

ISMRM Workshop Series 2017

## ISMRM Workshop on Osteoarthritis Imaging

(10<sup>th</sup> International Workshop for Osteoarthritis Imaging)



Sydney Harbour Marriott Hotel at Circular Quay, Sydney, NSW, Australia • 01–03 June 2017

### Organizing Committee

Co-Chair: David J. Hunter, M.D., Ph.D., University of Sydney, St. Leonards, NSW, Australia

Co-Chair: James M. Linklater, M.D., M.B.B.S., Castlereagh Sports Imaging, St. Leonards, NSW, Australia

### Scientific Committee

Leticia Deveza, M.D., University of Sydney, St. Leonards, NSW, Australia

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Felix Eckstein, M.D., Paracelsus Private Medical University, Salzburg, Austria

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Ali Guermazi, M.D., Ph.D., Boston University School of Medicine, Boston, MA, USA

Young-Jo Kim, M.D., Ph.D., Children's Hospital Boston, Boston, MA, USA

Christoph Ladel, Ph.D., Merck Serono/MerckKGaA, Darmstadt, Germany

Christopher Little, Professor, University of Sydney, St. Leonards, NSW, Australia

Michael C. Nevitt, Ph.D., University of California, San Francisco, San Francisco, CA, USA



This workshop is endorsed by the  
International Workshop on Osteoarthritis Imaging:



# ISMRM Workshop on Osteoarthritis Imaging

(10<sup>th</sup> International Workshop for Osteoarthritis Imaging)

## WELCOME MESSAGE

Dear Workshop Attendees,



Welcome to Sydney for the 2017 Workshop on Osteoarthritis Imaging!

This is a wonderful opportunity to draw a closer lens on this prevalent and disabling disease. We have put together a program that incorporates international expertise and speakers to stimulate further discussion.

The format will include both educational and topical scientific presentations describing cutting-edge technical developments for OA imaging, with the aim of enhancing mutual understanding across several technical areas of research and bridging knowledge gaps to areas of clinical and OA applications. Two pre-conference hands-on sessions will be arranged to familiarize researchers with pre-clinical osteoarthritis models and application of ultrasound in OA. As a new feature of the 2017 Workshop, there will be special activities devoted to young investigators, which will include an interactive panel covering open-ended, career-related aspects and a mentorship dinner in the format of small groups of trainees and an established faculty. As in previous workshops, there will be an emphasis on emerging techniques, but also translation to clinical practice and going beyond imaging. There will be ample opportunity for discussion, networking, cross-fertilisation and development of collaborations and interaction between industry and academia.

Thank you for making the long trek down to my hometown. While you are here, we hope to be able to show you the better side of our city. The workshop is being held in the centre of the city with easy access to the harbour and Opera House. We are also fortunate that Vivid Sydney is being held at the same time ([www.vividsydney.com/](http://www.vividsydney.com/)), an annual outdoor lighting festival with immersive light installations and projections.

We look forward to your involvement, insights and ongoing enthusiasm towards osteoarthritis imaging.

Cheers,

David Hunter, M.D., Ph.D., Workshop Co-Chair

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## DECLARATION OF FINANCIAL RELATIONSHIPS

The ISMRM is committed to:

- Ensuring balance, independence, objectivity and scientific rigor in all educational activities; and
- Presenting activities that promote improvements or quality in healthcare and are independent of commercial interests.

Therefore, it is the policy of the Society that any person who has influence over the content of an educational activity must disclose any real or apparent financial interest or other relationship (i.e., grant, research support, consulting fee, royalty, honorarium for promotional speakers' bureau, ownership interest) that the individual may have with the manufacturers, distributors or providers of any commercial products or services that may be discussed in the presentation.

The ISMRM does not imply that such financial interests or relationships are inherently improper or that such interests or relationships would prevent the speaker or organizer from making an objective contribution. However, it is imperative that such financial interests or relationships be identified so that potential conflicts can be resolved before the program, and participants at the activity may have these facts fully disclosed in advance. It then remains for the audience to determine whether an individual's outside interests may reflect a possible bias in either the exposition or the conclusions presented.

