

## Twelfth Scientific Meeting and Exhibition 15-21 MAY 2004



KYOTO INTERNATIONAL CONFERENCE HALL  
KYOTO, JAPAN

INTERNATIONAL SOCIETY FOR MAGNETIC RESONANCE IN MEDICINE

# MR PULSE

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## Letter From The President

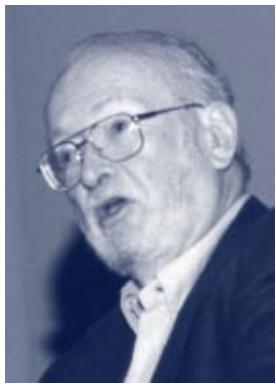
**Congratulations to Professors Paul Lauterbur and Peter Mansfield on winning the 2003 Nobel Prize in Physiology or Medicine!**

The Nobel Assembly at Karolinska Institutet on Monday, 6 October 2003, awarded the Nobel Prize in Physiology or Medicine for 2003 jointly to Drs. Paul C. Lauterbur and Sir Peter Mansfield for their discoveries concerning magnetic resonance imaging. The Nobel Academy notes that the two have made "seminal discoveries concerning the use of magnetic resonance to visualize different structures. These discoveries have led to the development of modern magnetic resonance imaging, MRI, which represents a breakthrough in medical diagnostics and research."

(<http://www.nobel.se/medicine/laureates/2003/press.html>)



Sir Peter Mansfield



Paul C. Lauterbur

This is of course the occasion that many of us have been waiting years for; the well-deserved recognition of the pioneering efforts that these two have made that has affected everything that we all do within the sphere of Magnetic Resonance. I know that I speak for all of us in saying that we are very happy that their work has finally been acknowledged with this Prize. It provides the public recognition that MR has deserved in significantly improved diagnostic imaging in many diseases for many disciplines. This award builds on the earlier Nobel Prizes given to the fundamental discoveries of the magnetic moments (Rabi, 1944), the NMR phenomenon (Purcell and Bloch, 1952), the implementation of 2D MR spectroscopy (Ernst, 1991), the development of MR spectroscopy for 3D macromolecular structures (Wüthrich, 2002), and now for MRI.

In one interview this week, Paul Lauterbur is quoted as saying, "In particular, I believe, I think the work has been helpful to many people..." This is indeed an understatement. The understanding of the spatial localization of the MR signal is the key to everything we do in MR. During the Lauterbur Lecture at the 2002 ISMRM Annual Meeting in Honolulu, this was made apparent in a moving and dramatic presentation by Paul to our membership.

See President's Letter page 2

Beyond the recognition of this fact by the Nobel Academy, we should also be aware and grateful for the contributions that Drs. Lauterbur and Mansfield have made to the Society; both are past Gold Medal Winners and both are Society Past-Presidents. To pay tribute, we hope to have video interviews with Paul and Sir Peter, as well as the 2002 Lauterbur Lecture, available for general viewing during the upcoming 2004 ISMRM Annual Meeting in Kyoto. Expect further tributes and Nobel celebrations being planned for the Kyoto Meeting.

Besides the excitement of the Nobel announcements, the Board of Trustees is planning another web-based "Zoomerang" survey of our members, with the goal of obtaining information to further assist with future meeting and strategic planning. One common theme of the survey will be that of communication with and within the membership. In response to the last survey one year ago and to implement more frequent informal communications with the membership, our Past President, Dick Ehman, the Board of Trustees, together with the ISMRM Central Office is now making available a "Question-and-Answer" (Q&A) section on the ISMRM Website to explain committee structure, study groups, society awards, and general information within the Society. Look for this within the month. The Society has also been active in recent months in helping inform the EU public regarding the "Directive For The Protection Of Workers From Exposure To Electro-Magnetic Fields And Waves (EMF)." In response to many such efforts on the part of our sister societies such as the ESMRMB, the EU have just released this statement on the progress of negotiations: "Static Magnetic Fields (and implications for MRI) have been removed from the exposure limit values...." This in essence means that there are now no plans on the part of the EU to limit exposure to static magnetic fields in the short term. We within the ISMRM want to thank Dr. Penny Gowland at Nottingham University, UK, Dr. Marty Prince, and the ISMRM Safety Committee for their efforts to help bring this about.

Clearly, it is a momentous time for our Society. Please join me and the Board of Trustees in congratulating Drs. Lauterbur and Mansfield for their recognition by the Nobel Academy!

— Michael E. Moseley, ISMRM President

## THE MEETING

The Twelfth Scientific Meeting and Exhibition of the International Society for Magnetic Resonance in Medicine will take place 15-21 May 2004 at the Kyoto International Conference Hall in Kyoto, Japan. The program for the ISMRM Scientific Meeting will be available online through the ISMRM Website ([www.ismrm.org](http://www.ismrm.org)). Please call the ISMRM office for more information or e-mail [info@ismrm.org](mailto:info@ismrm.org).

### Message from the Local and Regional Organizing Committee

**O**n behalf of the Local and Regional Organizing Committees of the 12th International Society for Magnetic Resonance in Medicine, I would like to welcome all of you to this premier International Meeting in Magnetic Resonance in Medicine, which will be held from May 15 to 21, 2004, at the Kyoto International Conference Hall in Kyoto, Japan. The ISMRM Annual Meeting will take place for the first time in an Asian country in 2004. It is indeed my great pleasure to welcome all the scientists, radiologists, and technologists from all over the world to Kyoto to attend the 12th ISMRM. I would like to express my sincere appreciation to all of you for your interest and support of this meeting.

The 12th ISMRM will highlight the most recent advances in Magnetic Resonance in Medicine and place emphasis on recently developing imaging techniques and diagnosis. The objectives of ISMRM will be not only to share medical knowledge and experience in Magnetic Resonance in Medicine, but also to develop closer ties among researchers and clinicians from various countries.

Since we host this meeting in Asia, we would like to organize several programs which are unique in Asia. Special seminars and presentations will be planned in addition to the usual scientific program for participants from Japan as well as from Asia. There will be two social events with a Japanese flavor to promote friendship and fellowship among participants and acquaint them with traditional Japanese culture. They include the opening reception and the gala party.

Kyoto is an ancient capital of Japan and has a lot to offer in regard to traditional Japanese culture, rich historical heritage, and beautiful scenery with many interesting sightseeing spots.

I do hope you will enjoy not only the scientific part of the meeting but also the beautiful scenery of Kyoto and the history of Japan.

*Mutsumasa Takahashi, M.D.  
Chair, Local and Regional Organizing Committee*

### LOCAL ORGANIZING COMMITTEE 2004

Mutsumasa Takahashi, M.D., *Chairperson*  
Atsuko Heshiki, M.D., *Vice Chairperson*  
Kazuo Miyasaka, M.D., *Secretary General*  
Kuni Otomo, M.D., *Treasurer*  
Kazuro Sugimura, M.D., *Treasurer*  
Shoji Naruse, M.D., *Treasurer*  
Tokuko Watanabe, Ph.D., *Secretary*  
  
Tsutomu Araki, M.D. (Japan)  
Sudarshan K. Aggarwal (India)  
Kee-Hyun Chang, M.D. (Korea)  
Jian-Ping Dai, M.D. (China)  
Tsukasa Doi (Japan)  
Wan-Yuo Guo, (Taiwan, R.O.C.)  
Hiroto Hatabu, M.D. (Japan)  
Junichi Hachiya, M.D. (Japan)  
Kazuhiro Homma, Ph.D. (Japan)  
  
Hiroo Ikehira, M.D. (Japan)  
Tamon Inoue, Ph.D. (Japan)  
Toshiro Inubushi, Ph.D. (Japan)  
Masumi Kadoya, M.D. (Japan)  
Yoko Kanazawa, Ph.D. (Japan)  
Katsumi Kose, Ph.D. (Japan)  
Lilian L.Y. Leong, M.B., B.S., F.R.C.R. (Hong Kong)  
Fumiyuki Mitsumori, Ph.D. (Japan)  
Carolyn E. Mountford, D.Phil. (Australia)  
Tsutomu Nakada, M.D. (Japan)  
Lenny Tan (Singapore)  
Kaori Togashi, M.D. (Japan)  
Shogo Ueno, Ph.D. (Japan)  
Masahiro Umeda, Ph.D. (Japan)  
Tsuneya Watabe, M.D. (Japan)  
Hiroshi Watari, M.D. (Japan)  
Yasuyuki Yamashita, M.D. (Japan)

## CALL FOR PAPERS

The Scientific Program Committee invites abstract submissions to be presented in oral sessions, as conventional posters, and as electronic posters at the ISMRM Twelfth Scientific Meeting & Exhibition. Submissions must contain new, previously unpublished material. All abstracts must be submitted electronically via the ISMRM Website. No paper forms will be available. Any abstract submitted on paper will not be considered for review. The deadline for receipt of abstracts is **19 November 2003**. A 100-word synopsis of each abstract will be printed in the Program Book. It should include a brief description of the problem, methods, results, and conclusions. It must include text only, with no equations or images and no references or citations to items described in the full abstract. If the submitted synopsis is longer than 100 words, it will be cut short in the Program Book. To conserve space and provide authors greater opportunity to clarify their projects, the synopsis should NOT appear in the actual abstract submission (previously it was the first paragraph). The abstract should be submitted in a single-column format, according to the instructions found online. You will be able to compose your abstract and then upload it for submission. Detailed instructions for submission are posted on the ISMRM Website. All copyrights to accepted abstracts become the property of ISMRM. No proprietary information may be withheld by authors.

You may also receive submission information by calling, faxing, or writing to:  
International Society for Magnetic Resonance in Medicine, 2118 Milvia Street, Suite 201, Berkeley, California 94704, USA  
Telephone: +1 510 841 1899  
Fax: +1 510 841 2340  
E-mail: [info@ismrm.org](mailto:info@ismrm.org)  
Website: [www.ismrm.org](http://www.ismrm.org)

The *Proceedings* will be published on CD-ROM only. The full text of all accepted abstracts will be available online two weeks before the meeting to pre-registered attendees only. If you wish to have access to the *Proceedings* before the meeting, you must pre-register.

## INFORMATION FOR AUTHORS

### NEW THIS YEAR! Poster Presentation Options

If you wish to have your abstract considered for poster presentation, you will be able to choose between two presentation options:

**1. Traditional poster presentation.** Your abstract will be published in the *Proceedings*, and your poster will be presented in the poster hall. You will stand at your poster during your assigned poster session to answer questions and discuss your work with colleagues.

**2. Electronic poster presentation.** Your abstract will be published in the *Proceedings*. You will also be asked to submit your poster in PowerPoint format in advance of the meeting, and a CD containing all electronic posters will be published and distributed to meeting registrants. Because the posters will be available electronically, inclusion of movies, sounds, and other multi-media formats is possible. This new format opens new opportunities for poster presentation, and authors are encouraged to take advantage of them. No formal presentation of electronic posters will be made.

A number of on-site E-poster review stations will be available as well as a number of E-poster Discussion Kiosks with LCD/beamer projection to facilitate discussion. As already done with the abstracts, copyrights to accepted electronic posters become the property of ISMRM.

### ABSTRACT SUBMISSIONS

Only online submissions will be accepted. Log on to the ISMRM Website ([www.ismrm.org/04](http://www.ismrm.org/04)). Click on "Online Abstract Submission" and follow the instructions.

### ABSTRACT SUBMISSION WITHDRAWAL

Written requests for withdrawal of Abstract submissions from the scientific program, signed by the first author, must be received by 20 January 2004 at the ISMRM Central Office.

### LETTERS OF NOTIFICATION

Authors will be notified of the decision of the Scientific Program Committee in February 2004.



### Poster Presentation of MR Sites from the Hosting Region

#### SUBCOMMITTEE ON MR SITE PRESENTATIONS

Atsuko Heshiki, M.D., *Chair*  
Kee-Hyun Chang, M.D., Jeffrey L. Duerk, Ph.D., Hiroyuki Fujita, Ph.D., Albert C. Lardo, Ph.D., Cynthia L. Lean, Ph.D., Kazuro Sugimura, M.D., Kaori Togashi, M.D.

In addition to the submission of traditional abstracts, MR sites in Japan, China, and the Pan Pacific region are kindly invited to present their sites and research projects in a special poster area, which should give an overview of all the MR activities in this region. The whole series of posters will emphasize the clinical and scientific work going on in the part of the world that hosts the 2004 ISMRM Scientific Meeting. This poster section should become a gathering place for all scientists and clinicians, not only from the hosting region but also from abroad and should therefore facilitate contacts among them.

One poster will be accepted per research group. It should present an overview of the clinical and research activities of an MR group and may introduce staff members, technical equipment, lists of projects, publication lists, and other issues relevant to scientific and clinical work. Applications should be made by letter outlining the scope of the anticipated poster presentation and must be received by **17 November 2003**.

