology (HKUST), received his B.S. in mechanical engineering from Oklahoma State University in 1958, his M.S. in mechanical engineering from the Massachusetts Institute of Technology in 1960, and his Ph.D. in aeronautics and astronautics from Stanford University in 1965. Before joining HKUST in 1995, he held positions at New York University (1965–67), NASA Ames Research Center (1967–68), National Taiwan University (1968–70), and the University of Hawaii (1970–94). His recent research centers on convection, boiling and condensation in porous media, reciprocating flow and oscillatory heat transfer and transport processes in micro-systems. Dr. Cheng is a member of the AIAA Thermophysics Technical Committee and is a Fellow of ASME and Associate Fellow of AIAA. He is the author or coauthor of over 160 publications. He has also contributed chapters on heat transfer in geothermal systems and porous media to *Advances in Heat Transfer*, *Handbook of Heat Transfer Applications*, and *Annual Review of Heat Transfer*. He is a member of the editorial board of the *International Journal of Heat and Mass Transfer*, *Numerical Heat Transfer*, *Experimental Heat Transfer*, *Journal of Porous Media*, and *Revue Générale de Thermique*. He is a recipient of the ASME Heat Transfer Memorial Award (1996).



RONALD L. DOUGHERTY, Professor and Chair of Mechanical Engineering at the University of Kansas (KU), received his B.S. in 1972, M.S. in 1974, and Ph.D. in 1978 from the University of Missouri-Rolla, all in mechanical engineering. Before joining KU in 1999, he held positions at Pratt-Whitney Aircraft (1978–83), Terra Tek, Inc. (1983–85), and Oklahoma State University (1985–99). His recent research centers on radiative transfer in participating media, dynamic light scattering/photon spectroscopy, and particle characterization by nonintrusive laser diagnostics. Dr. Dougherty was a member of the AIAA Thermophysics Technical Committee (1986–89), Thermophysics Technical Program Chair at the AIAA 30th Aerospace Sciences Meeting (1992), and Chair of the Oklahoma Section of AIAA (1995–96). He has been a member of the American Society of Mechanical Engineers Heat Transfer Division's committee on Theory and Fundamental Research since 1993. He has chaired 10 thermophysics sessions at AIAA meetings. He is the author or coauthor of over 40 publications.



H. FREDERICK NELSON, Professor of Aerospace Engineering at the University of Missouri–Rolla, received his B.S. in Aerospace Engineering from Iowa State University in 1961, and his M.S. and Ph.D. in Aeronautical Engineering from Purdue University in 1964 and 1968, respectively. He joined the faculty of the University of Missouri–Rolla in 1968, where he was promoted to Professor in 1978. He has taken sabbatical leaves at the Jet Propulsion Laboratory (1974–75), Rocket Propulsion Laboratory at Edwards (1981–82), and NASA Ames Research Center (1988–89). His research interests include aerothermodynamics of planetary entry, nonequilibrium ionization and chemistry in gas dynamics, shock wave structure, and plume radiation. Dr. Nelson was a member of the AIAA Thermophysics Technical Committee (1979–81, 89), General Program Chairman of the 19th AIAA Thermophysics Conference (1984), Chairman of the AIAA Thermophysics Technical Committee (1990–92), and Editor of a thermophysics volume in the AIAA Progress in Astronautics and Aeronautics book series (1985). He is an Associate Fellow of AIAA and a recipient of the AIAA National Faculty Advisor Award (1991). Dr. Nelson is author or coauthor of over 70 papers in archival journals.



