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Kui Xu · David K. Harrison
Duane F. Bruley *Editors*

Oxygen Transport to Tissue XXXII

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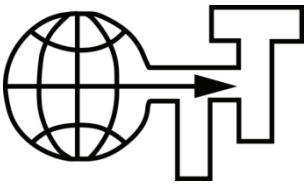

The 37th Annual Meeting of
the International Society on Oxygen Transport to Tissue
July 5–9, 2009, Cleveland, Ohio, USA

The International Society on Oxygen Transport to Tissue is an interdisciplinary society comprising about 250 members worldwide. Its purpose is to further the understanding of all aspects of the processes involved in the transport of oxygen from the air to its ultimate consumption in the cells of the various organs of the body.

The annual meeting brings together scientists, engineers, clinicians and mathematicians in a very unique international forum for the exchange of information and knowledge, the updating of participants on latest developments and techniques, and the discussion of controversial issues within the field of oxygen transport to tissue.

Founded in 1973, the society has been the leading platform for the presentation and discussion of many of the technological and conceptual developments within the field, both at the meetings themselves and in the proceedings of the society. These have been published in the "Advances in Experimental Medicine and Biology" series.

Examples of some of the areas in which members have made highly significant contributions to the field include spectrophotometric and magnetic resonance methods, electrode techniques, mathematical modeling of oxygen transport, and the understanding of local regulation of oxygen supply to tissue and fluorocarbons-blood substitutes.

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[1] Deceased

Dedication

The 37th ISOTT Conference President, Joseph C. LaManna, would like to dedicate this volume in memory of **Marco E. Cabrera**, who had attended previous ISOTT meetings and was an integral part of the Local Organizing Committee for the Cleveland meeting before his sudden and untimely death in February, 2009.

Joseph C. LaManna and Marco E. Cabrera at ISOTT 2007, Uppsala, Sweden.

Marco E. Cabrera received his undergraduate degree in physics from the Universidad del Valle de Guatemala in 1978 and his Ph.D. degree in biomedical engineering from Case Western Reserve University in 1995. He achieved the rank of Associate Professor in the Departments of Pediatrics Biomedical Engineering, and Physiology and Biophysics. His research focused on regulation of energy metabolism in cardiac and skeletal muscles in response to exercise and adaptations to physical inactivity and training. It combined dynamic experimental measurements and computational models that encompassed mechanisms at the cellular, tissue, and whole body levels.

Marco believed passionately in a quantitative systems physiology approach for the in vivo study of organisms. His vision was endorsed by NIH funding of the Center for Modeling Integrated Metabolic Systems (MIMS). He was active professionally on the editorial board of the Journal of Biological Chemistry and assistant editor of Exercise and Sports Sciences Reviews as well as a Fellow of the American College of Sports Medicine and a member of the American Physiological Society, Biomedical Engineering Society, and American Society of Biochemistry and Molecular Biology.

Marco was a dear friend, valued research collaborator, and esteemed mentor. His ready smile, enthusiasm, and breadth of vision engaged many friends and collaborators. Marco's research scope encompassed a wide variety of fields including exercise physiology, human and animal performance evaluation, metabolic systems biology, mathematical modeling, and computer simulation. He had an exceptional ability to develop collaborations with theoretical and experimental researchers from different fields that could contribute to quantitative understanding of exercise and metabolism. Marco had a variety of wonderful collaborations locally at Case Western Reserve University, University Hospitals of Cleveland, and the Cleveland Clinic as well as nationally and internationally. To achieve the research goals that Marco set forth, his collaborators and students will continue along the path that he started.

Awards

The Melvin H. Knisely Award

The Melvin H. Knisely Award was established in 1983 to honor Dr. Knisely's accomplishments in the field of the transport of oxygen and other metabolites and anabolites in the human body. Over the years, he has inspired many young investigators and this award is to honor his enthusiasm in assisting and encouraging young scientists and engineers in various disciplines. The award acknowledges outstanding young investigators. This award was first presented during the banquet of the 1983 annual conference of ISOTT in Ruston, Louisiana. The award includes a Melvin H. Knisely plaque and a cash prize.

Melvin H. Knisely Award Recipients:

1983 Antal G. Hudetz, Hungary
1984 Andras Eke, Hungary
1985 Nathan A. Bush, USA
1986 Karlfried Groebe, Germany
1987 Isumi Shibuya, Japan
1988 Kyung A. Kang, Korea/USA
1989 Sanja Batra, Canada
1990 Stephen J. Cringle, Australia
1991 Paul Okunieff, USA
1992 Hans Degens, Netherlands
1993 David A. Benaron, USA
1994 Koen van Rossem, Belgium
1995 Clare E. Elwell, UK
1996 Sergei A. Vinogradov, USA
1997 Chris Cooper, UK
1998 Martin Wolf, Switzerland
1999 Huiping Wu, USA
2000 Valentina Quaresima, Italy
2001 Fahmeed Hyder, Bangladesh
2002 Geofrey De Visscher, Belgium
2003 Mohammad N. Khan, USA
2004 Fredrick Palm, Sweden
2005 Nicholas Lintell, Australia
2006 No award was made
2007 Ilias Tachtsidis UK
2008 Kazuto Masamoto, Japan
2009 Rossana Occhipinti, USA

The Dietrich W. Lübbers Award

The Dietrich W. Lübbers Award was established in honor of Professor Lübbers's long-standing commitment, interest, and contributions to the problems of oxygen transport to tissue and to the society. This award was first presented in 1994 during the annual conference of ISOTT in Istanbul, Turkey.