### WHERE TO APPLY

International Society for Magnetic Resonance in Medicine  
Subcommittee on Site Presentations  
Scientific Program Committee  
2118 Milvia Street, Suite 201  
Berkeley, California 94704, USA

**IMPORTANT DATES**

**17 NOVEMBER 2003**  
Deadline for online receipt of Hosting Region Poster submissions.

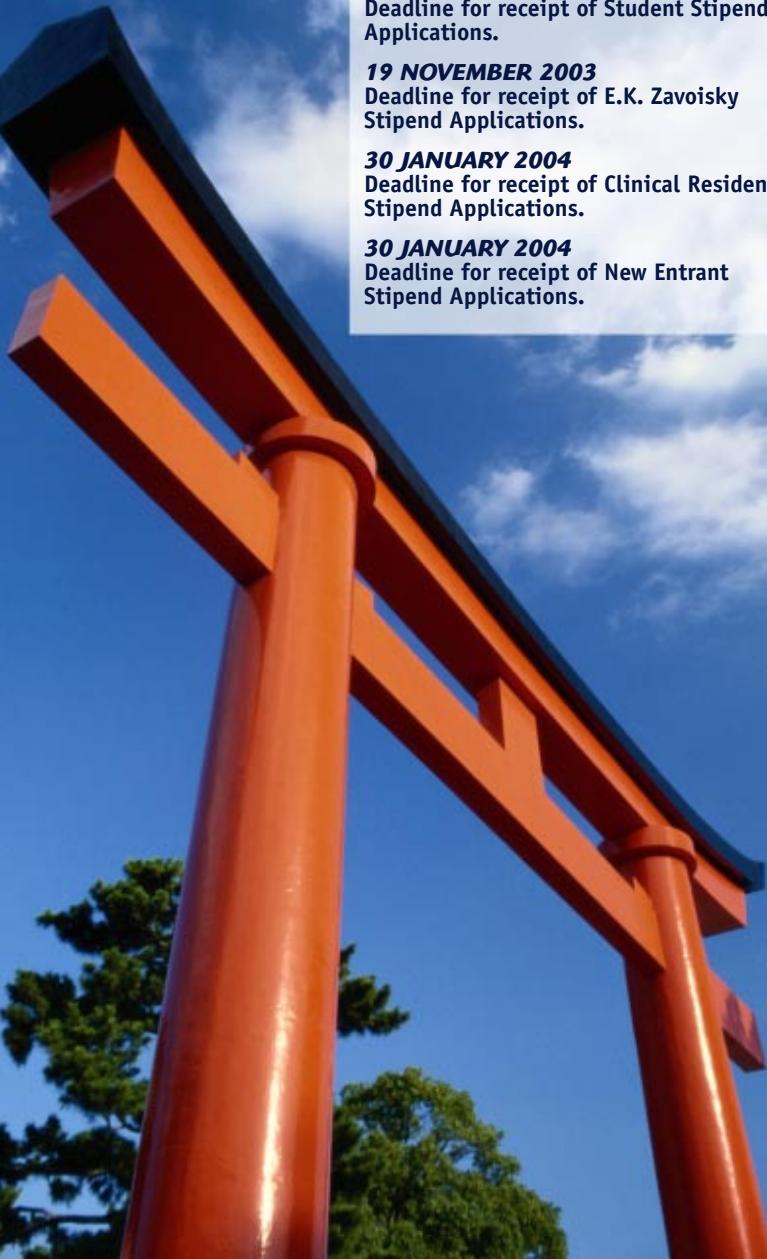
**19 NOVEMBER 2003**  
Deadline for online receipt of Abstract submissions.

**19 NOVEMBER 2003**  
Deadline for receipt of Student Stipend Applications.

**19 NOVEMBER 2003**  
Deadline for receipt of E.K. Zavoisky Stipend Applications.

**30 JANUARY 2004**  
Deadline for receipt of Clinical Resident Stipend Applications.

**30 JANUARY 2004**  
Deadline for receipt of New Entrant Stipend Applications.



**KYOTO • JAPAN**

**BRAIN FUNCTION AND fMRI**

*Peter Jezzard, Douglas C. Noll, and Steve C.R. Williams, Organizers*

**Saturday, 15 May, 08.30 - 17.50 and Sunday, 16 May, 08.10 - 14.40**

**EDUCATIONAL OBJECTIVES**

Upon completion of the course, participants should be able to:

- Identify the principal areas of the brain used in sensory perception, motor activity, language, and cognition;
- Describe the way in which these cortical areas inter-communicate, both at the electrical and chemical level;
- Describe the associated hemodynamic responses of the brain that accompany electrical and metabolic activity;
- Define and compare the various MRI pulse sequences that can be used to map human brain function;
- Identify the sources of artifacts that are inherent in many fMRI procedures and describe methods to minimize these artifacts;
- Design a simple fMRI paradigm, and describe the principles used in data analysis;
- Explain the principles of perfusion based fMRI and the methods used to construct maps of white matter tracts;
- Identify the areas of application of fMRI in neurology, psychiatry and basic neuroscience.

**PROGRAM**

*The final five minutes of each presentation will be reserved for questions.*

**Day 1: Saturday, 15 May**

08.30 **Introduction**

**SESSION I: Functional Anatomy and Connectivity**

08.40 **Introduction to Neuronal Anatomy and Electrical Activity**

*Mark S. Cohen*

09.15 **Grey Matter Functional Specialization**

*Arno Villringer*

09.50 **Fiber Tracts and Structural Connectivity in the Human Brain**

*Hubertus Axer*

10.25 **Break**

**SESSION II: Neurochemistry**

10.45 **Neurochemistry and Neurotransmitter Systems**

*Paul Grasby*

11.20 **Neuronal Metabolism**

*Stephen R. Williams*

11.55 **Hemodynamic Responses to Neuronal Activity**

*Richard B. Buxton*

12.30 **Break**

**SESSION III: The BOLD Signal**

14.00	<b>Sources of BOLD Signal and Field Strength Issues</b> <i>Richard P. Kennan</i>
14.35	<b>Temporal BOLD Characteristics and Non-Linearity</b> <i>Douglas C. Noll</i>
15.10	<b>Spatial Resolution Limits</b> <i>Robert W. Cox</i>
15.45	Break

**SESSION IV: fMRI Pulse Sequences and Artifacts**

16.05	<b>BOLD fMRI Sequences</b> <i>Peter Jezzard</i>
16.40	<b>Susceptibility Artifacts</b> <i>Lawrence L. Wald</i>
17.15	<b>Minimization and Correction of Physiological Noise Components in fMRI</b> <i>Gunnar Krueger</i>
17.50	Adjournment

**Day 2: Sunday, 16 May****SESSION V: Experimental Design and Data Analysis**

08.10	<b>Experimental Paradigm Design</b> <i>Nick F. Ramsey</i>
08.45	<b>Pre-Statistics</b> <i>Mark Jenkinson</i>
09.10	<b>Data Modeling, the General Linear Model, and Statistical Inference</b> <i>Robert W. Cox</i>
09.55	Break

**SESSION VI: Non-BOLD Functional Imaging Methods**

10.15	<b>Functional Perfusion MRI</b> <i>Thomas T. Liu</i>
10.50	<b>Connectivity Mapping Using DTI</b> <i>Derek K. Jones</i>
11.10	Questions
11.30	Break

**SESSION VII: Clinical and Neuroscience Applications**

13.00	<b>Design of a Clinical fMRI Protocol</b> <i>Steve C.R. Williams</i>
13.25	<b>fMRI of Neurological Disorders</b> <i>Steven C. Cramer</i>
13.50	<b>fMRI of Drug Abuse</b> <i>Thomas Ernst</i>
14.15	<b>fMRI of Human Sensory Processes and High-Level Cognition</b> <i>Kang Cheng</i>
14.40	Adjournment

**MR PHYSICS FOR PHYSICISTS**

*Michael H. Buonocore, Peter M. Jakob, and John P. Mugler, Organizers*

**Saturday, 15 May, 08.30 - 17.50 and Sunday, 16 May, 07.30 - 14.30**

**EDUCATIONAL OBJECTIVES**

Upon completion of the course, participants should be able to:

- Describe the fundamental properties of the NMR signal, spin polarization, and different quantum mechanical interactions of spins;
- Explain physical principles, signal processing techniques, and instrumentation used in signal creation, detection, and image generation;
- Compare and contrast the structure, advantages and unique image artifacts of routinely-used advanced pulse sequences;
- Describe measurements for characterizing and optimizing image quality, and methods for avoidance of image artifacts;
- Describe models and graphical tools for understanding magnetization dynamics, and separating out the components of magnetization contributing to an MR echo.
- Compare advanced image reconstruction methods based on gridding, and those used in parallel imaging.
- Explain special MRI pulse sequences and processing methods used for spatial mapping of specific physiological processes.

**PROGRAM**

*The final five minutes of each presentation will be reserved for questions.*

**Day 1: Saturday, 15 May**

**SESSION I: Origin and Basic Properties of the MR Signal**

08.30	<b>Quantum-Mechanical and Classical Description of the MR Signal</b> <i>James Tropp</i>
09.10	<b>Multiple-Quantum Coherence: Theory and Application</b> <i>Jianhui Zhong</i>
09.50	<b>Beyond Thermal Polarization</b> <i>Gordon Cates</i>
10.30	Break

**SESSION II: The MRI System**

10.50	<b>Overview of an MRI System</b> <i>Richard W. Bowtell</i>
11.30	<b>Transmit and Receive RF Subsystems</b> <i>Ed B. Boskamp</i>
12.10	Break
13.30	<b>Gradient Subsystem</b> <i>Franz Schmitt</i>

**SESSION III: From Signal to Image: Basic Concepts**

14.10	<b>Pulse Sequences I: Echo Formation</b> <i>R. Todd Constable</i>
14.50	<b>Pulse Sequences II: Spatial Encoding and Image Reconstruction</b> <i>Richard G.S. Spencer</i>
15.30	Break

**Pulse Sequences III: Major Techniques**

15.50	<i>Klaus Scheffler</i>
16.30	<b>Measurement and Optimization of Image Quality</b> <i>Dennis L. Parker</i>

**SESSION IV: From Signal to Image: Advanced Concepts**

17.10	<b>Models for Magnetization Behavior</b> <i>Jürgen Hennig</i>
17.50	Adjournment

**Day 2: Sunday, 16 May****SESSION IV: From Signal to Image: Advanced Concepts (continued)**

07.30	<b>Image Reconstruction Via Gridding</b> <i>Gary H. Glover</i>
08.10	<b>Image Reconstruction from Limited Data</b> <i>Zhi-Pei Liang</i>
08.50	<b>Parallel Imaging: The Basics</b> <i>Peter Kellman</i>
09.30	Break
09.50	<b>Parallel Imaging: Toward Routine Clinical Use</b> <i>David J. Larkman</i>
10.30	<b>Image Artifacts and Correction Methods</b> <i>Joseph V. Hajnal</i>
11.10	<b>RF Pulse Design</b> <i>John Pauly</i>
11.50	Break
13.10	<b>Phase Contrast Techniques for Measuring Velocity and Flow</b> <i>Norbert J. Pelc</i>
13.50	<b>Measuring Water Diffusion in Tissue</b> <i>Peter van Zijl</i>
14.30	Adjournment

**SESSION V: From Images to Physiological Mapping**

## WEEKEND EDUCATIONAL PROGRAMS

**ADVANCED BODY MRI**

*Donald G. Mitchell and Richard Semelka, Organizers*

**Saturday, 15 May, 08:30 - 17:15**

**EDUCATIONAL OBJECTIVES**

Upon completion of the course, participants should be able to:

- Evaluate and recommend pulse sequence strategies that will optimize body MR imaging and MR angiography;
- Describe cost-effective indications for MR imaging throughout the body;
- Evaluate new pulse sequences based on existing knowledge of MRI techniques, allowing continuous improvement of body MRI and MRA protocols;
- Implement modern MR applications for diagnosing chest, abdominal, pelvic and vascular diseases;
- Incorporate into their practices recent developments for MR imaging of the pancreas and biliary tract, including MR cholangiopancreatography, and for comprehensive evaluation of the kidneys;
- Diagnose abdominal vascular disease using state-of-the-art MR angiographic techniques;
- Identify new diagnostic opportunities in MR body imaging.