GEORGE P. "BUD" PETERSON, Provost at Rensselaer Polytechnic Institute, received his B.S. in mechanical engineering in 1975, his B.S. in mathematics in 1977, and his M.S. in engineering in 1980, all from Kansas State University, and his Ph.D. in mechanical engineering from Texas A&M University in 1981. He joined the faculty of Texas A&M University in 1981, where he was promoted to Professor in 1990, Tenneco Professor in 1991, Head of Mechanical Engineering in 1993, Associate Vice-Chancellor and Executive Associate Dean of Engineering in 1996. He served as Program Director of Thermal Transport and Thermal Processing at the National Science Foundation (1993–94). His research interests include phase change heat transfer, thermal control, conduction, and thermal contact resistance. He was a member of the AIAA Thermophysics Technical Committee (1986–89) and AIAA representative to the National Heat Transfer Conference (1990–93). He was an Associate Editor of the *Journal of Energy Resources Technology* (1986–92) and Editor of *Heat Transfer—Recent Contents* (1992–95). He is an Editor for *Experimental and Fluid Sciences* and *Microscale Thermophysical Engineering* and an Associate Editor for the *Journal of Heat Transfer* and the *Journal of Heat and Fluid Flow*. Dr. Peterson is a Fellow of ASME and AIAA and a recipient of the AIAA Award for Best Technical Paper in Thermophysics (1991) and of the AIAA Thermophysics Award (1996). He is the author or coauthor of over 130 papers in archival journals, seven book chapters, and a textbook on heat pipes.



ALLIE M. SMITH, Emeritus Dean of Engineering and Professor of Mechanical Engineering at the University of Mississippi, received his B.S. in mechanical engineering from North Carolina State University in 1956 and his M.S. in 1961 and his Ph.D. in 1966 from North Carolina State University in mechanical and aerospace engineering. Before joining the University of Mississippi in 1979, he worked for ARO for 14 years as a thermal physics supervisor and as a research manager. His research work has been in the area of radiative heat transfer, particularly the experimental and theoretical understanding of cryodeposits. Dr. Smith has been active in the AIAA thermophysics community: member of the AIAA Thermophysics Technical Committee (1973–75, 1985–88), Chairman of the AIAA Thermophysics Technical Committee (1976–77), and General Chairman of the 10th AIAA Thermophysics Conference (1975). He served as an Associate Editor of the *AIAA Journal* (1975–77), Editor for two thermophysics volumes in the AIAA Progress in Astronautics and Aeronautics book series (1976, 1977), General Chairman of the 17th Aerospace Sciences Meeting (1979), and Chairman of the AIAA Terrestrial Energy Systems Committee (1981–82). Dr. Smith is a Fellow of AIAA and ASME and recipient of the AIAA Thermophysics Award (1978) and the AIAA Hermann Oberth Award (1985). He is the author or coauthor of over 75 publications.

Editorial Advisory Board



DONALD K. EDWARDS, Professor Emeritus of Mechanical Engineering at the University of California, Irvine (UCI), received his B.S. in 1954, M.S. in 1956, and Ph.D. in 1959 from the University of California, Berkeley, all in mechanical engineering. In 1959 he joined the faculty of the University of California, Los Angeles, where he was promoted to Professor in 1968 and served as Chairman of Chemical, Nuclear, and Thermal Engineering (1975–78). At UCI he served as Chairman of Mechanical Engineering and Associate Dean of Engineering before retiring in 1991. He received the ASME Heat Transfer's Memorial Award (1973) and was the first recipient of the AIAA Thermophysics Award (1976). He was a Technical Editor for the *ASME Journal of Heat Transfer* (1975–81) and an Associate Editor for the *International Journal of Solar Energy* (1983–85). He is a Fellow of AIAA and ASME and a member of the Editorial Advisory Board for the *International Journal of Heat and Mass Transfer*.



TOM J. LOVE, George Lynn Cross Professor Emeritus of Aerospace, Mechanical, and Nuclear Engineering and Halliburton Professor of Engineering at the University of Oklahoma, received his B.S. from the University of Oklahoma in 1948, his M.S. from the University of Kansas in 1956, and his Ph.D. from Purdue University in 1963, all in mechanical engineering. In 1956 he joined the faculty of the University of Oklahoma, where he was promoted to Professor (1965) and served as Director of the School of Aerospace, Mechanical, and Nuclear Engineering (1963–72). He was a member of the AIAA Thermophysics Technical Committee (1970–72), an Associate Editor for the *AIAA Journal* (1972–75), and an Associate Editor for *ASME Journal of Bioengineering* (1976–79). He is a Fellow of AIAA and ASME. Dr. Love is a recipient of the AIAA Thermophysics Award (1984) and of the ASME Memorial Heat Transfer Award (1989).