Following are the names of all speakers, committee members and other organizers who had influence over the program content. If individuals have disclosed real or apparent financial interests or relationships with regard to the subject matter of this meeting, the interests or relationships are described.

Please see online addendum for disclosure information.

### Invited Speakers

David J. Hunter, M.D., Ph.D.

Young-Jo Kim, M.D., Ph.D.

Christoph Ladel, Ph.D.

James M. Linklater, M.D., M.B.B.S.

Christopher Little, Professor

Richard Loeser, Jr., M.D.

Stefan Lohmander, M.D., Ph.D.

### Workshop Organizers & Staff

David J. Hunter, M.D., Ph.D.

James M. Linklater, M.D.,

M.B.B.S.

Melissa Simcox

Candace Spradley

### Moderators

Akshay S. Chaudari, M.Sc.

Philip Conaghan, M.D., Ph.D.

Leticia Deveza, M.D.

Chang-Hai Ding, M.D.

Felix Eckstein, M.D.

Young-Jo Kim, M.D., Ph.D.

Christoph Ladel, Ph.D.

Christopher Little

Richard Loeser, Jr., M.D.

Stefan Lohmander, M.D., Ph.D.

Catherine C. Roberts, M.D.

Jos Runhaar, Ph.D.

# ISMRM Workshop on Osteoarthritis Imaging

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## OVERVIEW

The Osteoarthritis Imaging Workshop will focus on the rapidly developing magnetic resonance imaging (MR) and other imaging modalities for assessment of osteoarthritis (OA). MRI is useful for assessment of joint structures such as cartilage, bone, ligaments, menisci, and synovium. It has also shown promise in detection of biochemical changes in these tissues by measurement of MRI parameters (including T2, T1rho). However, at the current time, the FDA does not accept MRI as a trial endpoint for drug trials.

The emphasis will be both on the emerging imaging techniques as well as promoting the use of imaging-based measures of OA as tools in epidemiological research and clinical trials, understanding OA-pathoetiology and OA-related joint biomechanics, and eventually, in diagnosis and treatment of OA. Presentations will focus on recent advances in designs of pulse sequence, coil designs, and applications to enhance our understanding of the OA disease process.

The format will include both educational and topical scientific presentations describing cutting-edge technical developments for OA imaging, with the aim of enhancing mutual understanding across several technical areas of research and bridging knowledge gaps to areas of clinical and OA applications. Abstracts were selected as either brief proffered presentations or as posters. Invited presenters will include international researchers in respective areas of OA and MRI research including junior scientists. A pre-conference hands-on session will familiarize researchers with pre-clinical osteoarthritis models and application of imaging in that context.

## TARGET AUDIENCE

This workshop is designed for scientists and clinicians, including physicists, engineers, computer scientists, radiologists, rheumatologists and orthopedic surgeons, students working on pulse sequences (rf coil design, image reconstruction, musculoskeletal and body imaging), MRI technologists, clinical investigators and anyone pursuing imaging of OA.

## EDUCATIONAL OBJECTIVES

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

- Describe the state-of-the art techniques in imaging of osteoarthritis;
- List currently available, established and emerging imaging techniques;
- Identify the challenges and opportunities for measurements of osteoarthritis in all joint tissues, including bone, cartilage, synovium, menisci, and ligaments;
- Discuss the use of different imaging modalities for clinical research and clinical applications in osteoarthritis;
- Assess the research needs for moving the field forward on MRI Biomarker Qualification and regulatory acceptance;
- Illustrate how different imaging modalities can be used to generate biomechanical models of a joint; and
- Compare the merits of different pre-clinical models of osteoarthritis, as taught in the hands-on session of the workshop.

