

BIOMEDICAL MATHEMATICS:

**Promising Directions in Imaging,
Therapy Planning, and Inverse Problems**

BIOMEDICAL MATHEMATICS:
**Promising Directions in Imaging,
Therapy Planning, and Inverse Problems**

Yair Censor, Ming Jiang, Ge Wang
Editors

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Conference on Biomedical Mathematics**

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*Corresponding author.

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*Corresponding author.

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*Corresponding author.

Preface

This book brings together 27 state-of-the-art, refereed and subsequently revised, research and review papers, by leading experts and practitioners in mathematical methods in biomedical imaging, in intensity-modulated radiation therapy (IMRT) and in optimization and inverse problems. The emphasis is on trying to discover relations and connections between these fields that will enhance progress in each of them. As this volume shows, applicable mathematical work in these fields goes hand-in-hand with real-world applications and the mutual “technology transfers” between them leads to further progress.

The topics covered here include mathematical aspects and practical problems in current major and emerging technologies in diagnostic and therapeutic medicine and biology research. The contributed work signifies the interdisciplinary cooperation between mathematicians and scientists from medical physics, engineering, clinical medicine, and biology that leads to mathematically based better solutions of practical problems in biomedical imaging and IMRT.

The Huangguoshu National Park of China, Guizhou, China, under the leadership of Mr. Degang Yuan, President of the Huangguoshu Tourism Group Company, LTD, recognizing the importance of the field and the need for interaction between theoreticians and practitioners, and desiring to create a high-profile cultural activity at the Huangguoshu National Park, provided us with a special grant to organize the “Huangguoshu International Interdisciplinary Conference on Biomedical Mathematics—Promising Directions in Imaging, Therapy Planning, and Inverse Problems.” The Conference took place during November 3–9, 2008, in the breathtaking Huangguoshu National Park of China.

The Conference was conducted under the scientific auspices of the Mathematical Center of the Ministry of Education of China at Peking University (PKU) in Beijing, China; the Center for Computational Mathematics and Scientific Computation (CCMSC) at the University of Haifa, Haifa, Israel; the School of Biomedical Engineering & Sciences at the Virginia Polytechnic Institute and State University, Virginia, USA; and the Guizhou University in Guiyang, Guizhou, China.

Experts from around the world were invited and participated. They came from Australia, Canada, Germany, Israel, Italy, Japan, Korea, P.R. China, Spain, Sweden, Switzerland, the United Kingdom, and the United States of America. Most of the papers in this volume originated from the lectures presented at the Conference, while others were written in the wake of discussions held during the Conference.

Preface

It is our pleasure to heartily thank Mr. Degang Yuan and the team of the Huangguoshu Tourism Group, Peking University, and Virginia Tech for their devoted and efficient work throughout all phases of the preparations for the conference. In particular we thank Dr. Lingyin Zhao, Zongmin (Tracy) Mao, Haifeng (Mountain) Tong, and Gang (Leo) Xie, from the the Huangguoshu Tourism Group; Prof. Tie Zhou, Dr. Caifang Wang, Dr. Xin Jiang, and Yuanzheng Si, Yu Zhou, Shengkun Shi, from Peking University (PKU); and Deepak Bharkhada, from Wake Forest University, for their cooperation and extraordinary support in organizing and conducting the Conference. Many thanks are due to the referees whose work enhanced the final versions of the papers which appear here. Last but not least, we thank the participants of the Conference and the authors who contributed their work to this volume. We gratefully acknowledge the help of Ms. Betsey Phelps, Managing Editor, Medical Physics Publishing, Madison, WI, USA, for her and her team's work on the production of this volume.

We hope that researchers in applied mathematics, medical physics, biomedical imaging, and intensity-modulated radiation therapy will find this book a useful tool in their current research and development efforts.

Yair Censor, Ming Jiang and Ge Wang
Haifa, Beijing, and Blacksburg, VA, respectively
January 31, 2010

Contributing Authors

Numbers in brackets refer to the chapter numbers authored or co-authored by the contributors.

