

NATO Advanced Study Institute

on

**MICROSCALE HEAT TRANSFER-FUNDAMENTALS AND
APPLICATIONS IN BIOLOGICAL AND
MICROELECTROMECHANICAL SYSTEMS**

PROGRAM

July 18 – 30, 2004
Altin Yunus-Çesme, Izmir-Türkiye

NATO Advanced Study Institute

**MICROSCALE HEAT TRANSFER – FUNDAMENTALS AND
APPLICATIONS IN BIOLOGICAL AND
MICROELECTROMECHANICAL SYSTEMS**

Altin Yunus-Çesme, Izmir-Türkiye
July 18 – 30, 2004

Co-Director: Prof. S. Kakaç

Co-Director: Prof. L. L. Vasiliev

ASI No. 979991

SCIENTIFIC PROGRAM

SUNDAY, 18 JULY 2004

16:00 – 18:30 Registration to the Institute

19:00 Dinner

MONDAY, 19 JULY 2004

SESSION I – Chairman: Franz Mayinger

9:00 – 10:00 **OPENING CEREMONIES**

Welcoming Address: S. Kakaç

Opening Remarks: Y. Bayazitoglu, ASME Heat Transfer Division Chair
 L. Vasiliev, Co-Director of the Institute
 F. Arinç, Secretary General of ICHMT

10:00 – 11:00 **Break and Registration**

11:00 – 12:00 **Single-Phase Forced Convection in Microchannels-State-of-the Art Review**

 Y. Yener, Northeastern University, Boston, MA, USA
 S. Kakaç, University of Miami, Coral Gables, FL, USA

12:00 – 14:00 Lunch Break

14:30 – 16:30 Free Time

16:30 – 17:00 Afternoon Tea

SESSION II - Chairman: Yaman Yener

17:00 – 18:00 **Measurements of Single-Phase Pressure Drop and Heat Transfer Coefficient in Micro and Minichannels**

 A. Bontemps
 University of Joseph Fourier, Grenoble Cedex 9, France

18:00 – 18:30 Discussions and further information about the Institute

18:30 – 19:30 **Welcoming Party**

19:30 Dinner

TUESDAY, 20 JULY 2004

SESSION III – Chairman: V. Dhir

- 9:00 – 10:00 **Steady, Periodic and Transient Forced Convection in Microchannels**
R. Cotta, M. Mikhailov and S. Kakaç
Federal University of Rio de Janeiro, Rio de Janeiro, RJ, Brazil
- 10:00 – 11:00 **Flow Regimes in Microchannel Single-Phase Gaseous Fluid Flow**
Y. Bayazitoglu, Rice University, Houston, Texas, USA
S. Kakac, University of Miami, Miami, FL, USA
- 11:00 – 11:30 Coffee Break
- 11:30 – 12:30 **Microscale Heat Transfer at Low Temperatures**
R. Radebaugh, National Inst. Standards and Tech., Boulder, USA
- 12:30 – 12:45 Discussions
- 12:45 – 14:00 Lunch Break
- 14:00 – 16:30 Free Time
- 16:30 – 17:00 Afternoon Tea

SESSION IV - Chairman: Renato Cotta

- 17:00 – 18:00 **Convective Heat Transfer for Single-Phase Gases in Microchannel Slip Flow: Analytical Solutions**
Y. Bayazitoglu, Rice University, Houston, Texas, USA
- 18:00 – 19:00 **Microscopic Heat Engineering Utilizing Microscale and Nanoscale Phenomena**
A. Yabe, National Institute of Advanced Industrial Science and Technology, Ibaraki, Japan
- 19:00 – 19:30 Discussions
- 19:30 Dinner
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WEDNESDAY, 21 JULY 2004

SESSION V – Chairman: Michael Ohadi

- 9:00 – 10:00 **Nano technology and Heat Transfer (Thermal Engineering and Transport Phenomena)**
V. Yabe, National Institute of Advanced Industrial Science and Technology, Ibaraki, Japan
- 10:00 – 11:00 **Microfluidics in Lab-on-a-Chip: Models, Simulations and Experiments**
D. Li, University of Toronto, Ontario, Canada
- 11:00 – 11:30 Discussions and coffee Break
- 11:30 – 12:30 **Numerical Simulation Of Convective-Conductive Heat Transfer In Block Of Rectangular Microchannels**
Valerii i. Artemov, Alexander I. Leontiev, Anatolii F. Polyakov, Moscow Power Engineering Institute, Russia
- 12:30 – 14:00 Lunch Break
- 14:30 – 16:30 Free Time
- 16:30 – 17:00 Afternoon Tea