**SPEAKER UPLOAD INFORMATION** (Audiovisual Preview) Please see program for additional times (breaks & lunch).

The audio-visual staff will be located in the back of the meeting room. Uploading presentations is available on a first-come, first-served basis. Hours are:

- Wednesday, 31 May 2017 from 15:00–18:00
- Thursday–Saturday, 01–03 June 2017 from 08:00–09:00

## PROGRAM CREDIT DESIGNATION:

The International Society for Magnetic Resonance in Medicine is accredited by the Accreditation Council for Continuing Medical Education to provide continuing medical education for physicians.

This workshop does not offer CME credits. To obtain your Certificate of Participation for the workshop, log into the ISMRM membership portal at [www.ismr.org](http://www.ismr.org), then click on “My Meeting Evaluations” on the left menu and follow the instructions provided.

# ISMRM Workshop on Osteoarthritis Imaging

(10<sup>th</sup> International Workshop for Osteoarthritis Imaging)

Wednesday, 31 May 2017 (no CME available)		
15:00	Registration & Speaker Upload (available until 18:00)	
Day 1 – Thursday, 01 June 2017 (no CME available)		
08:00	Registration & Speaker Upload Available	
Parallel Pre-Course Workshops (Optional: Separate Registration Required)		
09:00	Are Any Pre-clinical Models of Osteoarthritis Useful for Translation of Diagnostics & Therapies to Patients? <i>Location: Castlereagh Imaging (Corner of Pacific Highway &amp; Reserve Road)</i>	Christopher Little, Professor University of Sydney Sydney, NSW, Australia
09:00	Ultrasound in Osteoarthritis (Limit of 15 attendees) <i>Location: Royal North Shore Hospital – Kolling Building</i>	James M. Linklater, M.D., M.B.B.S. Castlereagh Sports Imaging St. Leonards, NSW, Australia
12:00	Lunch & Speaker Upload Available	
13:30	Introduction	David J. Hunter, M.D., Ph.D. & James M. Linklater, M.D., M.B.B.S.
Session 1: Biomarker Qualification: Now What?		
Moderators: Philip Conaghan, M.D., Ph.D. & Chang-Hai Ding, M.D.		
14:00	Keynote Lecture: Lessons Learned from Rheumatoid Arthritis	Philip Conaghan, Ph.D. Leeds University Leeds, England, UK
14:30	Discussion	
14:45	Young Investigator Award Presentation	
Proffered Papers - Oral Session		
15:00	Knee Structural Lesions Do Not Predict Longitudinal Change in Femorotibial Cartilage T2 Values in Radiographically Normal Knees of Participants from the Osteoarthritis Initiative Healthy Reference Cohort	Wolfgang Wirth, Ph.D. Paracelsus Medical University Salzburg, Austria
15:15	Cartilage Cavity – Validation Against Radiologist & Artificial Lesions	Erik B. Dam, Ph.D. Biomediq Copenhagen, Denmark
15:30	Association Between MRI Subchondral Bone Texture & Radiographic OA Progression: Data from the Osteoarthritis Initiative Bone Ancillary Study	James W. MacKay, M.B.B.Chir., MRCP, FRCR University of Cambridge Cambridge, England, UK
15:45	3D Deep Learning Based Cartilage Segmentation for Visualization & Analysis of Quantitative MRI for Osteoarthritis	Archit Raj, M.Tech. Samsung R&D Institute Bangalore, India
16:00	Reception & Poster Session	
18:00	Dinner	
21:00	Vivid Sydney Festival (walk around)	