- | | | | |
|--|-----------|---|------|
| Francesca Albertini
Centre for Proton Radiation Therapy
Paul Scherrer Institute
5232 Villigen PSI
Switzerland | [1] | Heinz H. Bauschke*
Department of Mathematics
Irving K. Barber School
UBC Okanagan
Kelowna, BC V1V 1V7
Canada | [4] |
| Ashok R. Amin*
Carilion Clinic
101 Elm Avenue, 4 th Floor
Roanoke, VA 24013
<i>and</i> Virginia Tech Biomedical &
Engineering Sciences
Blacksburg, VA 24061 | [2] | Martin Bech
Department of Physics (E17)
Technical University of Munich
85748 Garching
Germany | [18] |
| Simon R. Arridge*
Department of Computer Science
University College London
Gower Street
London WC1E 6BT
United Kingdom | [19*, 21] | Adi Ben-Israel*
Rutgers Center for Operations Research
Rutgers University
640 Bartholomew Road
Piscataway, NJ 08854-8003 | [5] |
| Guillaume Bal*
Department of Applied Physics and
Applied Mathematics
Columbia University
New York, NY 10027 | [3] | Thomas Bortfeld
Department of Radiation Oncology
Massachusetts General Hospital <i>and</i>
Harvard Medical School
30 Fruit Street
Boston, MA 02114 | [23] |
| Vladimir Bashkirov
Department of Radiation Medicine
Loma Linda University Medical Center
Loma Linda, CA 92354 | [17] | Matthias Bosshardt
Centre for Proton Radiation Therapy
Paul Scherrer Institute
5232 Villigen PSI
Switzerland | [1] |

*Corresponding author.

Contributing Authors

- Alberto Bravin [18]
European Synchrotron Radiation Facility
B.P. 220
38043 Grenoble Cedex
France
- James A. Brink, M.D. [6]
Yale University School of Medicine
333 Cedar Street
New Haven, CT 06510
- Oliver Bunk [18]
Paul Scherrer Institut
5232 Villigen PSI
Switzerland
- Yair Censor* [17, 20*]
Department of Mathematics
University of Haifa
Mt. Carmel, Haifa 31905
Israel
- Noah C. Choi [23]
Department of Radiation Oncology
Massachusetts General Hospital *and*
Harvard Medical School
30 Fruit Street
Boston, MA 02114
- Peter Cloetens [18]
European Synchrotron Radiation Facility
B.P. 220
38043 Grenoble Cedex
France
- Rinaldo Cubeddu [21]
IIT, CNR-INFN, and CNR-IFN
Department of Physics
Politecnico de Milano
Piazza Leonardo da Vinci 32
20133 Milan
Italy
- Cosimo D'Andrea [21]
IIT, CNR-INFN, and CNR-IFN
Department of Physics
Politecnico de Milano
Piazza Leonardo da Vinci 32
20133 Milan
Italy
- Christian David [18]
Paul Scherrer Institut
5232 Villigen PSI
Switzerland
- Bruno De Man* [7]
CT and X-ray Systems and Applications
Laboratory
GE Global Research – KWC1307
1 Research Circle
Niskayuna, NY 12309
- Tilman Donath [18]
Paul Scherrer Institut
5232 Villigen PSI
Switzerland
- Eric D. Ehler [8]
Departments of Human Oncology
and Medical Physics
University of Wisconsin
K4/334-3684 Clinical Science Center
600 Highland Avenue
Madison, WI 53792-3684
- Tommy Elfving* [9]
Department of Mathematics
Linköping University
SE-581 83 Linköping
Sweden
- Jeffrey A. Fessler [7]
EECS Department
University of Michigan
1301 Beal Avenue
Ann Arbor, MI 48109-2122

*Corresponding author.