JAMES N. MOSS, Senior Research Engineer for Aerothermodynamics at the NASA Langley Research Center, received his B.S. in engineering science from the Tennessee Polytechnic Institute in 1962, his M.S. in aerospace engineering from the University of Virginia in 1968, and his Ph.D. in aerospace engineering from Virginia Polytechnic Institute and State University in 1972. He also received an M.S. in engineering administration in 1988 from George Washington University. Dr. Moss joined NASA in 1962, where his early research assignments dealt with ablating systems. His current research concerns transitional and rarefied flows. Dr. Moss has been active in the AIAA thermophysics community: member of the AIAA Thermophysics Technical Committee (1978–80), Technical Program Chairman of the 16th AIAA Thermophysics Conference (1981), General Program Chairman of the 20th AIAA Thermophysics Conference (1985), Co-Editor of a thermophysics volume in the AIAA Progress in Astronautics and Aeronautics book series (1986), Chairman of the AIAA Thermophysics Technical Committee (1986–88), and Associate Editor of the *Journal of Thermophysics and Heat Transfer* (1986–89). He is a Fellow of AIAA and a member of the International Advisory Committee on Rarefied Gas Dynamics. Dr. Moss is a recipient of the AIAA Thermophysics Award (1989) and the NASA Exceptional Engineering Achievement Medal (1990).



ROBERT SIEGEL, Heat Transfer Consultant, received his B.S. in 1950 and M.S. in 1951 from the Case Institute of Technology and his Sc.D. from the Massachusetts Institute of Technology in 1953, all in mechanical engineering. He worked at NASA John H. Glenn Research Center at Lewis Field from 1955 to 1999 and became a Senior Research Scientist. Before joining NASA, he worked for General Electric as a heat transfer engineer and analyst. He has been an active researcher in heat transfer since 1950. The majority of his research is in radiative heat transfer, reduced-gravity boiling, transient convection, and solidification. He invented the first drop tower. He served as an Associate Technical Editor for the *Journal of Heat Transfer* (1973–83) and an Associate Editor of the *Journal of Thermophysics and Heat Transfer* (1986–98). Dr. Siegel is a Fellow of AIAA and ASME and a member of the Honorary Advisory Boards of the *International Journal of Heat and Mass Transfer* and *International Communications in Heat and Mass Transfer*. He is the recipient of the ASME Heat Transfer Division's Memorial Award (1970), the NASA Exceptional Scientific Achievement Award (1986), a Space Act Award (1993), the AIAA Thermophysics Award (1993), and the ASME/AIChE Max Jakob Memorial Award (1996).



RAYMOND VISKANTA, W.F.M. Goss Distinguished Professor of Engineering at Purdue University, received his B.S. from the University of Illinois in 1955, and his M.S. in 1956 and Ph.D. in 1960 from Purdue University, all in mechanical engineering. After a brief period with Argonne National Laboratory, he joined the faculty of Purdue University, where he was promoted to Professor in 1966. He was a member of the AIAA Thermophysics Technical Committee (1972–75), General Chairman of the 2nd AIAA/ASME Joint Thermophysics and Heat Transfer Conference (1978), and Editor of two volumes in the AIAA Progress in Astronautics and Aeronautics book series (1979). He is a recipient of the ASME Heat Transfer Division's Memorial Award (1976), the AIAA Thermophysics Award (1979), the ASEE Senior Research Award (1984), the ASME/AIChE Max Jakob Memorial Award (1986), the ASME Melville Medal (1988), and the 1991 Nusselt-Reynolds Prize of the Assembly of World Conferences on Experimental Heat Transfer, Fluid Mechanics and Thermodynamics. Dr. Viskanta is a Fellow of ASME and AIAA, a member of the National Academy of Engineering, a foreign member of the Academy of Engineering Sciences of the Russian Federation, and a Dr.-Ing. E.h. (Honorary Doctor of Engineering Degree) from Technical University of Munich. He was an Associate Editor for the *Journal of Quantitative Spectroscopy and Radiative Transfer* (1969–72), an Associate Technical Editor for the *Journal of Heat Transfer* (1981–87) and *Experimental Heat Transfer* (1987–90), and the Technical Editor of the *ASME Journal of Heat Transfer* (1990–95). He is a member of the Editorial Advisory Boards of the *International Journal of Heat and Mass Transfer*, *International Journal of Heat and Fluid Flow*, *AIAA Journal*, *Numerical Heat Transfer*, and *KSME International Journal* and was Chair of the Committee on Microgravity Research and member of the Space Studies Board of the National Research Council (1997–2000).