# ISMRM Workshop on Osteoarthritis Imaging

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Day 2 – Friday, 02 June 2017 (no CME available)		
07:00	Sunrise Walk and Yoga Class at Royal Botanic Gardens	
08:00	Registration & Speaker Upload Available	
Session 2: Clinical Utility of Different Imaging Modalities		
Moderators: Stefan Lohmander, M.D., Ph.D. & Akshay S. Chaudhari, M.Sc.		
09:00	Keynote Lecture: What Are the Optimal Methods for Demonstrating the Clinical Utility of Different Imaging Modalities?	Stefan L. Lohmander, M.D., Ph.D. University of Lund Lund, Sweden
09:30	Discussion	
Proffered Papers - Oral Session		
09:45	Quantitative Measurement of Cartilage Volume Is Possible Using Two-Dimensional Magnetic Resonance Imaging Data Sets	Lena F. Schaefer, M.D. Harvard Medical School Cambridge, MA, USA
10:00	Association Between Knee Inflammation & Pain That Disturbs Sleep in Knee Osteoarthritis	C. Kent Kwok, M.D. University of Arizona Arthritis Center Tucson, AZ, USA
10:15	Prevalence of Structural Abnormalities in the Knee Detected by MRI in Middle-Aged Subjects Without Radiographic Knee Osteoarthritis	Jaanika Kumm, M.D., Ph.D. Department of Radiology University of Tartu Tartu, Estonia
10:30	Break, Poster Viewing & Speaker Upload Available	
11:00	DMOAD Clinical Trials: Treating Structure Is Sufficient & We Should Not Require Clinical Benefit for Approval: Debate Positive	James M. Linklater, M.D., M.B.B.S. Castlereagh Sports Imaging St. Leonards, NSW, Australia
11:30	DMOAD Clinical Trials: Treating Structure Is Sufficient & We Should Not Require Clinical Benefit for Approval: Debate Negative	Philip Conaghan, Ph.D. Leeds University Leeds, England, UK
12:00	Discussion	
12:30	Lunch & Speaker Upload Available	
Session 3: Imaging of the Hip in Osteoarthritis		
Moderators: Young-Jo Kim, M.D., Ph.D. & Catherine C. Roberts, M.D.		
14:00	Keynote Lecture: Update on Imaging of the Hip in OA	Young-Jo Kim, M.D., Ph.D. Children’s Hospital Boston Boston, MA, USA
14:30	Discussion	

# ISMRM Workshop on Osteoarthritis Imaging

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Day 2: Friday, 02 June 2017 continued from previous page

Proffered Papers - Oral Session		
14:45	Hip Cartilage Damage in Adolescents with Healed Legg Calvé Perthes Disease	Carly Jones, B.A.Sc. University of British Columbia Vancouver, BC, Canada
15:00	A 5-Minute MRI Acquisition for Simultaneous Morphometry & T2 Relaxometry of Cartilage & Meniscus & for Semi-Quantitative Radiological Assessment	Akshay S. Chaudhari, M.Sc. Stanford University Stanford, CA, USA
15:15	Quantitative Imaging of Bone-Cartilage Interactions after ACL Injury with PET-MRI	Feliks Kogan, Ph.D. Stanford University Stanford, CA, USA
15:30	Development of an MRI System-Specific Strategy to Ensure the Accuracy of Dual Flip Angle-Based T1 Mapping in the dGEMRIC Scan	Seonghwan Yee, Ph.D. University of Colorado Medical School Aurora, CO, USA
15:45	Assessment of Mechanical Properties of Trapeziometacarpal Joint Cartilage using Contrast-Enhanced Computed Tomography	Reza Nickmanesh, M.Sc. University of British Columbia Vancouver, BC, Canada
16:00	Poster Session with Poster Tours	
17:00	Young Investigators' Panel	
18:30	Adjourn (dinner on own)	
19:00	Young Investigators' Dinner (by invitation only)	
21:00	Opera Bar (optional, not included in registration fee)	



RESEARCH &  
EDUCATION FUND



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### THE ISMRM RESEARCH & EDUCATION FUND IN ACTION!

Your donation to the ISMRM Research & Education Fund supports MR Trainees (regardless of scientific discipline, geography or country of origin) to attend this workshop and other ISMRM educational events.