**PROGRAM**

08.30	<b>Body MRI Techniques</b> <i>Donald G. Mitchell</i>
09.15	<b>3T MRI- Role for Body Imaging?</b> <i>Shahid M. Hussain</i>
09.45	<b>Screening of the Abdomen with MRI</b> <i>Susanne C. Goehde</i>
10.15	Break
10.30	<b>Diffuse Liver Disease</b> <i>Katsuyoshi Ito</i>
11.00	<b>Hepatocellular Carcinoma</b> <i>Masa Kanematsu</i>
11.30	<b>MRI Contrast Agents</b> <i>Myeong-Jin Kim</i>
12.15	<b>Pancreas</b> <i>Richard Semelka</i>
12.45	Break
14.15	<b>MRA of the Abdomen</b> <i>Guenther Schneider</i>
15.00	<b>Acute Disease of the Female Pelvis</b> <i>Michele Brown</i>
15.30	<b>Prostate</b> <i>Jelle O. Barentsz</i>
16.00	Break
16.15	<b>Bowel</b> <i>Diego R. Martin</i>
16.45	<b>Chest MRI</b> <i>Hiroto Hatabu</i>
17.15	Adjournment

**NEUROIMAGING**

*Yukio Miki and William T.C. Yuh, Organizers*

**Saturday, 15 May, 08.30 - 17.00**

**EDUCATIONAL OBJECTIVES**

Upon completion of the course, participants should be able to:

- Describe and implement in daily clinical practice several of the newest and most promising MR techniques;
- Compare new knowledge to current practice, recognizing the strengths and weaknesses in their own practice;
- Identify MR areas that potentially benefit clinical practice and patient management;
- Describe the current status of high-field neuroimaging;
- Explain the role of various MR techniques in the diagnosis of diseases of the spine, and head and neck in both adults and pediatric patients.

**PROGRAM**

08.30	<b>Review and Update of MR Physics and Protocols</b> <i>Stephen R. Thomas</i>
08.50	<b>Diffusion Imaging (Including Tensor)</b> <i>Susumu Mori</i>
09.10	<b>Perfusion Imaging</b> <i>Kei Yamada</i>
09.30	<b>Spectroscopy and Brain Activation</b> <i>William G. Bradley</i>
09.50	<b>Open Discussion</b>
10.00	Break
10.30	<b>Sellar and Parasellar Diseases</b> <i>Yukio Miki</i>
10.50	<b>MRA and CTA</b> <i>Shigeki Aoki</i>
11.10	<b>Diagnosis and Intervention of Acute Stroke</b> <i>William Yuh, Masayuki Maeda, and Toshiaki Taoka</i>
11.40	<b>Open Discussion</b>
11.50	Break
13.30	<b>Brain Tumors</b> <i>Yukunori Korogi</i>
13.50	<b>MR Imaging of Seizure Disorder</b> <i>Kee-Hyun Chang</i>
14.10	<b>Infectious Diseases of the Brain</b> <i>Fong Y. Tsai</i>
14.30	<b>Inflammatory Diseases of the Brain</b> <i>Vincent Dousset</i>
14.50	<b>Open Discussion</b>
15.00	Break
15.30	<b>Head and Neck</b> <i>Thomas Vogl</i>

**Clinical Application and Safety of Contrast Agents**

*Michael V. Knopp*

**Imaging Based Radiation Treatment**

*Nina A. Mayr*

**Clinical Application from Low to 3T Scanners**

*Lawrence N. Tanenbaum*

**Open Discussion**

*Douglas P. Beall*

**Infectious Diseases of the Spine**

*E. Turgut Tali*

**Spinal Cord Tumors and Their Mimics**

*Yuichi Inoue*

**Open Discussion**

Adjournment

**RF BOOTCAMP:****ESSENTIALS OF RF COIL DESIGN, CONSTRUCTION, AND INTERFACE**

*H. Cecil Charles and Michael B. Smith, Organizers*

**Saturday, 15 May, 08.00 - 17.50**

**EDUCATIONAL OBJECTIVES**

Upon completion of the course, participants should be able to:

- Define inductance, capacitance, resonance and distributed capacitance with reference to RF coils, their design and operation;
- Describe the basic needs and components of a working RF laboratory;
- Compare design and construction of two important types of coils;
- Explain the fundamentals of RF coil connections to the scanner.

**PROGRAM**

08.00	<b>Welcome and Overview</b> <i>H. Cecil Charles</i>
08.10	<b>Basic Concepts I (Components)</b> <i>Steven M. Wright</i>
08.40	<b>Basic Concepts II (Measurements)</b> <i>James R. MacFall</i>
09.10	<b>The RF Laboratory</b> <i>Randy Duensing</i>
10.00	<b>Discussion</b> <i>Team</i>
10.20	Break
10.40	<b>The Flat Circular Coil (Theory)</b> <i>H. Cecil Charles</i>
11.10	<b>The Flat Circular Coil (Construction)</b> <i>H. Cecil Charles</i>
12.00	Break

13.30	<b>The Bird Cage Coil (Theory)</b> <i>Michael B. Smith</i>
14.15	<b>The Bird Cage Coil (Construction)</b> <i>H. Cecil Charles</i>
15.00	<b>Coil Interface: Theory and Implementation</b> <i>Randy Duensing</i>
15.45	Break
16.05	<b>Where do We Go From Here?</b> <i>Michael B. Smith</i>
16.45	<b>Safety Issues</b> <i>Daniel J. Schaefer</i>
17.30	<b>Panel Discussion</b> <i>Team</i>
17.50	Adjournment

### MR SPECTROSCOPY: BASICS AND CLINICAL APPLICATIONS

*Roland Kreis, Organizer*

Saturday, 15 May, 08.30 - 18.00

#### EDUCATIONAL OBJECTIVES

Upon completion of the course, participants should be able to:

- Describe fundamental principles of clinical MR spectroscopy;
- Explain the crucial steps in performing and evaluating a MRS examination;
- Enumerate potential pitfalls in the clinical application of MR spectroscopy;
- Define diagnostic and patient management situations in which there is a clinically significant justification for a MRS examination;
- Summarize recent clinical uses of *in vivo* MRS.

#### PROGRAM

*The final five minutes of each presentation will be reserved for questions.*

#### Introduction and Methodology

08.30	<b>Basics of MRS</b> <i>Chris Boesch</i>
09.00	<b>Localization Techniques</b> <i>Markus von Kienlin</i>
09.30	<b>Prescan and Shimming</b> <i>Daniel M. Spielman</i>
10.00	<b>Discussion</b>
10.15	Meet the Teacher Break
10.45	<b>Detectable Metabolites and Their Significance</b> <i>Robert J. Gillies</i>
11.15	<b>Data Processing + Fitting</b> <i>Andrew A. Maudsley</i>
11.45	<b>Quantitation + Artifacts in Clinical MRS</b> <i>Roland Kreis</i>
12.15	<b>Discussion</b>
12.30	Meet the Teacher Break

#### Applications

13.45	<b>Clinical MRS: Tumors and Masses in the Brain</b> <i>Franklyn A. Howe</i>
14.15	<b>Clinical MRS: Tumors and Masses in the Prostate and Breast</b> <i>John Kurhanewicz</i>
14.45	<b>Clinical MRS: MS and Inflammation</b> <i>David H. Miller</i>
15.15	<b>Discussion</b>
15.30	Meet the Teacher Break
16.00	<b>Clinical MRS: Stroke and Hypoxia</b> <i>Peter B. Barker</i>
16.30	<b>Clinical MRS: Epilepsy</b> <i>Kenneth D. Laxer</i>
17.00	<b>Clinical MRS: Psychiatry</b> <i>Perry F. Renshaw</i>
17.30	<b>Discussion</b>
17.45	Meet the Teacher
18.00	Adjournment

### MR SPECTROSCOPY: FRONTIER METHODOLOGY AND APPLICATIONS

*Roland Kreis, Organizer*

Sunday, 16 May, 07.30 - 14.30

#### EDUCATIONAL OBJECTIVES

Upon completion of the course, participants should be able to:

- Describe fundamental principles on which advanced uses of MRS are based;
- List state-of-the-art techniques developed for research applications of MR spectroscopy;
- Appraise potential and hurdles for the use of new ways of polarization transfer in *in vivo* MRS;
- Summarize recent biomedical research activities involving *in vivo* MRS;
- Summarize issues of present-day methodology and applications of high resolution spectroscopy.

#### PROGRAM

*The final eight minutes of each presentation will be reserved for questions.*

#### Methodology

07.30	<b>Sophisticated RF Pulses for MRS</b> <i>Robin A. de Graaf</i>
08.00	<b>(De-)Coupling and Spectral Editing</b> <i>Peter S. Allen</i>
08.30	<b>Fast CSI</b> <i>Stefan Posse</i>
09.00	<b>New Ways for Polarization Transfer</b> <i>Jan Henrik Ardenkjaer-Larsen</i>
09.40	Meet the Teacher Break
10.10	<b>High Resolution NMR</b> <i>Masahiro Shirakawa</i>

#### Advanced Applications

10.50	<b>In Vitro NMR Approaches to Metabonomics and Metabolomics</b> <i>Jeremy K. Nicholson</i>
11.30	Meet the Teacher Break
12.45	<b>High Field <math>^1\text{H}</math>-MRS</b> <i>Rolf Gruetter</i>
13.15	<b>In Vivo <math>^{13}\text{C}</math> and <math>^{15}\text{N}</math> MRS and Kinetic Analyses</b> <i>Douglas L. Rothman</i>
13.45	<b><math>^{23}\text{Na}</math> MR: How and Why</b> <i>Gil Navon</i>
14.15	Meet the Teacher
14.30	Adjournment

**CARDIAC IMAGING***David A. Bluemke, Organizer***Sunday, 16 May, 07.30 - 17.00****EDUCATIONAL OBJECTIVES**

Upon completion of the course, participants should be able to:

- Explain the use of cardiac MR to assess myocardial ischemia and viability;
- List the current recognized indications in cardiovascular imaging as well as to define those under investigation;
- Interpret CMR examinations of cardiomyopathy and ARVD;
- Describe the current value of MR imaging of the coronary arteries and atherosclerotic plaques and list its limitations;
- Describe analysis methods used in CMR.

**PROGRAM**

<i>The final five minutes of each presentation will be reserved for questions.</i>	
07.30	<b>Coronary MR Angiography</b> <i>Matthias Stuber</i>
08.05	<b>MRI of Atherosclerotic Disease</b> <i>Chun Yuan</i>
08.40	<b>MRI of Congenital Heart Disease</b> <i>Scott D. Flamm</i>
09.15	Break
09.35	<b>MR Dobutamine Stress Testing</b> <i>Raymond Kwong</i>
10.10	<b>MR Perfusion Imaging of Ischemia</b> <i>Steven D. Wolff</i>
10.45	<b>MRI of Myocardial Viability</b> <i>Andrew Arai</i>
11.20	Questions/Summary
11.30	Break
13.00	<b>Analysis of Cardiac MR Images</b> <i>Rob van der Geest</i>
13.35	<b>MRI in Assessment of Arrhythmia</b> <i>David A. Bluemke</i>
14.05	<b>LV Global and Regional Function</b> <i>Victor A. Ferrari</i>
14.40	Break
15.00	<b>Clinical Cardiac Imaging at 1.5T and 3.0T: Relative Strengths and Weaknesses</b> <i>J. Paul Finn</i>
15.35	<b>Non-Contrast CMR Approaches in Coronary Heart Disease</b> <i>Matthias Friedrich</i>
16.10	<b>Interventional CMR</b> <i>Harald Quick</i>
16.45	Questions/Summary
17.00	Adjournment

**MR OF TRANSGENIC MOUSE MODELS (MR OMICS)***Daniel H. Turnbull, Organizer***Sunday, 16 May, 08.00 - 16.30****EDUCATIONAL OBJECTIVES**

The course will give an understanding of the following topics:

- Different ways in which molecular biologists are using mouse models to understand development and disease;
- Small animal imaging;
- Applications of MR to mouse models of cancer, neurological and cardiac diseases;
- Use of MR and mouse models for drug discovery; different approaches being taken to obtain functional and molecular information from mouse imaging techniques.

**PROGRAM**

08.00	<b>Mouse Models of Human Disease</b> <i>Alexandra L. Joyner</i>
08.45	<b>Overview of Mouse Imaging Methods</b> <i>R. Mark Henkelman</i>
09.30	Break
10.00	<b>MR of Mouse Models of Neurological Disease</b> <i>Daniel H. Turnbull</i>
10.45	<b>MR of Mouse Models of Cancer</b> <i>Zaver M. Bhujwalla</i>
11.30	Break
13.00	<b>MR of Mouse Models of Cardiac Disease</b> <i>Axel Haase</i>
13.45	<b>MR of Mouse Models for Drug Discovery</b> <i>Nicolau Beckmann</i>
14.30	Break
15.00	<b>Functional MR Imaging and Spectroscopy in Mice</b> <i>Mathias Hoehn</i>
15.45	<b>Cellular/Molecular MR Imaging in Mice</b> <i>Jeff W.M. Bulte</i>
16.30	Adjournment

**MUSCULOSKELETAL MRI***Lynne S. Steinbach, Organizer***Sunday, 16 May, 07.30 - 17.00****EDUCATIONAL OBJECTIVES**

Upon completion of the course, participants should be able to:

- Identify various principles of physics that result in some of the more popular MR imaging sequences;
- Design optimized protocols in musculoskeletal MRI;
- Interpret normal anatomy of the ankle tendons and ligaments, knee ligaments, hip, wrist, shoulder and elbow;
- Recognize pathology of the ankle tendons and ligaments, knee ligaments, hip, wrist, shoulder and elbow using MRI;
- Distinguish some patterns of benign lesions that can be mistaken for neoplastic lesions on MR.