Dietrich W. Lübbers Award Recipients:

1983 Antal G. Hudetz, Hungary
1984 Andras Eke, Hungary
1985 Nathan A. Bush, USA
1986 Karlfried Groebe, Germany
1987 Isumi Shibuya, Japan
1988 Kyung A. Kang, Korea/USA
1989 Sanja Batra, Canada
1990 Stephen J. Cringle, Australia

1991 Paul Okunieff, USA
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1993 David A. Benaron, USA
1994 Koen van Rossem, Belgium
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1997 Chris Cooper, UK
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2001 Fahmeed Hyder, Bangladesh
2002 Geofrey De Visscher, Belgium
2003 Mohammad N. Khan, USA
2004 Fredrick Palm, Sweden
2005 Nicholas Lintell, Australia
2006 No award was made
2007 Ilias Tachtsidis UK
2008 Kazuto Masamoto, Japan
2009 Rossana Occhipinti, USA

The Britton Chance Award

The Britton Chance Award was established in honor of Professor Chance's long-standing commitment, interest, and contributions to the science and engineering aspects of oxygen transport to tissue and to the society. This award was first presented in 2004 during the annual conference of ISOTT in Bari, Italy.

Britton Chance Award Recipients:

2004 Derek Brown, Switzerland
2005 James Lee, USA
2006 Hanzhu Jin, China/USA
2007 Eric Mellon, USA
2008 Jianting Wang, USA
2009 Jessica Spires, USA

The Duane F. Bruley Award

The Duane F. Bruley Award was established in 2003 and first presented by ISOTT at the 2004 annual conference in Bari, Italy. This award was created to provide travel funds for student researchers in all aspects of areas of oxygen transport to tissue. The awards signify Dr. Bruley's interest in encouraging and supporting young researchers to maintain the image and quality of research associated with the society. As a co-founder of ISOTT in 1973, Dr. Bruley emphasizes cross-disciplinary research among basic scientists, engineers, medical scientists, and clinicians. His pioneering work constructing mathematical models for oxygen and other anabolite/metabolite transport in the microcirculation, employing computer solutions, were the first to consider system nonlinearities, time dependence, including multidimensional diffusion, convection, and reaction kinetics. It is hoped that receiving the Duane F. Bruley Award will inspire students to excel in their research and will assist in securing future leadership for ISOTT.

Duane F. Bruley Award Recipients:

2004 Helga Blocks (Belgium); Jennifer Caddick (UK); Charlotte Ives (UK); Nicholas Lintell (Australia); Leonardo Mottola (Italy); Samin Rezania

(Iran/USA); Ilias Tachtsidis (UK); Liang Tang (China/USA); Iyichi Sonoro (Japan); Antonio Franco (Italy)

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Preface

The International Society on Oxygen Transport to Tissue (ISOTT) is an interdisciplinary society comprising about 250 members worldwide. Its purpose is to further the understanding of all aspects of the processes involved in the transport of oxygen from the air to its ultimate consumption in the cells of the various organs of the body. Oxygen has played a substantial role in the evolution process of biological systems, including human, as the key molecule for energy production and genetic adaptation to the environment. Considering that the physiological function of oxygen is an extremely diverse and multidisciplinary research area, increased involvement of basic medical scientists, clinicians, and biomedical engineers in ISOTT was encouraged.

The annual meeting brings together scientists, engineers, clinicians and mathematicians in a unique international forum for the exchange of information and knowledge, the updating of participants on latest developments and techniques, and the discussion of controversial issues within the field of oxygen transport to tissue.

Founded in 1973, the society has been the leading platform for the presentation and discussion of many of the technological and conceptual developments within the field, both at the meetings themselves and in the proceedings of the society.

Examples of some of the areas in which members have made highly significant contributions to the field include Near Infrared Spectroscopy (NIRS) and other spectrophotometric and magnetic resonance methods, electrode techniques, mathematical modeling of oxygen transport, and the understanding of local regulation of oxygen supply to tissue and fluorocarbons-blood substitutes.

The 37th Annual ISOTT conference was held in Cleveland, Ohio, USA from July 5–9, 2009. The meeting consisted of one featured presentation by Jay Dean, Ph.D., from the Department of Molecular Pharmacology and Physiology, Hyperbaric Biomedical Research Laboratory at the University of South Florida. His topic was "Oxygen and the World War II Aviator." In addition, there were 21 featured lectures, 12 organized sessions, 56 general oral presentations, and 19 poster presentations. We welcomed 134 total participants comprised of 71 full, 13 social, 34 student, 10 daily, and 6 outside exhibitor registrations.

Our venue was the campus of Case Western Reserve University (CWRU), including the recently built Village at 115 dormitory-style housing facility where most

participants stayed. Participants were provided with many opportunities to interact, both scientifically and socially, during the conference and after hours in an informal atmosphere. Evening activities were structured to take advantage of Cleveland as well as CWRU's proximity to the University Circle cultural institutions. The highlight of the 2009 ISOTT meeting was the Closing Banquet held at the Rock and Roll Hall of Fame and Museum where several of our participants entertained us with their musical talents! Visit the website of http://www.case.edu/isott09/ to view information on the Annual Meeting in Cleveland, Ohio.

Joseph C. LaManna, Ph.D.
President, ISOTT 2009

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