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# ISMRM Workshop on Osteoarthritis Imaging

(10<sup>th</sup> International Workshop for Osteoarthritis Imaging)

Day 3 – Saturday, 03 June 2017 (no CME available)		
07:00	Sunrise Walk Across Sydney Harbour Bridge	
08:00	Registration & Speaker Upload Available	
Session 4: Phenotypes/Subgroups in Osteoarthritis		
Moderators: Richard Loeser, Jr., M.D. & Jos Runhaar, Ph.D.		
09:00	Keynote Lecture: Phenotypes/Subgroups in OA	Richard F. Loeser, Jr., M.D. Thurston Arthritis Research Center Chapel Hill, NC, USA
09:30	Discussion	
Proffered Papers - Oral Session		
09:45	Association of Childhood Overweight Measures with Adulthood Knee Cartilage Defects & Bone Marrow Lesions: a 25-Year Cohort Study	Benny Samuel Eathakkattu Antony, Ph.D. University of Tasmania Hobart, TAS, Australia
10:00	Reduction in Infrapatellar Fat Pad (IPFP) Volume During Diet & Exercise Intervention Is Associated with Improvements in Knee Function, Quality of Life & Inflammatory Serum Markers	Felix Eckstein, M.D. Paracelsus Medical University Salzburg, Austria
10:15	Effects of Body Weight Change on Cartilage Cavity & Homogeneity on MRI Among Subjects at High Risk for Developing Knee OA; Evaluating Markers of Early Cartilage Degeneration	Jos Runhaar, Ph.D. Erasmus University Medical Center Rotterdam Rotterdam, Netherlands
10:30	Break, Poster Viewing & Speaker Upload Available	
Session 5: Ongoing Interventional Clinical Trials		
Moderators: Christoph Ladel, Ph.D. & Felix Eckstein, M.D.		
11:00	Keynote Lecture: Ongoing Interventional Clinical Trials	Christoph Ladel, Ph.D. Merck Serono/MerckKGaA Darmstadt, Germany
11:30	Discussion	

Day 3: Saturday, 03 June 2017 continued on next page



ISMRM members enjoy interviews and talks from noted contributors to the field of Magnetic Resonance in Medicine such as Paul C. Lauterbur, Peter Mansfield, Paul A. Bottomley and more. Become an ISMRM member today!

# ISMRM Workshop on Osteoarthritis Imaging

(10<sup>th</sup> International Workshop for Osteoarthritis Imaging)

Day 3: Saturday, 03 June 2017 continued on from previous page

Proffered Papers - Oral Session		
11:45	Optimizing Recruitment Criteria for an Osteoarthritis Structure Modification Trial: Data from the OAI	Michael Bowes, Ph.D. Imorphics, Ltd. Manchester, England, UK
12:00	A Randomised Double-Blind Placebo-Controlled Crossover Trial of Humira (Adalimumab) for Erosive Hand Osteoarthritis – The HUMOR Trial	Dawn Aitken, Ph.D. Menzies Institute for Medical Research University of Tasmania Hobart, TAS, Australia
12:15	High Resolution 3D Modelling Of Cartilage Surfaces at the Knee Using Clinical MRI Data	James W. MacKay, M.B.B.Chir., MRCP, FRCR University of Cambridge Cambridge, England, UK
12:30	Lunch & Speaker Upload Available	
Session 6: Pre-clinical Models Translation		
Moderators: Christopher Little, Professor & Leticia Deveza, M.D.		
14:00	Preferred Pre-clinical Method(s) to Optimize Likelihood of Translation	Christopher Little, Professor University of Sydney Sydney, NSW, Australia
Proffered Papers - Oral Session		
14:30	MRI Monitoring of Post-Traumatic Osteoarthritis in Rat Meniscectomy Models	Tonima S. Ali, M.Sc. Queensland University of Technology Brisbane, Australia
14:45	Correlation Time Determined in Cartilage by MRI T1p Relaxation Dispersion	Victor Casula, Ph.D. University of Oulu Oulu, Finland
15:00	T1p Mapping of the Human Articular Cartilage Response to Loading & Unloading	Sven Nebelung, M.D. Aachen University Hospital Aachen, Germany
15:15	Quantitative Microscopic Analysis of Subtle Microstructural Matrix Changes in Bovine Articular Cartilage	Simo Saarakkala, Ph.D. University of Oulu Oulu, Finland
15:30	Break, Poster Viewing & Speaker Upload Available	
16:00	Panel Discussion with Pharma Representatives	
17:30	Adjourn (dinner on own)	
22:00	Ivy (optional, not included in registration fee)	