**PROGRAM**

07.30	<b>Technical Aspects of Musculoskeletal MRI</b> <i>Christopher F. Beaulieu</i>
08.15	<b>MRI of Ankle Tendons and Ligaments</b> <i>Lynne S. Steinbach</i>
09.00	<b>MRI of the Knee: Ligaments</b> <i>Garry E. Gold</i>
09.45	Questions
09.50	Break
10.10	<b>MRI of the Hip</b> <i>Juerg Hodler</i>
10.55	<b>MRI of the Wrist</b> <i>Mark Schweitzer</i>
11.45	Questions
11.50	Break
13.20	<b>MRI of the Shoulder: Impingement and Rotator Cuff</b> <i>William B. Morrison</i>
14.05	<b>MRI of the Shoulder: Instability</b> <i>Wilfred C.G. Peh</i>
14.50	Questions
14.55	Break
15.15	<b>MRI of the Elbow</b> <i>Christine Chung</i>
16.00	<b>Musculoskeletal Pseudotumors on MRI</b> <i>Suzanne E. Anderson</i>
16.45	Questions
17.00	Adjournment

**Opening Session**

Monday, 17 May

**Welcome & Awards Ceremony**

07.45 - 08.20

**2004 LAUTERBUR LECTURE:  
"From Immune Suppression  
to Mad Cow Disease—  
In Vitro NMR Spectroscopy  
with the Molecules of Life"**

Kurt Wüthrich, Eidgenössische Technische Hochschule, Zurich, Switzerland

08.20 - 09.00

Dr. Wüthrich was awarded the Nobel Prize in 2002 for his development of nuclear magnetic resonance spectroscopy for determining the three-dimensional structure of biological macromolecules in solution. Through his work at the beginning of the 1980s, Kurt Wüthrich has made it possible to use NMR on proteins. He developed a general method of systematically assigning certain fixed points in the protein molecule and also a principle for determining the distances between these. Using the distances, he was able to calculate the three-dimensional structure of the protein. The advantage of NMR is that proteins can be studied in solution, i.e., an environment similar to that in the living cell. His work in NMR is also used in the pharmaceutical industry to determine the structure, and hence the properties, of proteins and other macromolecules that can be interesting target molecules for new pharmaceuticals. Pharmaceutical molecules are designed to fit into the structure of the protein—like a key in a lock. Perhaps the most important industrial use of NMR is in the search for small potential pharmaceutical molecules that can interact with a given biological macromolecule. If the small molecule binds to the large one, the NMR spectrum of the large molecule is normally changed. This may be used to "screen" a large number of pharmaceutical candidates at an early stage in the development of a new drug.

*Adapted from the Official Website of the Nobel Foundation*

Monday, 17 May, 09.00 - 10.15

**MR IMPACT IN METABOLOMICS  
AND PROTEOMICS***Sebastián Cerdán and Rolf Gruetter, Organizers***EDUCATIONAL OBJECTIVES**

Upon completion of this session, participants should be able to:

- Explain the concepts of metabolomics and proteomics, and their potential relevance in medicine;
- Describe the roles of metabolomics in tumor diagnosis, drug discovery and drug evaluation;
- Describe the role that MRI can and has played in the modern view of proteomics and metabolomics.

**PROGRAM**09.00 **From the Genome to the Metabolome by NMR**

*Kevin Brindle*  
University of Cambridge  
Cambridge, England, UK

09.25 **The Tumour Metabolome by <sup>1</sup>H MRS: Implications for Medical Diagnosis**

*John R. Griffiths*  
St. George's Hospital Medical School  
London, England, UK

09.50 **MR-based Metabonomic Approaches in Toxicology, Disease Diagnosis and Global Systems Biology**

*Jeremy K. Nicholson*  
Imperial College Faculty of Medicine  
London, England, UK

Tuesday, 18 May, 08.15 - 09.30

**MRI BEYOND TISSUE ANATOMY  
WITH NOVEL CONTRAST AGENTS***Sebastián Cerdán, Organizer***EDUCATIONAL OBJECTIVES**

Upon completion of this session, participants should be able to:

- Briefly describe the principles of contrast agent design, and the different approaches for imaging tissue pH, pO<sub>2</sub> and other biochemical variables;
- Explain approaches for improved blood pool imaging and its applications in angiography and vascular research;
- Give examples of applications of stem cells in physiology and pathology and describe approaches for stem cell tracking by MRI.

**PROGRAM**08.15 **MRI of Biochemical Variables with Novel Contrast Agents**

*A. Dean Sherry*  
University of Texas  
Dallas, Texas, USA

08.40 **Improved Blood Pool Agents for High Resolution Angiography and Vascular Research**

*Robert M. Weisskoff*  
EPIX Medical, Inc.  
Cambridge, Massachusetts, USA

09.05 **Stem Cell Tracking in Physiology and Pathology**

*Mathias Hoehn*  
Max Planck Institute for Neurological Research  
Cologne, Germany

Wednesday, 19 May, 08.15 - 09.30

**MR IN SCREENING***Riccardo Manfredi, James F.M. Meaney and Neil M. Rofsky, Organizers***EDUCATIONAL OBJECTIVES**

Upon completion of this session, participants should be able to:

- Compare the various screening tests, in the light of the current knowledge base (accuracy, cost, availability, etc.);
- List areas where MRI is likely to be superior to other competing modalities;
- Describe the potential of MRI for screening, specifically in cardiovascular disease and cancer;
- Discuss the challenges screening poses to the MR community.

**PROGRAM****08.15 Disease Screening in the 21st Century: Is it Viable and What are the Tools?**

*Bruce J. Hillman*  
University of Virginia Health Sciences Center  
Charlottesville, Virginia, USA

**08.40 MR Screening in Cardiovascular Disease**

*Zahi A. Fayad*  
Mount Sinai School of Medicine  
New York, New York, USA

**09.05 MR Screening in Cancer**

*Christiane K. Kuhl*  
University of Bonn  
Bonn, Germany

Thursday, 20 May, 08.15 - 09.30

**THE CURRENT AND FUTURE ROLE OF IMAGING IN CANCER THERAPY ASSESSMENT***Kim Butts and Jeffrey L. Duerk, Organizers***EDUCATIONAL OBJECTIVES**

Upon completion of this session, participants should be able to:

- Describe several areas in which clinical oncologists could effectively use non-invasive assessment of cancer therapy;
- List the ways in which MR is currently used in assessing cancer therapy (either efficacy, progression, side-effects, prognosis, etc.);
- Assess future directions of novel techniques and agents that will be developed by or available to the MR community to assess cancer therapy.

**PROGRAM****08.15 The Role of Imaging in the Assessment of Cancer Treatment**

*Anthony F. Shields*  
Wayne State University  
Detroit, Michigan, USA

**08.40 Current Concepts in MR Based Therapy Assessment**

*Michael V. Knopp*  
Ohio State University  
Columbus, Ohio, USA

**09.05 Molecular Imaging in Cancer Therapies of the Future**

*Chrit T. Moonen*  
Université Victor Segalen  
Bordeaux, France

Friday, 21 May, 08.15 - 09.30

**EXTENDING THE LIMITS OF MRI: NEW CONCEPTS FOR SIGNAL DETECTION AND ENHANCEMENT***Michael B. Smith, Daniel K. Sodickson, and Scott D. Swanson, Organizers***EDUCATIONAL OBJECTIVES**

Upon completion of this session, participants should be able to:

- Identify new methods of detecting small signals in NMR and appreciate why different technologies are required for different spatial scales;
- Describe current and new uses of laser polarized noble gases;
- Evaluate recent research into new polarization-enhanced contrast agents created with Dynamic Nuclear Polarization (DNP) or ParaHydrogen-Induced Polarization (PHIP), and identify their potential impact for direct imaging of enhanced molecules;
- Appreciate how fundamental NMR research translates into future clinical procedures and creates new windows into the molecular world of man.

**PROGRAM****08.15 Signal Detection in NMR: Macroscopic, Microscopic and Nanoscale**

*James Tropp*  
General Electric Medical Systems  
Fremont, California, USA

**08.40 NMR and MRI at a Distance: From Nanometers to Meters**

*Alexander Pines*  
University of California  
Berkeley, California, USA

**09.05 Beyond Relaxation Contrast: Agents for Polarization Enhancement in MR Imaging**

*J. Stefan Petersson*  
Amersham Health  
Malmö, Sweden

## MORNING CATEGORICAL COURSES

Tuesday, 18 May - Friday 21 May, 07.00 - 08.00

**FUNCTIONAL BODY MRI:  
FROM MORPHOLOGY TO FUNCTION***Riccardo Manfredi and Carlo Bartolozzi,  
Organizers***EDUCATIONAL OBJECTIVES**

Upon completion of this course, participants should be able to:

- Evaluate new pulse sequences based on knowledge of current MR technique, allowing continuous improvement of body MR images;
- Incorporate recent developments for MR imaging such as MRCP for the pancreas and biliary tract, and MR diffusion and perfusion techniques for kidneys;
- Apply new contrast agents in different hepatic diseases;
- Evaluate the possibility of MR imaging in bowel imaging and in screening oncologic patients for metastatic disease;
- Achieve functional information reflecting physiologic processes.

**PROGRAM****Tuesday, 18 May****07.00 Perfusion and Diffusion Techniques in Body Imaging***Joseph C. McGowan***07.30 Body Imaging at 3T***Kimberly Amrami***Wednesday, 19 May****07.00 Liver and Liver-Specific Contrast Agents***Thomas Helmberger***07.30 Biliary and Pancreatic Ducts***Alice Gillams***Thursday, 20 May****07.00 Kidneys***Michael Pedersen***07.20 Uterus/Female Pelvis***Kaori Togashi***07.40 Whole Body MRI***Thomas Lauenstein***Friday, 21 May****07.00 Bowel***David J. Lomas***07.30 Breast***Francesco Sardanelli***UNDERSTANDING DIFFUSION TENSOR IMAGING AND FUNCTIONAL MRI: THE RELATIONSHIP BETWEEN STRUCTURE AND FUNCTION IN THE BRAIN***Gareth J. Barker and R. Todd Constable,  
Organizers***EDUCATIONAL OBJECTIVES**

Upon completion of this course, participants should be able to:

- Explain how the fMRI data is acquired and processed;
- Explain how the diffusion tensor is acquired, measured and mapped;
- Define the terms structural and functional connectivity;
- Describe sources of artifacts, limitations to the data, and the likely impact of new parallel imaging techniques on fMRI and DTI data;
- Outline the methods available to combine the complementary information from fMRI and DTI data.

**PROGRAM**

*The final five minutes of each presentation will be reserved for questions.*

**Tuesday, 18 May****Introduction to fMRI****07.00 fMRI Basics: Paradigm****Design/Analysis***R. Todd Constable***07.30 fMRI Resting State Connectivity/ Structural Equation Modeling***Mark J. Lowe***Wednesday, 19 May****Introduction to DTI****07.00 DTI Basics***Derek K. Jones***07.30 Tractography and Beyond***Geoff Parker***Thursday, 20 May****Artifacts... and Correction Strategies****07.00 DTI***Christopher A. Clark***07.30 fMRI***Douglas C. Noll***Friday, 21 May****Quantitative Measures/Information Obtained****07.00 DTI: b-Values, Fractional Anisotropy and Other Quantitative Measures***Peter J. Basser***07.30 fMRI/DTI - Combining Data***Claudia A.M. Wheeler-Kingshott***ECHO MANAGEMENT***Kim Butts and Scott D. Swanson, Organizers***EDUCATIONAL OBJECTIVES**

Upon completion of this course, participants should be able to:

- Explain the basic principles of spin echo, gradient echo, and stimulated echo formation;
- Appreciate the complexity of coherence pathways that arise when two or more RF pulses are applied;
- Describe methods that investigators use to mitigate effects of multiple coherence pathways to assure formation of proper echoes;
- List techniques used in steady-state free precession (SSFP) pulse sequences to minimize spurious echo formation;
- Determine which sequence will be appropriate for what clinical application.

**PROGRAM****Tuesday, 18 May****07.00 Basic Principles of Echo Formation***R. Scott Hinks***07.25 Basics of Echo Formation: Refocused***James B. Murdoch***07.50 Discussion****Wednesday, 19 May****07.00 Basic FSE/TSE and FLARE***David G. Norris***07.25 Advanced FSE/TSE***Jürgen Hennig***07.50 Discussion****Thursday, 20 May****07.00 Gradient Recalled Echoes***Felix W. Wehrli***07.25 Advanced Gradient Echo Imaging***Samuel Patz***07.50 Discussion****Friday, 21 May****07.00 Fully Refocused SSFP***Klaus Scheffler***07.25 Setting Up the steady State in SSFP***Brian A. Hargreaves***07.50 Discussion**

MORNING CATEGORICAL COURSES

Tuesday, 18 May - Friday 21 May, 07.00 - 08.00

**ESTABLISHED AND EVOLVING APPLICATIONS OF MRA**

*James F.M. Meaney, Organizer*

**EDUCATIONAL OBJECTIVES**

Upon completion of this course, participants should be able to:

- Define the established indications for MRA;
- Recognize the importance of non-contrast and contrast-enhanced approaches in the different vascular territories;
- Diagnose common vascular pathology and variants;
- Apply the different post-processing algorithms to enhance diagnostic practice;
- Perform basic vessel wall imaging.