SESSION VI – Chairman: Alexander I. Leontiev

- 17:00 – 18:00 **Transient Flow Analysis in Microfluidics**
R. Cotta and C. Cardoso, Federal University of Rio de Janeiro, Rio de Janeiro, RJ, Brazil
- 18:00 – 19:00 **From Micro to Macro Scale Boiling**
V. Dhir, University of California at LA, Los Angeles, CA, USA
- 19:00 – 19:30 General Discussions
- 19:30 Dinner
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THURSDAY, 22 JULY 2004

SESSION VII – Chairman: Joan Sik Lee

- 9:00 – 10:00 **Flow Boiling Heat Transfer in Mini-Channels**
A. Bontemps, Joseph Fourier University, Grenoble Cedex 9,
France
- 10:00 – 11:00 **Heat Removal with Flow in Microchannels Microjets , and
MicroDroplets**
V. Dhir, University of California at LA, Los Angeles, USA
- 11:00 – 11:30 Discussions and Coffee Break
- 11:30 – 12:00 **Meeting with the Lecturers**
- 12:00 – 14:00 Lunch Break
- 14:30 – 16:30 Free Time
- 16:30 – 17:00 Afternoon Tea

SESSION VIII - Chairman: Srinivas Garimella

- 17:00 – 18:00 **Boiling Heat Transfer in Minichannels**
V. Kuznetsov, Institute of Thermophysics, Russian Academy of
Sciences, Novosibirsk, Russia
- 18:00 – 19:00 **Nucleate Pool Boiling on Microconfigured Metal – Graphite
Composites**
W.J. Yang, University of Michigan, Ann Arbor, Michigan USA
- 19:00 – 19:30 General discussions
- 19:30 Dinner
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FRIDAY, 23 JULY 2004

SESSION IX – Chairman: Dongqing Li

- 9:00 – 10:00 **Condensation Flow Mechanisms, Pressure Drop and Heat Transfer in Microchannels**
S. Garimella , Georgia Institute of Technology, Atlanta, GA, USA
- 10:00 – 11:00 **Heat Transfer Characteristics of Silicon Film Irradiated by Pico to Femtosecond Lasers**
J.S. Lee, Seoul National University, Seoul, Korea
- 11:00 – 11:30 Discussions and Coffee Break
- 11:30 – 12:00 **Contributions from the participants**
- 12:00 – 14:00 Lunch Break
- 14:30 – 16:30 Free Time
- 16:30 – 17:00 Afternoon Tea
- 17:00 – 19:00 Informal **group discussions** between the lecturers and the participants

SATURDAY - SUNDAY 24 AND 25 JULY 2004

Participants may take historical tours

TUESDAY, 27 JULY 2004

SESSION XII – Chairman: Andre Bontemps

- 9:00 – 10:00 **Heterogeneous Crystallization of Amorphous Silicon Accelerated by External Force Field: Molecular Dynamics Study**
J.S. Lee, Seoul National University, Seoul, 151-742, Korea
- 10:00 – 11:00 **Challenges on Computational Modeling of Sub-micron and Nano-scale Heat Transfer**
C.H. Amon, Carnegie Mellon University, Pittsburg, PA, USA
- 11:00 – 11:30 Coffee Break
- 11:30 – 12:00 General Discussions
- 12:00 – 14:30 Lunch Break
- 14:30 – 16:30 Free Time
- 16:30 – 17:00 Afternoon Tea

SESSION XIII - Chairman: Wen-Jey Yang

- 17:00 – 18:00 **Evaporation Heat Transfer on Porous Cylindrical Tube Disposed in a Narrow Channel**
L. Vasiliev and A. Zhuravlyov, Luikov Heat & Mass Transfer Institute, Minsk, Belarus
- 18:00 – 19:00 **Miniature and Micro Heat Pipes**
L.L. Vasiliev, Luikov Heat & Mass Transfer, Institute, Minsk, Belarus
- 19:00 – 19:30 Discussion
- 19:30 Dinner
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WEDNESDAY, 28 JULY 2004