M. MICHAEL YOVANOVICH, Distinguished Professor Emeritus of Mechanical Engineering at the University of Waterloo, Ontario, Canada, received his B.S. from Queen's University in 1957, his M.S. from the State University of New York at Buffalo in 1963, and his M.E. and Sc.D. from the Massachusetts Institute of Technology in 1965 and 1967, respectively. After a brief period with the University of Poitiers in France, he joined the faculty of the University of Waterloo, where he was promoted to Professor in 1972. He was a member of the AIAA Thermophysics Technical Committee (1971–74, 85–88, 91–94), General Chairman of the first AIAA/ASME Joint Thermophysics and Heat Transfer Conference (1974), and Editor of a thermophysics volume in the AIAA Progress in Astronautics and Aeronautics book series (1975). He is a recipient of the AIAA Thermophysics Award (1984) and the AIAA Award for Best Technical Paper in Thermophysics (1983 and 1994). Dr. Yovanovich is a Fellow of AAAS, AIAA, and ASME. He was an Associate Technical Editor of the ASME *Journal of Heat Transfer* (1984–86) and Associate Senior Editor of the ASME *Journal of Electronic Packaging* (1988–93). He was a member of the Editorial Advisory Boards of the *Transactions of the Canadian Society of Mechanical Engineers* and the *International Journal of Heat and Fluid Flow*.

Editorial Policy Statement on Numerical Accuracy and Experimental Uncertainty

The purpose of this statement is to reiterate the desire to have high-quality investigations with properly documented results published in the AIAA journals, and to clarify acceptable standards for presentation of numerical and experimental results. Recently there has been considerable concern with the quality of published numerical solutions. Also the practice of including error bars on experimental results is often lacking. In response to these problems, a succinct policy statement on these items is as follows:

The AIAA journals will not accept for publication any paper reporting (1) numerical solutions of an engineering problem that fails adequately to address accuracy of the computed results or (2) experimental results unless the accuracy of the data is adequately presented.

The implementation of this policy will be at the discretion of the Editors and Associate Editors of the journals.

The accuracy of the computed results is concerned with how well the specified governing equations in the paper have been solved numerically. The appropriateness of the governing equations for modeling the physical phenomena and comparison with experimental data is not part of this evaluation. Accuracy of the numerical results can be judged from grid refinement studies, variation of numerical parameters that influence the results, comparison with exact solutions, and any other technique the author selects. The validity of the accuracy estimation will be judged by the reviewers of the paper. An estimate of accuracy of the numerical results must be presented when comparisons with other numerical and experimental results are given,

and when new results of the author will likely become data for future comparisons. Since accuracy of various computed results obtained from a numerical solution can vary significantly, the accuracy of the result being used must be stated. Accuracy of results from a validated code must still be established to show that proper input parameters have been used with the code.

Estimates of experimental uncertainty are required for all plotted or tabulated data obtained by authors. If data from other workers are used, they require no uncertainty. Unless otherwise stated and properly referenced, it is assumed that the uncertainty of authors' output data is estimated by the small-sample method¹ with assumed odds 20:1. All reported data must show uncertainty estimates if used in text or tables; for example, $T = 642 \pm 8$ K. All figures reporting new data should contain uncertainty estimates either on the figure with error bars in both coordinate directions or in the caption; for example, uncertainty in $T = \pm 8$ K at 20:1 odds. Investigations with limited data should present tabulated results in the paper while extensive data should be available elsewhere in tabulated form for use by other workers.

Finally, the accepted documentation procedures for a technical investigation must be used. For computational papers, the author must provide an adequate description of the numerical solution procedure, if not documented elsewhere. In addition, the complete governing equations must be specified with sufficient detail along with the input parameters to the code so that a reader could reproduce the results of the paper. For papers concerned with experimental test, thorough documentation of the experimental conditions, instrumentation, and data reduction techniques is required.

¹Kline, S. J., and McClintock, F. A., "Describing Uncertainties in Simple-Sample Experiments," *Mechanical Engineering*, Jan. 1953, pp. 3–8.