**PROGRAM**

**Tuesday, 18 May**

**Body MRA**

07.00	<b>Thoracic Aorta MRA</b> <i>Mitsue Miyazaki</i>
07.20	<b>Abdominal MRA</b> <i>Thomas M. Grist</i>
07.40	<b>Coronary MRA</b> <i>Scott D. Flamm</i>

**Wednesday, 19 May**

**MRA Post-processing Workstation**

**Demonstrations—Speakers to be announced**

07.00	<b>Philips Medical Systems</b>
07.10	<b>GE Medical Systems</b>
07.20	<b>Siemens Medical Solutions</b>
07.30	<b>Vital Images</b>
07.40	<b>Toshiba</b>
07.50	<b>Panel Discussion</b>

**Thursday, 20 May**

**Peripheral MRA**

07.00	<b>Upper Extremity MRA</b> <i>Klaus U. Wentz</i>
07.20	<b>Lower Extremity MRA</b> <i>Tim Leiner</i>
07.40	<b>MR Venography</b> <i>Stefan G. Ruehm</i>

**Friday, 21 May**

**Carotid MRA**

07.00	<b>Optimization of Non-contrast Techniques</b> <i>Dennis L. Parker</i>
07.20	<b>Contrast-Enhanced MRA</b> <i>John Huston</i>
07.40	<b>Plaque Imaging and Characterization</b> <i>Chun Yuan</i>

**NEW HORIZONS IN MUSCULOSKELETAL MRI: OPTIMIZING MR IMAGING WITH CURRENT TECHNOLOGY**

*Joshua M. Farber and Lawrence M. White, Organizers*

**EDUCATIONAL OBJECTIVES**

Upon completion of this course, participants should be able to:

- Describe MR techniques for imaging cartilage at various field strengths and understand the clinical role of MRI in the evaluation of articular cartilage disorders;
- Assess the musculoskeletal system using high- and low-field MR systems;
- Explain use of fat suppression MRI techniques in the musculoskeletal system;
- Explain and use fast scanning MRI techniques in the musculoskeletal system;
- Understand high-resolution MR imaging and its trade-off with signal to noise, and apply this knowledge to imaging the musculoskeletal system;
- Describe the rationale of protocol approaches and apply this understanding to optimize MRI clinical protocols.

**PROGRAM**

**Tuesday, 18 May**

07.00	<b>MRI of Cartilage—Technical Considerations</b> <i>Timothy J. Mosher</i>
07.25	<b>MRI of Cartilage—Clinical Applications and Imaging Evaluation</b> <i>Carl S. Winalski</i>
07.50	<b>Discussion</b>

**Wednesday, 19 May**

07.00	<b>Fat Suppression Techniques in Musculoskeletal MRI</b> <i>John A. Carrino</i>
07.25	<b>Fast Imaging Techniques in Musculoskeletal MRI</b> <i>Joshua M. Farber</i>
07.50	<b>Discussion</b>

**Thursday, 20 May**

07.00	<b>High Field MRI of the Musculoskeletal System: Techniques, Protocol Optimization and Clinical Applications</b> <i>Johannes Bloem</i>
07.25	<b>Mid-Low Field MRI of the Musculoskeletal System: Techniques, Protocol Optimization and Clinical Applications</b> <i>Hiroshi Yoshioka</i>
07.50	<b>Discussion</b>

**Friday, 21 May**

07.00	<b>Spatial Resolution and SNR Considerations in MRI of the Musculoskeletal System</b> <i>Garry E. Gold</i>
07.25	<b>Optimizing Clinical Protocols in MRI of the Musculoskeletal System</b> <i>William B. Morrison</i>
07.50	<b>Discussion</b>

**PARALLEL IMAGING 2004**

*Neil M. Rofsky and Daniel K. Sodickson, Organizers*

**EDUCATIONAL OBJECTIVES**

Upon completion of this course, participants should be able to:

- Explain the basic principles of parallel imaging, including elements both of RF coil array design and of image reconstruction;
- Critically survey promising clinical applications of parallel MRI;
- Summarize current research into the limits of performance of parallel imaging, describe new developments in image reconstruction and coil array design, and outline emerging parallel imaging applications;
- Identify the key steps in a practical parallel imaging examination, and compare the nuts-and-bolts features of various MR vendors' existing implementations.

**PROGRAM**

**Tuesday, 18 May**

**Basics**

07.00	<b>Introduction</b> <i>Daniel K. Sodickson</i>
07.05	<b>Coil Arrays (The Technological Tools)</b> <i>Michael Ohliger</i>
07.30	<b>Image Reconstruction (The Mathematical Tools)</b> <i>Klaas Prüssmann</i>
07.55	<b>Discussion</b>

**Wednesday, 19 May**

**Clinical Applications**

07.00	<b>Recap of Basics</b> <i>Daniel K. Sodickson</i>
07.05	<b>Applications in Clinical Cardiology</b> <i>Scott D. Flamm</i>
07.30	<b>Applications in Clinical Radiology</b> <i>Stefan O. Schoenberg</i>
07.55	<b>Discussion</b>

## MORNING CATEGORICAL COURSES

Tuesday, 18 May - Friday 21 May, 07.00 - 08.00

## Thursday, 20 May

## Current Research

## 07.00 Recap of Basics and Applications

*Daniel K. Sodickson*

## 07.05 Limits of Parallel MRI: Recent Results, Current Controversies

*Daniel K. Sodickson*

## 07.20 New Developments in Image Reconstruction

*Jeffrey Tsao*

## 07.40 New Developments in Array Design

*Jozef H. Duyn*

## Friday, 21 May

## Vendor Update 2004

## 07.00 Recap of Basics, Applications, and New Developments

*Daniel K. Sodickson*

## 07.05 Philips Medical Systems

*Johan van den Brink*

## 07.15 GE Medical Systems

*Kevin F. King*

## 07.25 Siemens Medical Solutions

*Berthold Kiefer*

## 07.35 Toshiba

*Tetsuhiko Takahashi*

## 07.45 Hitachi

*Kazuya Okamoto*

## 07.55 Discussion and Conclusion

SPECTROSCOPY:  
THE BRAIN AND BEYOND*Peter S. Allen, John R. Griffiths, and Rolf Gruetter, Organizers*

## EDUCATIONAL OBJECTIVES

Upon completion of this course, participants should be able to:

- Describe the principles of spectral analysis through LC modeling;
- Outline the mechanisms for intra-sequence signal loss when target metabolites have coupled spins;
- List the key metabolites facilitating the spectroscopic recognition of tumor development in the prostate and the brain;
- Outline how water can be used as an internal concentration standard with minimal associated spectral artifacts;
- Explain how macromolecular contamination of spectra can be recognized and mitigated;
- Explain how MRS can be used to reflect metabolic processes in muscle using glycogen or lipids.

## Thursday, 20 May

## 07.00 Using Water as an Internal Standard

*Dieter Leibfritz*

## 07.20 Discussion

## 07.30 Dealing with Macromolecular Signals

*Kevin L. Behar*

## 07.50 Discussion

## Friday, 21 May

## 07.00 In Vivo Measurement of Muscle and Liver Glycogen

*Peter G. Morris*

## 07.20 Discussion

## 07.30 Myo-cellular Lipid Measurements

*Chris Boesch*

## 07.50 Discussion

## PROGRAM

## Tuesday, 18 May

## 07.00 The LC Modeling Approach

*Pierre-Gilles Henry*

## 07.20 Discussion

## 07.30 Coupled-Spin-Metabolite Signal Yield

*Peter S. Allen*

## 07.50 Discussion

## Wednesday, 19 May

## 07.00 MRS in Cancer of the Prostate

*Daniel Vigneron*

## 07.20 Discussion

## 07.30 MRS and Brain Cancer

*Martin O. Leach*

## 07.50 Discussion

**IMAGING IN DRUG DEVELOPMENT**

*Jeffrey L. Evelhoch and John R. Griffiths,  
Organizers*

**Monday, 17 May, 11:00 - 13:00**

**EDUCATIONAL OBJECTIVES**

Upon completion of this course, participants should be able to:

- Explain why the pharmaceutical industry is incorporating imaging into the process of drug development;
- List at least two examples of how information provided from MR studies can impact the development of a drug;
- Describe what roles a practicing radiologist should play in imaging studies associated with clinical trials of new drugs.

**PROGRAM**

**Monday, 17 May**

**Drug Development in Oncology**

11.00 **The Role of MR and Radiologists**  
*Patricia Cole*

11.15 **Current and Future MR Methods**  
*Geoff J.M. Parker*

11.30 **A Radiologist's Perspective**  
*Frederick Kelcz*

11.45 **Panel Discussion**

**Drug Development in Osteoarthritis**

12.00 **The Role of MR and Radiologists**  
*John C. Waterton*

12.15 **Current and Future MR Methods**  
*Garry E. Gold*

12.30 **Semiquantitative and Quantitative Imaging Techniques for Drug Discovery and Development in OA: A Radiologist's Perspective**  
*Philipp Lang*

12.45 **Panel Discussion**

13.00 Adjournment

**INTERVENTIONAL MRI:  
THE STATE OF THE ART AND BEYOND**

*Kim Butts, Organizer*

**Tuesday, 18 May, 10.30 - 12.30**

**EDUCATIONAL OBJECTIVES**

Upon completion of this course, participants should be able to:

- List several procedures that are being developed under MRI guidance;
- Describe the types of MR-compatible devices and open MRI systems that are available;
- Describe some of the challenges of using MRI guidance for interventional procedures;
- Compare the value of MRI-guidance to other available image-guidance systems.

**PROGRAM**

**Tuesday, 18 May**

10.30 **MR-Guided Breast Biopsy**  
*Christiane K. Kuhl*

10.50 **MR-Guided Focused Ultrasound**  
*Kullervo Hynynen*

11.10 **MR-Guided Microwave Therapy of the Liver**  
*Shigehiro Morikawa*

11.30 **MR-Guided Neurosurgery**  
*Christoph Nimsky*

11.50 **MR-Guided Vascular Interventions**  
*Elliot R. McVeigh*

12.10 **Discussion**

12.30 Adjournment

**HOT TOPICS FOR CLINICAL PRACTICE**

*Thomas M. Grist and Clifford R. Jack,  
Organizers*

**Wednesday, 19 May 10.30 - 12.30**

**EDUCATIONAL OBJECTIVES**

Upon completion of this course, participants should be able to:

- Describe five points that can be used to improve imaging strategies in important areas of clinical practice;
- Assess the applicability to clinical practice of three newer imaging techniques.

**PROGRAM**

**Wednesday, 19 May**

This course covers the most current questions and controversial areas, and includes the most up-to-date information available. Therefore, the final selection of subjects and speakers for the Hot Topics Course is not made until a date much later than for the other courses at the meeting, and at this time we don't yet have details. Please check the website periodically for news of the course program.

## CARDIOVASCULAR MR: TODAY AND BEYOND

Zahi A. Fayad, Christopher Kramer, and Samuel Wickline, *Organizers*

Thursday, 20 May, 10:30 - 12:30

### EDUCATIONAL OBJECTIVES

Upon completion of this course, participants should be able to:

- Describe basic areas of routine and promising clinical use of MR in assessing cardiovascular disease;
- Apply MR protocols for determination of cardiac morphology, dynamic function, flow, and physiologic status;
- Explain methodology that aids in the interpretation of results for cardiac MR assessment of acquired cardiac disease;
- Compare approaches for optimal presentation and analysis of cardiac MR results.

### PROGRAM

Thursday, 20 May

10.30 **Valvular Disease**

*Samuel A. Wickline*

10.55 **Perfusion**

*Juerg Schwitter*

11.20 **Viability**

*Joao A.C. Lima*

11.45 **Coronary Lumen and Vessel Wall**

*Zahi A. Fayad*

12.10 **Discussion**

12.30 Adjournment

## JAPANESE LANGUAGE SUMMARY

### SESSIONS:

### BASIC SCIENCE HIGHLIGHTS NEW CLINICAL DEVELOPMENTS

*Shoji Naruse and Kazuro Sugimura, Organizers*

Monday, 17 May, 18.30 - 20.00

Tuesday, 18 May, 18.00 - 19.30

Wednesday, 18 May, 18.00 - 19.30

Daily summary of topics and highlights of the Basic Science Sessions and the Clinical Science Sessions will be presented in Japanese.