SESSION XIV – Chairman: Ray Radebaugh

- 9:00 – 10:00 **Sub-Micron Heat Transport in Semiconductors Accounting for Phenon Dispersion and Polarization**
C.H. Amon, Carnegie Mellon University, Pittsburg, USA
- 10:00 – 11:00 **Role of Microscale Heat Transfer in Augmentation of Nucleate Boiling and Flow Boiling Heat Transfer**
V. V. Wadekar, HTFS, Harwell, OX11 0QR, Oxfordshire, UK
- 11:00 – 11:30 Coffee Break
- 11:30 – 12:00 Discussions
- 12:00 – 14:00 Lunch Break
- 14:00 – 16:30 Free Time
- 16:30 – 17:00 Afternoon Tea

SESSION XV - Chairman: Vishwas V. Wadekar

- 17:00 – 18:00 **Heat Transfer Issues in Cryogenic Catheters**
R. Radebaugh, National Institute of Standards and Technology
Boulder, CO, USA
- 18:00 – 19:00 Some contributions from the participants
- 19:00 – 19:30 General Discussions
- 19:30 Dinner
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THURSDAY, 29 JULY 2004

SESSION XVI – Chair: Sepnem Tavman

- 9:00 – 10:00 **Heat Pipe Based Miniature Sorption Coolers**
L. L. Vasiliev and L. Vasiliev, Luikov Heat of Mass Transfer
Institute, Minsk, Belarus
- 10:00 – 11:00 **Cooling of Harsh Environment Electronics Applications to
Automotive and Oil Exploration Electronics**
M. Ohadi, University of Maryland, College Park, MD, USA
- 11:00 – 11:30 Coffee Break
- 11:30 – 12:00 Discussions
- 12:00 – 14:00 Lunch Break
- 14:30 – 16:30 Free Time
- 16:30 – 17:00 Afternoon Tea

SESSION XVII - Chair: Yildiz Bayazitoglu

- 17:00 – 18:00 **Thermal Transport Phenomenon in Micro Film Heated by
Laser Source**
S. Torii, S. Kumamoto University Kumamoto, Japan and
W. J. Yang, University of Michigan, Ann Arbor, MI, USA
- 18:00 – 19:00 **Panel on Future Research Suggestions**
Lecturers of active participants are expected to make short
contributions
- 19:00 Dinner
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FRIDAY, 30 JULY 2004

SESSION XVIII – Chair: Colette Padet

- 9:00 – 10:00 **Some Biomedical Applications of Nanotechnology in Drug Delivery**
W. J. Yang, University of Michigan,, Ann Arbour, MI, USA
- 10:00 – 11:00 **Industrial Heat Exchangers and Mini-and Microscale Heat Transfer**
V. V. Wadekar, HTFS, Harwell, OX11 OQR Oxfordshire, UK
- 11:30 – 12:00 **Closing the Institute** – S. Kakaç & L. L. Vasiliev
- 12:00 – 14:00 Lunch Break
- 14:00 – 16:30 Free Time
- 16:30 – 17:30 Afternoon Tea
- 17:30 – 19:00 Group discussions between lecturers and ASI students

SESSION COORDINATORS

SESSION I through IX: Dr. Sebnem Tavman
Ege University, Izmir, Turkey

SESSION X through XIX: Dr. Arif Hepbasli, Ege University, Izmir, Turkey

GENERAL SCIENTIFIC COORDINATOR

Dr. Mila Avelino
University of Miami, Coral Gables, FL, USA

TECHNICAL MATTERS Barbaros Cetin, Cristhian Quintanilla-Aurich

SECRETARIES Ms. Tuba Oktucu, Executive and Scientific Secretary
Ms. Melda Koksall, Assistant Secretary

ADVISORS Dr. Nilufer Egrican, Yedi Tepe University, Istanbul, Turkey
Dr. Hafit Yuncu, Middle East Technical University, Ankara, Turkey
Dr. Ismail Tavman, Dokuz Eylul University, Izmir, Turkey