Contributing Authors

- Sylvain Gignat [1]
Centre for Proton Radiation Therapy
Paul Scherrer Institute
5232 Villigen PSI
Switzerland
- Alexandre Jollivet [3]
Department of Applied Physics and
Applied Mathematics
Columbia University
New York, NY 10027
- Cornelia Gansemer [23]
Department of Clinical Medicine (Mannheim)
Ruprecht-Karls University
Heidelberg
Germany
- Joanne Kang [16]
DKFZ Heidelberg
Department of Medical Physics in
Radiation Therapy
Im Neuenheimer Feld 280
69120 Heidelberg
Germany
- Çiğdem Güler [10]
Department of Mathematics
Technical University of Kaiserslautern
Kaiserslautern
Germany
- Alexander Katsevich [12]
Department of Mathematics
University of Central Florida
Orlando, FL 32816-1364
- Horst W. Hamacher* [10]
Department of Mathematics
Technical University of Kaiserslautern
Kaiserslautern
Germany
- Geraldine Le Duc [18]
European Synchrotron Radiation Facility
B.P. 220
38043 Grenoble Cedex
France
- Cem Iyigun [5]
Department of Industrial Engineering
Middle Eastern University
06531 Ankara
Turkey
- Antony J. Lomax* [1]
Centre for Proton Radiation Therapy
Paul Scherrer Institute
5232 Villigen PSI
Switzerland
- Torben Jensen [18]
Niels Bohr Institute
University of Copenhagen
2100 Copenhagen
Denmark
- Genaro López [13]
Department of Mathematical Analysis
University of Seville
Apdo. 1160, 41080-Seville
Spain
- Ming Jiang* [11]
LMAM, School of Mathematical Sciences
Peking University
Beijing 100871
China
- Victoria Martín-Márquez [13]
Department of Mathematical Analysis
University of Seville
Apdo. 1160, 41080-Seville
Spain

*Corresponding author.

Contributing Authors

- Scott McAllister [17]
Department of Computer Science
and Engineering
California State University San Bernardino
San Bernardino, CA 92407
- Atsushi Momose* [14]
Department of Advanced Materials Science
Graduate School of Frontier Sciences
The University of Tokyo
5-1-5 Kashiwanoha, Kashiwa
Chiba 277-8561
Japan
- Frank Natterer [15]
Department of Mathematics and
Computer Science
University of Münster
Münster
Germany
- Touraj Nikazad [9]
Department of Mathematics
Iran University of Science and Technology
Narmak, Tehran, 16846-13114
Iran
- Uwe Oelfke* [16]
DKFZ Heidelberg
Department of Medical Physics
in Radiation Therapy
Im Neuenheimer Feld 280
69120 Heidelberg
Germany
- Scott N. Penfold* [17]
Centre for Medical Radiation Physics
University of Wollongong
Wollongong, New South Wales 2522
Australia
- Franz Pfeiffer* [18]
Department of Physics (E17)
Technical University of Munich
85748 Garching
Germany
- Daniel Pflugfelder [16]
DKFZ Heidelberg
Department of Medical Physics
in Radiation Therapy
Im Neuenheimer Feld 280
69120 Heidelberg
Germany
- Constantin Popa [9]
Faculty of Mathematics
and Computer Science
Ovidius University
Constanta Boulevard
Mamaia 124
900527 Constanta
Romania
- Nadeem Riaz [24]
Department of Radiation Oncology
Stanford University School of Medicine
Stanford, CA 94305
- Anatoly B. Rosenfeld [17]
Centre for Medical Radiation Physics
University of Wollongong
Wollongong, New South Wales, 2522
Australia
- Keith E. Schubert [17]
Department of Computer Science
and Engineering
California State University San Bernardino
San Bernardino, CA 92407

*Corresponding author.