## SMRT and ISMRM Joint Presentation: MANAGING MR ARTIFACTS AND PITFALLS

*Kim Butts and John Christopher, Organizers*

Monday, 17 May, 14.00 - 16.00

### EDUCATIONAL OBJECTIVES

Upon completion of this course, participants should be able to:

- Recognize and identify common MR artifacts;
- Describe the physical causes of many common MR artifacts;
- Describe how these artifacts hinder clinical interpretation of MR images;
- Recommend imaging solutions to prevent artifacts in MR images.

### PROGRAM

Monday, 17 May

13.30 **MRI Artifacts:**

#### A Technical Perspective

*Gregory C. Brown*

13.55 **The Physics of Cardiac and Blood**

#### Flow Artifacts

*David N. Firmin*

14.20 **Neuro and Vascular Pitfalls**

*William G. Bradley*

14.45 **Body and Cardiac Pitfalls**

*Katsuyoshi Ito*

15.10 **Discussion**

15.30 Adjournment

## MR PHYSICS AND TECHNIQUES FOR CLINICIANS

*Frank R. Korosec and Joseph G. McGowan, Organizers*

Monday, 17 May, 16.30 - 18.30,

Tuesday, 18 May - Thursday, 20 May, 16.00 - 18.00

### EDUCATIONAL OBJECTIVES

Upon completion of this course, participants should be able to:

- Define and describe the fundamental principles of MR imaging, including the definition of spin magnetization, the Larmor relationship, relaxation phenomena, and the process of using the spin magnetization to produce an image;
- Explain imaging pulse sequences based upon spin and gradient echoes, including fast spin echo and echo planar techniques;
- Design MR imaging protocols for diagnostic applications considering image contrast, spatial resolution, acquisition time, signal-to-noise ratio, and artifacts;
- Describe the principles and capabilities of various advanced MR techniques including perfusion, diffusion, cardiac and functional MRI and spectroscopy.

### PROGRAM

Monday, 17 May

16.30 **Spin Gymnastics I**

*Walter Kucharczyk and Donald B. Plewes*

17.30 **Spin Gymnastics II**

*Walter Kucharczyk and Donald B. Plewes*

18.30 Adjournment

Tuesday, 18 May

16.00 **Spin Echo Imaging**

*Bruce Pike*

16.40 **Gradient Echo Imaging**

*Michael Markl*

17.20 **Fast Spin Echo Imaging**

*Joseph C. McGowan*

18.00 Adjournment

Wednesday, 19 May

16.00 **Imaging Features**

*Frank R. Korosec*

16.40 **Ultrafast Imaging**

*Marcus Alley*

17.20 **Diffusion Imaging**

*Konstantinos Arfanakis*

18.00 Adjournment

Thursday, 20 May

16.00 **Vascular Imaging**

*Matt A. Bernstein*

16.40 **Cardiac Imaging**

*Debiao Li*

17.20 **fMRI**

*James J. Pekar*

18.00 Adjournment

# Educational Stipends for Students and Postdoctoral Trainees

The ISMRM invites applications for educational stipends that offer support for the attendance of students, postdoctoral and clinical trainees to present abstracts at the Twelfth Scientific Meeting. To be eligible for support, an applicant should either be (1) enrolled in a full-time under-graduate or graduate program or (2) a medical intern, first-, second-, or third-year resident, or a postdoctoral trainee who received a doctorate or equivalent degree after 31 July 2000. Those applicants who are first authors on the abstract will be given priority. Recipients of educational stipends who are not members of ISMRM will be required to submit an application for membership before the funds are disbursed. Stipend recipients are limited to three years of support.

## APPLICATION PROCEDURE:

Applicants for support should submit the following:

- Printout of the electronically submitted abstract;
- Copy of email confirming online submission;
- A letter from the applicant requesting student/postdoctoral support and confirming his/her intention to attend the meeting;
- A *curriculum vitae* of the applicant;
- A supervisor's or sponsor's letter confirming the applicant's eligibility for a student stipend. The Committee requests that the letter include comments on available funds for support. If a number of applicants from the same group are applying, the Committee would appreciate a unique comment on each applicant, since funding might be limited in this situation;
- Completed check sheet.

## WHERE TO APPLY:

Joseph V. Hajnal, Ph.D., *Chair*  
International Society for Magnetic Resonance in Medicine  
Subcommittee on Student Stipends  
2118 Milvia Street, Suite 201  
Berkeley, California 94704, USA

## DEADLINE:

Applications must be received no later than **19 November 2003**.

FOR OFFICE USE ONLY

CONFIRMATION NO.

DATE RECEIVED

## Student Stipend Check Sheet

### SEND COMPLETED CHECK SHEET AND ALL MATERIALS TO:

Joseph V. Hajnal, Ph.D., *Chair*  
International Society for Magnetic Resonance in Medicine  
Subcommittee on Student Stipends  
2118 Milvia Street, Suite 201  
Berkeley, California 94704, USA

Applicant Name \_\_\_\_\_  
Family Name \_\_\_\_\_ Given/First Name \_\_\_\_\_

Degree \_\_\_\_\_

Institution \_\_\_\_\_

Mailing Address \_\_\_\_\_  
\_\_\_\_\_

City \_\_\_\_\_

State/Province \_\_\_\_\_

Country \_\_\_\_\_

Postal Code/Zip+4 \_\_\_\_\_

Contact Phone Number \_\_\_\_\_

Home Phone Number \_\_\_\_\_

E-mail Address \_\_\_\_\_

Supervisor \_\_\_\_\_

I have previously applied for a student stipend.  YES  NO

If yes, state the year(s) you have received support \_\_\_\_\_  
\_\_\_\_\_

Have you submitted an Abstract to the ISMRM as the first author?

YES  NO

What is the typical lowest airfare from your city to Kyoto?

(US\$) \_\_\_\_\_

DO NOT release my CV to corporate sponsors.

Recipients of Student Stipends will be required to submit an application for membership in the ISMRM before the funds are disbursed.

### ENCLOSED:

- Student's Application Letter
- Student's *Curriculum Vitae*
- Abstract and confirmation of online submission
- Supervisor's Letter
- Eligibility Verification
- Membership Application (for nonmembers only)

# Clinical Resident Stipend Award

Recognizing the need to involve greater numbers of newly trained physicians in the science and clinical application of magnetic resonance, this stipend award has been set up to encourage young clinicians in this field of study. Each awardee will receive US\$600 toward the costs of attending the Twelfth Scientific Meeting in Kyoto, Japan. Upon request, an awardee may be paired with a senior member of the ISMRM who will be the awardee's mentor during the Scientific Meeting, providing the opportunity for regular reviews and discussions of important scientific and clinical developments presented at the meeting. Recipients of stipends who are not members of ISMRM will be required to submit an application for membership before funds are disbursed.

## ELIGIBILITY CRITERIA:

- Applicants must be actively enrolled in a clinical residency (i.e., clinical training) program;
- Applicants cannot be first or presenting authors on abstracts submitted to the ISMRM program and do not need to submit an abstract to the meeting;
- Applicants are required to attend at least 4 days of the ISMRM meeting, including at least one day of the weekend educational course.

## PROGRAM DESCRIPTION:

- The opportunity to be paired with a clinical mentor from the ISMRM community, with whom they will meet on a regular basis, will be available to stipend recipients.
- Mentors will subsequently be available to the awardees for advice and discussion regarding scientific and career issues in the field of magnetic resonance.

## APPLICATION PROCEDURE:

- Applicants should send a letter including a brief statement of their interest in attending the Scientific Meeting and explaining why they are interested in the field of magnetic resonance.
- A letter of support from the Department Chair is required stating that the resident either will be given the time off from clinical duties to attend and be supported for the remaining cost of the meeting or will use vacation time and personal funds as needed.
- A curriculum vitae of the applicant must accompany the application.
- Completed check sheet.

## WHERE TO APPLY:

Joseph V. Hajnal, Ph.D., *Chair*  
International Society for Magnetic Resonance in Medicine  
Clinical Resident Stipend Committee  
2118 Milvia Street, Suite 201  
Berkeley, California 94704, USA

## DEADLINE:

Applications must be received no later than **30 January 2004**.

FOR OFFICE USE ONLY

ID NO.

DATE RECEIVED

## Clinical Resident Stipend Check Sheet

### SEND COMPLETED CHECK SHEET AND ALL MATERIALS TO:

Joseph V. Hajnal, Ph.D., *Chair*  
International Society for Magnetic Resonance in Medicine  
Clinical Resident Stipend Committee  
2118 Milvia Street, Suite 201  
Berkeley, California 94704, USA

Applicant Name \_\_\_\_\_  
Family Name \_\_\_\_\_ Given/First Name \_\_\_\_\_

Degree \_\_\_\_\_

Mailing Address \_\_\_\_\_  
\_\_\_\_\_

City \_\_\_\_\_

State/Province \_\_\_\_\_

Country \_\_\_\_\_

Postal Code/Zip+4 \_\_\_\_\_

Contact Phone Number \_\_\_\_\_

Home Phone Number \_\_\_\_\_

E-mail Address \_\_\_\_\_

Supervisor \_\_\_\_\_

Please pair me with a mentor for the ISMRM 12<sup>th</sup> Scientific Meeting.

### ENCLOSED:

- Clinical Resident's Application Letter
- Clinical Resident's *Curriculum Vitae*
- Department Chair's Letter
- Eligibility Verification
- Membership Application (for nonmembers only)

Recipients of Clinical Resident stipends will be required to submit an application for membership in the ISMRM before the funds are disbursed.

## New Entrant Stipend Award

To encourage new entrants to research in areas of interest to the ISMRM, the Society invites applications for a New Entrant Stipend Award. This program is aimed at students or researchers who are new to the field and might not be funded under the main educational stipend program. Each awardee will receive US\$400 toward the costs of attending the Twelfth Scientific Meeting in Kyoto, Japan. Upon request, an awardee may be paired with a senior member of the ISMRM who will be the awardee's mentor during the Scientific Meeting, providing the opportunity for reviews and discussions of important scientific and clinical developments presented at the meeting. Recipients of stipends who are not members of ISMRM will be required to submit an application for membership before funds are disbursed.

### ELIGIBILITY CRITERIA:

- Applicants must already be or about to be actively involved in some aspect of research related to the ISMRM;
- Applicants cannot be first or presenting authors on abstracts submitted to the ISMRM program and do not need to submit an abstract to the meeting;
- Applicants are required to attend at least 4 days of the ISMRM meeting, including at least one day of the weekend educational course.

### PROGRAM DESCRIPTION:

- The opportunity to be paired with a mentor from the ISMRM community, with whom they will meet on a regular basis, will be available to stipend recipients.
- Mentors will subsequently be available to the awardees for advice and discussion regarding scientific and career issues in the field of magnetic resonance.

### APPLICATION PROCEDURE:

- Applicants should send a letter including a brief statement of their interest in attending the Scientific Meeting and explain how this will relate to their own work.
- A letter of support from the Department Chair is required stating that the student either will be given the time off to attend and be supported for the remaining cost of the meeting or will use vacation time and personal funds as needed.
- A *curriculum vitae* must accompany the application.
- Completed check sheet.

### WHERE TO APPLY:

Joseph V. Hajnal, Ph.D., *Chair*  
International Society for Magnetic Resonance in Medicine  
New Entrant Stipend Committee  
2118 Milvia Street, Suite 201  
Berkeley, California 94704, USA

### DEADLINE:

Applications must be received no later than **30 January 2004**.

FOR OFFICE USE ONLY

ID NO.

DATE RECEIVED

## New Entrant Stipend Check Sheet

### SEND COMPLETED CHECK SHEET AND ALL MATERIALS TO:

Joseph V. Hajnal, Ph.D., *Chair*  
International Society for Magnetic Resonance in Medicine  
New Entrant Stipend Committee  
2118 Milvia Street, Suite 201  
Berkeley, California 94704, USA

Applicant Name \_\_\_\_\_  
Family Name \_\_\_\_\_ Given/First Name \_\_\_\_\_

Degree \_\_\_\_\_

Institution \_\_\_\_\_

Mailing Address \_\_\_\_\_  
\_\_\_\_\_

City \_\_\_\_\_

State/Province \_\_\_\_\_

Country \_\_\_\_\_

Postal Code/Zip+4 \_\_\_\_\_

Contact Phone Number \_\_\_\_\_

Home Phone Number \_\_\_\_\_

E-mail Address \_\_\_\_\_

Supervisor \_\_\_\_\_

Please pair me with a mentor for the ISMRM 12<sup>th</sup> Scientific Meeting.

### ENCLOSED:

- New Entrant's Application Letter
- New Entrant's *Curriculum Vitae*
- Department Chair's Letter
- Eligibility Verification
- Membership Application (for nonmembers only)

Recipients of clinical New Entrant stipends will be required to submit an application for membership in the ISMRM before the funds are disbursed.

# E.K. Zavoisky Stipend Program

The ISMRM invites applications for stipends from the E.K. Zavoisky Program, established to support the attendance of scientists and clinicians at the ISMRM Twelfth Scientific Meeting. The program is named in honor of E.K. Zavoisky, pioneer in MR research from the former USSR (see below). The purpose of the program is to support scientists and clinicians who do not have access to the financial means to attend the ISMRM Twelfth Scientific Meeting. Applicants eligible for the Educational Stipend Program (undergraduate and graduate students and postdoctoral and medical trainees) are not eligible for the Zavoisky Program. Those applicants who are first authors on the Abstract submission will be given priority.

## APPLICATION PROCEDURE:

Applicants for support should submit the following:

- A printout of the electronically submitted abstract;
- Copy of email confirming online submission;
- A letter of application;
- *A curriculum vitae*;
- A letter from an appropriate person at their institution (supervisor, head of department, etc.) certifying that no alternative funds are available. If a number of applicants from the same institution are applying, the Committee would appreciate a unique comment on each, since funding might be limited in this situation;
- Completed check sheet.

## WHERE TO APPLY:

Donald M. Hadley, M.B., Ch.B., Ph.D., *Chair*  
International Society for Magnetic Resonance in Medicine  
E.K. Zavoisky Stipend Committee  
2118 Milvia Street, Suite 201  
Berkeley, California 94704, USA

## DEADLINE:

Applications must be received no later than **19 November 2003**.

### About E.K. Zavoisky

E.K. Zavoisky, from Kazan, Tatarstan, is nowadays acknowledged as the inventor of Electron Spin Resonance. There is also strong support for the thesis that he was the first to observe a NMR signal as early as 1941, but he could not detect the signal reproducibly with the very basic apparatus he was able to build with the limited means available to him.

Due to the political situation at that time, Zavoisky's work remained largely unnoticed in the west. Although unquestionably the first to observe spin resonance, the Nobel Prize Committee did not further consider his contribution due to the lack of follow-up papers and his move to other fields.

It is interesting to note that the CV of Zavoisky explicitly reports his first trip to an international conference (1961). There is little doubt that the history of spin resonance would be seen from a different perspective if Zavoisky had been able to pursue his work within the awareness of an international scientific community.

It seems, therefore, to be more than appropriate to name a program established to help scientists from around the world to communicate their achievements in the memory of E.K. Zavoisky.

FOR OFFICE USE ONLY

CONFIRMATION NO.

DATE RECEIVED

## E.K. Zavoisky Stipend Check Sheet

### SEND COMPLETED CHECK SHEET AND ALL MATERIALS TO:

Donald M. Hadley, M.B., Ch.B., Ph.D., *Chair*  
International Society for Magnetic Resonance in Medicine  
E.K. Zavoisky Stipend Committee  
2118 Milvia Street, Suite 201  
Berkeley, California 94704, USA

Applicant Name \_\_\_\_\_  
Family Name \_\_\_\_\_ Given/First Name \_\_\_\_\_

Degree \_\_\_\_\_

Institution \_\_\_\_\_

Mailing Address \_\_\_\_\_  
\_\_\_\_\_

City \_\_\_\_\_

State/Province \_\_\_\_\_

Country \_\_\_\_\_

Postal Code/Zip+4 \_\_\_\_\_

Contact Phone Number \_\_\_\_\_

Home Phone Number \_\_\_\_\_

E-mail Address \_\_\_\_\_

Supervisor \_\_\_\_\_

Have you submitted an Abstract to the ISMRM as the first author?

YES  NO

What is the typical lowest airfare from your city to Kyoto?

(US\$) \_\_\_\_\_

### ENCLOSED:

- E.K. Zavoisky Program Application Letter
- Curriculum Vitae
- Abstract and confirmation of online submission
- Supervisor's Letter

## From The SMRT President

The SMRT has had a busy and productive quarter. The regional meetings scheduled in September/October have been a great educational opportunity for many MR technologists. Overall attendance has been good and feedback from attendees has been positive. The SMRT has commitments from four additional regional sponsors in 2004. These sites include: 7 February 2004 in Warner Robins, Georgia, USA, organized by Garnold Bodenheimer; 28 February 2004 in Cleveland, Ohio, USA, organized by Julia Lowe; 20 March 2004 in Bethlehem, Pennsylvania, USA, organized by Linda Varnis; 3 April 2004 in Ottawa, Ontario, Canada, organized by Rich Heroux and Laurian Rohoman; February, 2004 in London, England, UK, organized by Muriel Cockburn.

The SMRT Educational Seminars "home study" program just published its 21st issue *"Advances in Interventional MRI."* Accolades to editor Kelly Baron and her team of reviewers and question authors for their hard work. The first home study was published in 1998, "Functional MRI: Capabilities and Limitations" by Mike Moseley and Gary Glover. These quarterly publications were created to meet the growing need for high quality educational material for MR technologists. This SMRT member-only benefit provides MR professionals the opportunity to expand their knowledge while earning Category A Continuing Education Credits at their own pace. There are twenty home study back issues in our library. Significant effort and many volunteer hours are required to maintain and grow this important benefit.

The Program Committee for the 13th Annual SMRT Meeting *"Rising to Excellence"* to be held in conjunction with the ISMRM Annual meeting in Kyoto, Japan, on 14-16 May 2004, has selected topics and chosen speakers for the two and a half day agenda. A publication in Japanese advertising this event will be distributed to technologists through the Japanese Radiologic Society. Thanks to Dr. Atsuko Heshiki for assisting in this effort. Program Chair, Jim Stuppino, and his committee continue to work to create a meeting that will serve the members and technologists around the world, as well as reflect current developments in MR technology.

The SMRT and ISMRM Joint Presentation: *Managing MR Artifacts and Pitfalls* is scheduled on Monday, 17 May 2004 at 14.00. This presentation will focus on addressing the physical and physiological causes of artifacts in MR images and resolution of these artifacts. Greg Brown and David Firmin will speak on *"The Physical Causes of Artifacts,"* Bill Bradley will discuss *"Neuro and Vascular*



**SMRT Board Members.**

*Seated in front, l to r: Cindy Comeau, Laurian Rohoman, and Anne Sawyer-Glover. Seated l to r: Muriel Cockburn, Heidi Berns, Judy Wood, Maureen Ainslie, Denise Davis, Gina Greenwood, Bobbie Burrow, Silke Bosk, and Julia Lowe. Standing l to r: William Faulkner, Maureen Hood, Marcia Gervin, Gregory Brown, Julie Strandt-Peay, Andrew Cooper, James Stuppino, Raymond Cruz, Scott Kurdilla, John Koveleski, Nanette Keck, Kelly Baron, and Cindy Hipp. (not pictured: John Christopher, Todd Frederick, and Bart Schraa).*

*Pitfalls,"* and Katsuyoshi Ito will review *"Body and Cardiac Pitfalls."*

The External Relations Committee, chaired by Maureen Hood, continues to keep abreast of global activities within health education organizations that may ultimately impact our profession. Maureen attended the Health Professions Network meeting this September in Dallas, Texas, USA. The meeting agenda covered issues in licensure, health literacy and allied health education. Highlighted at this meeting is an effort by the Health Occupations Students of America (HOSA) to encourage health professionals to become involved in their communities to promote health career opportunities at a local level.

During our last Executive Committee teleconference, Maureen provided an update from the Alliance for Radiologic Excellence. They support the Consumer Assurance of Radiologic Excellence (CARE) Act, a legislative proposal that would require states in the U.S. to adopt minimum education and certification standards for personnel performing these procedures. An additional bill "RadCARE" s1197 has five co-sponsors and has been referred to the Committee on Health, Education, Labor and Pensions. The next Alliance meeting will be held in Washington, D.C. in January 2004.

Maureen also provided information on the U.S. initiative to address the topic of advanced practice technologists in Radiology. This initiative is being driven by the increased demand for services in Radiology coupled with a shortage of qualified radiologists. The American College of Radiology (ACR), American Society of Radiologic Technologists (ASRT), and the American Registry of Radiologic Technologists

(ARRT) established an advisory board in June 2003 to draft standards for radiologist assistant certification (RA). In addition to this effort, the Intersociety Conference held in August 2003 also met to discuss the topic of Radiologist Extenders. A formal report is pending. The External Relations committee will monitor the developments of advanced practice technologists in the USA and its impact on MR technologists worldwide.

THE SMRT continues to participate in the Associated Sciences Consortium at the RSNA. The 2003 theme is *"Shaping our Future- Forces at Work."* Policy Board members volunteer time at the Associated Science Booth to provide attendees with information regarding SMRT membership benefits.

The SMRT Executive Committee and Policy Board continue to work to promote membership in our section. The SMRT encourages employers to provide financial support for their MR technologists to enhance their education by joining the SMRT. The benefits provided by this premier professional organization created and sustained by MR technologists serve to solidify your commitment to your technologists' growth and development. Many technologists have limited access to professional development or academic enrichment funds. By making these funds available for educational opportunities, i.e. regional and annual SMRT meetings, your investment in your staff becomes visible and concrete. The \$75.00 annual membership fee provides a wealth of information and educational benefits. Your institution or private practice will surely prosper from this investment.

**— Maureen Ainslie, SMRT President**

# Report on the ISMRM Workshop on Cellular and Molecular Imaging in Diagnostics and Therapy

The ISMRM workshop on "Cellular and Molecular Imaging in Diagnostics and Therapy" was held during 2.5 days in Bordeaux, France, from 29 June to 1 July of 2003. The venue was "La Cité Mondiale" on the banks of the Garonne right in the heart of beautiful historic Bordeaux near the place where Thomas Jefferson served as the US ambassador in France. The location and the lively river festival being held at the same time at Bordeaux, served as the perfect décor for the workshop. A special reception was hosted by Professor Ducassou at the splendid Bordeaux town hall.

The workshop was endorsed by the Society of Molecular Imaging (SMI), which also assisted in the finances and scientific program. Despite the near-overlap with the rescheduled ISMRM Annual Meeting, the workshop attracted 160 participants from all over the world. The well-filled auditorium, combined with outstanding chairpersons and ample time for discussion, led to a very lively symposium.

Molecular Imaging is evolving rapidly as a multi-modality imaging activity, and the Bordeaux symposium reflected this character by a balanced mix of contributions using MRI, Nuclear Medicine, Ultrasound, and Optical techniques. Twenty-four invited presentations were held together with four short presentations selected from about fifty poster abstracts. Posters could be discussed during coffee breaks and a dedicated poster viewing session.

The description of the human genome has opened medical research towards the development of new molecular therapies, targeted to correct specific pathologies. Gene expression, a powerful tool for medicine of the future, can be studied by modern molecular imaging techniques, e.g. using PET, MRI, and optical methods.



In addition, cellular imaging shows a major potential towards understanding and guiding novel cell repair strategies based on stem cells. Ultrasound contrast agents may be used as drug delivery devices. These and other emerging topics in imaging, recently summarized as "molecular imaging,"

are fast becoming a hot topic in imaging research. The perspective of the Bordeaux meeting was to look at these fast developments from a clinical viewpoint and to assess the potential in future therapies.

The symposium was organized around five major sessions. The first session was on Contrast Agents for Molecular Imaging. Juri Gelovani (Houston) defined the field in his inaugural lecture on Molecular Imaging. Bertrand Tavitian (Orsay) and Silvio Aime (Torino) gave an overview on PET/SPECT and MRI contrast agents, respectively. Frank Roesch (Mainz) addressed the potentials of combined MRI/SPECT/PET contrast agents. Sam Wickline (St. Louis) concluded the session with ultrasound and combined MRI/ultrasound contrast agents.

The four sessions covering the rest of the symposium were split into a diagnostics- and therapy-related part. The second session was on targeted pathways and physiological processes. Uwe Haberkorn (Heidelberg) reported on new Marker Gene/Marker Substrate combinations, and Jim Basilion (Boston) presented recent advances in imaging gene expression by MRI. In the therapy part, Andreas Jacobs (Cologne) showed results on the use of PET and MRI in imaging-guided gene therapy. Chrit Moonen (Bordeaux) presented methods to control image guided transgene expression using MRI guided focused ultrasound.

Day 2 started with a cancer session. Kenneth Krohn (Seattle) gave a lecture on imaging tumor proliferation using nuclear medicine techniques, followed by Michal Neeman (Rehovot) on functional and molecular imaging of vascular remodeling using multi-modality contrast agents. Pat Price (Manchester) concluded the therapy part with a lecture on imaging of neoangiogenesis for monitoring cancer treatment.

The therapy part started with a presentation by Hans-Jürgen Wester (Munich) on tumor targeting with radio-labeled peptides, followed by a lecture by Clemens Lowik (Leiden) on new optical methods for imaging of metastatic tumor treatment. The session was concluded by short presentations selected from the poster abstracts.