Contributing Authors

- Reinhard W. Schulte [17]
Department of Radiation Medicine
Loma Linda University Medical Center
Loma Linda, CA 92354
- Martin J. Schweiger [19]
Department of Computer Science
University College London
Gower Street
London WC1E 6BT
United Kingdom
- Alexander Segal [20]
Department of Mathematics
University of Haifa
Mt. Carmel, Haifa 31905
Israel
- Vadim Y. Soloviev* [21]
Department of Computer Science
University College London
Gower Street
London WC1E 6BT
United Kingdom
- George Starkschall [22]
Department of Radiation Physics
The University of Texas M.D. Anderson
Cancer Center
1515 Holcombe Boulevard
Houston, TX 77030
- Yoshihiro Takeda [14]
Department of Advanced Materials Science
Graduate School of Frontier Sciences
The University of Tokyo
5-1-5 Kashiwanoha, Kashiwa
Chiba 277-8561
Japan
- Wolfgang A. Tomé* [8]
University of Wisconsin
School of Medicine and Public Health
Departments of Human Oncology *and*
Medical Physics
K4/314 Clinical Science Center
600 Highland Avenue
Madison, WI 53792
- Alexei Trofimov* [23]
Department of Radiation Oncology
Massachusetts General Hospital *and*
Harvard Medical School
30 Fruit Street
Boston, MA 02114
- Gianluca Valentini [21]
IIT, CNR-INFM, and CNR-IFN
Department of Physics
Politecnico de Milano
Piazza Leonardo da Vinci 32
20133 Milan
Italy
- Michael W. Vannier, M.D. [24]
Department of Radiology
University of Chicago
5841 S. Maryland Avenue
Chicago, IL 60637
- Christian Vrančić [23]
Department of Clinical Medicine (Mannheim)
Ruprecht-Karls University
Heidelberg
Germany
- Ge Wang [2, 11, 25, 27]
Virginia Tech Biomedical & Engineering
Sciences
1880 Pratt Drive, Suite 2000
Blacksburg, VA 24061

*Corresponding author.

Contributing Authors

- | | |
|--|---|
| Xianfu Wang [4]
Department of Mathematics
Irving K. Barber School
UBC Okanagan
Kelowna, BC V1V 1V7
Canada | Liangjin Yao [4]
Department of Mathematics
Irving K. Barber School
UBC Okanagan
Kelowna, BC V1V 1V7
Canada |
| Rodney D. Wiersma* [24]
Department of Radiation and Cellular
Oncology
The University of Chicago
5758 S. Maryland Avenue, MC9006
Chicago, IL 60637 | Wataru Yashiro [14]
Department of Advanced Materials Science
Graduate School of Frontier Sciences
The University of Tokyo
5-1-5 Kashiwanoha, Kashiwa
Chiba 277-8561
Japan |
| Timm Weitkamp [18]
European Synchrotron Radiation Facility
B.P. 220
38043 Grenoble Cedex
France | Yangbo Ye* [25, 27*]
Department of Mathematics
University of Iowa
Iowa City, IA 52242 |
| Jan Jakob Wilkens [16]
Department of Radiation Oncology
Technical University of Munich
Klinikum rechts der Isar
Ismaninger Strasse 22
81675 Munich
Germany | Adam D. Yock [23]
Department of Radiation Oncology
Massachusetts General Hospital <i>and</i>
Harvard Medical School
30 Fruit Street
Boston, MA 02114 |
| Lei Xing [24]
Department of Radiation Oncology
Stanford University School of Medicine
Stanford, CA 94305 | Hengyong Yu* [25*, 27]
Biomedical Imaging Division
VT-WFU School of Biomedical
Engineering and Science
Virginia Tech
Blacksburg, VA 24061 |
| Hong-Kun Xu* [13]
Department of Applied Mathematics
National Sun Yat-sen University
Kaohsiung 80424
Taiwan | |

*Corresponding author.

These papers were presented at the Huangguoshu International Interdisciplinary Conference on Biomedical Mathematics "Promising Directions in Imaging, Therapy Planning, and Inverse Problems" November 3-9, 2008 in China. The emphasis is on trying to discover relations and connections between these fields that will enhance progress in each of them. As this volume shows, applicable mathematical work in these fields goes hand-in-hand with real-world applications and the mutual "technology transfers" between them leads to further progress. The topics covered here include mathematical aspects Real - time imaging for radiation therapy guidance Biomedical Mathematics : Promising Directions in Imaging , Therapy Planning , and Inverse Problems ed. L Xing. 2010. Assessment of two novel ventilatory surrogates for use in the delivery of gated/tracked radiotherapy for non-small cell lung cancer. Simon R. Hughes, James McClelland, +4 authors David Landau. Medicine. Radiotherapy and oncology : journal of the European Society for Therapeutic Radiology and Oncology. Search for IMRT inverse plans with piecewise constant fluence maps using compressed sensing techniques. Lei Zhu, Lei Xing. Mathematics, Medicine. Medical physics. 2009. VIEW 1 EXCERPT.