The topic of the fourth session was Inflammatory and Neurodegenerative Diseases. Nicolas Grenier and Vincent Dousset (Bordeaux) opened the session with an overview on imaging of macrophage activity with MRI. Michael Schäfers (Münster) presented a lecture on imaging atherosclerotic plaque activity using PET/SPECT. David Brooks (London) and Bengt Langström (Uppsala) showed their resent results on imaging of pathophysiological processes in Parkinson's disease and Alzheimer plaques, respectively. The therapy part included a presentation on imaging-guided therapy of Parkinson's disease by Rüdiger Hilker (Cologne) and a review of pharmaceutical perspectives by Martin Rausch (Basel).

The third (half) day concluded the symposium with a special session on stem cells and progenitors. Pierre Charbord (Tours) gave a general introduction of this booming field and set the tone for an exciting session. Kishore Bhakoo (London) presented a lecture on stem cell imaging and gene expression. Jeff Bulte (Baltimore) demonstrated tracking of magnetically

See *Imaging* page 22

labeled progenitors and stem cells, followed by Mathias Höhn (Cologne) showing *in vivo* MRI results of stem cell migration following stroke. Bernd Fleischmann (Bonn) concluded the session with a lecture on cellular therapy in cardiology.

This cross-modality symposium brought together specialists of many different fields enjoying the wide-ranging discussions and presentations. The educational objectives appeared to have been met: (1) To be able to define the research fields of molecular and cellular imaging and their (potential) impact in diagnosis and therapy of the future; (2) To be aware of new technologies in molecular and cellular imaging targeted to specific biological pathways; (3) To describe the role of the major imaging modalities in cellular and molecular imaging; (4) To understand the (potential) role of molecular imaging in advanced therapies, notably gene therapy; (5) To understand the (potential) role of cellular imaging in cell repair therapy, notably via stem cells; (6) To understand the basic principles of imaging of key biological processes such as angiogenesis, apoptosis, inflammation.

We conclude with special thanks to Roberta Kravitz and the ISMRM office, together with Emily of the congress venue, for a perfect organization despite the huge workload of the rescheduled ISMRM meeting (which was held only 10 days following this workshop). Many thanks also to the SMI for generous support and help in putting together the Scientific Program. We also acknowledge generous financial support by Philips Medical Systems, Siemens Medical Solutions, GE Medical Systems, Guerbet, and Novartis. We hope that this workshop has helped stimulate the exciting field of molecular and cellular imaging.

#### Workshop Organizing Committee

Chrit Moonen, Andreas Jacobs, Michèle Allard, Vincent Dousset, and Nicolas Grenier

# MR in Drug Development: From Discovery to Clinical Therapeutic Trials

2-3 April 2004

Hilton McLean Tysons Corner, McLean, Virginia, USA

Abstract Deadline: 19 FEBRUARY 2004

Early Registration Deadline: 11 MARCH 2004



This workshop, the first meeting of its type, is seen as a major step forward in bringing together the various players who will help MR technologies approach their potential for beneficial impact on the drug development process. We believe that this will ultimately lead to the development of more efficacious therapies, which will enhance public health and safety worldwide. While attempts have been made previously to bring together representatives from various sections of the scientific community to deal with imaging and drug development, few of them have defined the most critical issues which need to be addressed.

While there has never been any doubt that MR technologies could have a significant impact on drug development, the issue has been a lack of understanding of the problems and obstacles involved in achieving this. This meeting will provide an opportunity for scientists, clinicians, regulators, and industry representatives to study the issues that are being encountered or will need to be addressed in order to advance the incorporation of MR technologies into drug development. The workshop will cover aspects of the drug development process, technology considerations, and logistics regarding preclinical and clinical studies that will provide the attendees with a broad perspective of the complex issues with which they must deal. Experts will provide a perspective on the basic metabolic processes of ischemia, and there will be representation from both North America and Europe.

#### SESSION TOPICS

- Drug Chemistry: Preclinical Disease Models
- Preclinical Safety Models: Translational Research
- Overview of Drug Development
- Phase II/III Regulatory Experiences
- Panel Discussion on Future Directions

#### WORKSHOP ORGANIZING COMMITTEE

- David S. Lester, Ph.D., Chair
- Jeffrey L. Evelhoch, Ph.D.
- John R. Griffiths, M.B.B.S., D.Phil.
- Nakissa Sadrieh, Ph.D.
- Liqun Wang, Ph.D.
- John C. Waterton, Ph.D.
- Steve C. R. Williams, Ph.D.
- Andy Van Bruggen, Ph.D.

#### AUDIENCE DESCRIPTION

This workshop is designed for users and developers of MRI methodologies from academia, industry (pharmaceutical and otherwise), and government. It will be of interest to those in industry and academia who wish to hear regulatory perspectives, and regulators wanting to learn how MR techniques can aid the drug development process. Prior experience is not required.

#### EDUCATIONAL OBJECTIVES

Upon completion of this workshop participants should be able to:

- Describe how MRI techniques can contribute to the drug development process;
- Explain the various stages of drug development and how they relate to each other;
- Identify future applications and directions of MRI methodologies and their future applications to the pharmaceutical industry;
- Recognize how MRI methodologies can be incorporated into clinical trials for regulatory submission;
- Describe how MRI will help in the transition from preclinical to clinical trials in the drug development process;
- Describe the difference between use of MRI for diagnostics vs. clinical therapeutic trials.

#### WORKSHOP SPEAKERS

Speakers are confirmed from academia; pharmaceutical, instrument, and IT corporations; and regulatory authorities.

#### FOR FURTHER INFORMATION, PLEASE CONTACT ISMRM

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# Quantitative Cerebral Perfusion Imaging Using MRI: A Technical Perspective

21-23 March 2004, San Servolo, Venice, Italy

The aims of this workshop are to facilitate the critical discussion of recent developments in cerebral perfusion MRI, to evaluate the different methodologies, to assess its clinical applications, as well as to review the field as it stands. The workshop will encompass both Dynamic Susceptibility Contrast MRI (DSC-MRI) and Arterial Spin Labeling (ASL) categories of techniques for CBF quantification. It will particularly emphasize a critical scientific assessment of the methods, assumptions, and limitations of each technique, the relative advantages and disadvantages of both methodologies, and comparison/validation against other non-MR perfusion methods. There will also be a discussion of the various basic science and clinical applications of these techniques. Throughout, the emphasis of the workshop will be on the key issues that have arisen in the development and application of MR perfusion within the last few years. Invited speakers will be encouraged particularly to go into significant technical depth and detail in their presentations. There will be dedicated poster sessions as well.



## EDUCATIONAL OBJECTIVES

Upon completion of this workshop, participants should be able to:

- Identify the assumptions and limitations of DSC-MRI and ASL perfusion imaging techniques;
- Describe the different methods to measure the arterial input function, and the "state-of-the-art" techniques to perform the deconvolution required for quantification of CBF using DSC-MRI;
- Describe the various labeling approaches used in ASL to measure cerebral perfusion, as well as their relative advantages and disadvantages;
- Apply and interpret DSC-MRI and ASL, both in a clinical setting and in basic research studies;
- Design the appropriate MR acquisition protocols and select the suitable data modeling to assess cerebral perfusion in various applications.

## AUDIENCE DESCRIPTION

The workshop will be aimed at MR physicists and engineers, but will also be of great relevance to (technically inclined) cerebral physiologists, neuroscientists, and clinicians. Many students will also find it valuable.

## CREDIT HOURS AVAILABLE

The International Society for Magnetic Resonance in Medicine designates this educational activity for up to **15 category 1** credits towards the Physician's Recognition Award of the American Medical Association. Each physician should claim only those credits actually spent in the activity.

**Abstract Deadline: 2 FEBRUARY 2004**

**Early Registration Deadline: 27 FEBRUARY 2004**



## FOR FURTHER INFORMATION, PLEASE CONTACT ISMRM

Phone: +1 510 841 1899 FAX: +1 510 841 2340 E-mail: [info@ismrm.org](mailto:info@ismrm.org) Website: [www.ismrm.org](http://www.ismrm.org)

## WORKSHOP ORGANIZING COMMITTEE

- Alberto Bizzi, M.D., *Local Organizer*, Istituto Neurologico Carlo Besta, Milan, Italy
- Fernando Calamante, Ph.D., Institute of Child Health, University College London, London, England UK
- Thomas E. Conturo, M.D., Ph.D., Washington University School of Medicine, St. Louis, Missouri, USA
- Susumu M. Mori, Ph.D., The Johns Hopkins University, School of Medicine, Baltimore, Maryland, USA

## WORKSHOP SPEAKERS\*

- David Alsop, Ph.D., Beth Israel Deaconess Medical School, Boston, Massachusetts, USA
- Richard B. Buxton, Ph.D., University of California, San Diego, La Jolla, California, USA
- Fernando Calamante, Ph.D., University College London, London, England, UK
- Thomas E. Conturo, M.D., Ph.D., Washington University School of Medicine, St. Louis, Missouri, USA
- John A. Detre, M.D., University of Pennsylvania, Philadelphia, Pennsylvania, USA
- Jeff H. Duyn, Ph.D., National Institutes of Health, Bethesda, Maryland, USA
- James R. Ewing, Ph.D., Henry Ford Hospital and Health Science Center, Detroit, Michigan, USA
- Valerij G. Kiselev, Ph.D., Freiburg University Hospital, Freiburg, Germany
- Leif Østergaard, M.D., Ph.D., Århus University Hospital, Århus, Denmark
- Laura M. Parkes, Ph.D., University of Nijmegen, Nijmegen, The Netherlands
- Afonso C. Silva, Ph.D., National Institutes of Health, Bethesda, Maryland, USA
- A. Gregory Sorensen, M.D., Massachusetts General Hospital, Boston, Massachusetts, USA
- David L. Thomas, Ph.D., University College London, London, England, UK
- Matthias J. P. van Osch, Ph.D., University Medical Center Utrecht, Utrecht, The Netherlands
- Eric C. Wong, Ph.D. M.D., University of California at San Diego, La Jolla, California, USA

\*Partial List

Mark Your  
Calendar!

## ISMRM IMPORTANT DATES AND DEADLINES

### 17 NOVEMBER 2003

Deadline for receipt of Hosting Region Poster submissions.

### 19 NOVEMBER 2003

Deadline for online receipt of Abstract submissions.

### 19 NOVEMBER 2003

Deadline for receipt of Student Stipend Applications.

### 19 NOVEMBER 2003

Deadline for receipt of E.K. Zavoisky Stipend Program Applications.

### 21 JANUARY 2003

Deadline for receipt of Proffered Papers for the SMRT 13th Annual Meeting.

### 30 JANUARY 2004

Deadline for receipt of Clinical Resident Stipend Program Applications.

### 30 JANUARY 2004

Deadline for receipt of New Entrant Stipend Program Applications.

### 21-23 MARCH 2004

ISMRM Workshop on Quantitative Cerebral Perfusion Imaging Using MRI: A Technical Perspective

### 2-3 APRIL 2004

ISMRM Workshop on MR in Drug Development: From Discovery to Clinical Therapeutic Trials

### 2 APRIL 2004

Deadline for Advance Registration for the ISMRM Twelfth Scientific Meeting & Exhibition.

15-21 MAY 2004

## TWELFTH SCIENTIFIC MEETING AND EXHIBITION Kyoto, Japan



### FRIDAY, 14 MAY 2004

On-site Registration open from 14.00 - 20.00.  
SMRT Poster Tour & Reception 18.30 - 20.00.

### SATURDAY, 15 MAY 2004

Weekend Educational Programs begin.  
On-site Registration open from 06.30 - 18.00.  
SMRT 13th Annual Meeting begins 07:45.

### SUNDAY, 16 MAY 2004

Weekend Educational Programs continue.  
On-site Registration open from 07.00 - 18.00.  
SMRT 13th Annual Meeting continues.

### MONDAY, 17 MAY 2004

On-site Registration open from 06.30 - 18.30.  
Scientific Sessions begin at 07.45.  
Technical Exhibition open at 10.00.

### TUESDAY - THURSDAY, 18-20 MAY 2004

On-site Registration open from 06.30 - 18.00.  
Morning Categorical Courses begin at 07.00.  
Scientific Sessions begin at 08.15.  
Technical Exhibition open at 09.30.

### FRIDAY, 21 MAY 2004

On-site Registration for Scientific Meeting from 06.30 - 12.30.  
Morning Categorical Courses begin at 07.00.  
Scientific Sessions begin at 08.15.  
Scientific Meeting adjourns at 12.30.

### Bill Negendank Award Fund

In memory of William George Negendank, M.D., his colleagues in the ISMRM MR of Cancer Study Group have established the **Bill Negendank Award Fund** to recognize outstanding young investigators in the field of Cancer MR (see *MR Pulse*, Vol. 3, No. 3, page 6). To make your tax-deductible contribution, please send your check made payable to the ISMRM or submit your Visa, MasterCard, American Express, or Eurocard number, expiration date, and amount you wish to donate to the following address:

Bill Negendank Award Fund  
International Society for  
Magnetic Resonance In Medicine  
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