# ISMRM Workshop on Osteoarthritis Imaging

(10<sup>th</sup> International Workshop for Osteoarthritis Imaging)

Day 4 – Sunday, 4 June 2017 (no CME available)

09:00	Post -Conference Activity (Optional): Walk Bronte to Bondi for Lunch at 12:00; (not included in registration fee)
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## JOINT ANNUAL MEETING ISMRM-ESMRMB

16–21 June 2018

SMRT 27<sup>th</sup> Annual Meeting 15–18 June 2018  
[www.smrt.org](http://www.smrt.org)

Paris, France

[www.ismrm.org](http://www.ismrm.org) • [www.esmrmb.org](http://www.esmrmb.org)

ISMRM-ESMRMB ABSTRACT DEADLINE: 08 NOVEMBER 2017

SMRT ABSTRACT DEADLINE: 15 NOVEMBER 2017

# ISMRM Workshop on Osteoarthritis Imaging

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Poster Number	Title	Author
1	Texture Analysis Using T2-Kurtosis Image of Medial Meniscus Associated with Meniscal Pathologies	Takako Aoki, Ph.D. Tokyo Metropolitan University Tokyo, Japan
2	Radiographic Progression of Joint Space Narrowing & Patient Reported Outcome According to Oral Calcium Intake: Data from the Osteoarthritis Initiative	Shadpour Demehri, M.D. Johns Hopkins Medical Institutions Baltimore, MD, USA
3	Framework for Fully Automated Subchondral Bone Segmentation & 3D Reconstruction from MR Images	Akash P. Gandhamal, M.Tech. SGGS Institute of Engineering and Technology Nanded, India
4	Mucoid Degeneration of the Anterior Cruciate Ligament & Its Association with Medial Tibiofemoral Osteoarthritis Progression: Data from the fNIH OA	Robert Kwee, M.D. Zuyderland Medical Center Brunssum, Netherlands
5	A Phase III Clinical Results of INVOSSA™(Tissuegene-C): A Clues for the Potential Disease Modifying OA Drug with Imaging	Bumsup Lee, Ph.D., DVM Kolon Life Science Gwacheon-Si, South Korea
6	Systematic Review & Meta-Analysis of the Reliability & Discriminative Validity of Cartilage Compositional MRI in Knee Osteoarthritis	James W. MacKay, M.B.B.Chir., MRCP, FRCR University of Cambridge Cambridge, England, UK
7	Functionally Assessing Human Articular Cartilage <i>In Situ</i> by MRI - A Whole Knee Joint Loading Apparatus	Sven Nebelung, M.D. Aachen University Hospital Aachen, Germany
8	Variations in Knee Cartilage Structure Assessment Using Gagest Quantitative MRI at 3T	Ales Neubert, Ph.D. Royal Brisbane and Women's Hospital Herston, QLD, Australia
9	The Association Between Baseline Meniscal Extrusion on MRI with Long-Term Incidence & Progression of Knee OA	Jan van der Voet, M.D. Erasmus University Medical Center Rotterdam, Netherlands
10	The Association Between Meniscal Body Extrusion & the Development of Bone Marrow Lesions on Knee MRI in Overweight & Obese Women	Fan Zhang, M.D. Lund University Lund, Sweden
11	Protective Effects on Cartilage by Magnetoelectric Therapy in Knee Osteoarthritis Rabbit Model	Xiaoming Zhang, M.S. Chinese Academy of Sciences Hefei, China

Follow the conversations:



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## ISMRM FUTURE WORKSHOPS

17–20 August 2017 • New York City, NY, USA

*ISMRM Workshop on Magnetic Resonance Imaging of Cardiac Function*

08–11 September 2017 • Cape Town, South Africa

*ISMRM Workshop on Motion Correction in MRI & MRS*

15–17 September 2017 • Hangzhou, China

*ISMRM Workshop on Advanced Musculoskeletal MRI: Osteoarthritis & Beyond*

28 September–01 October 2017 • McLean, VA, USA

*ISMRM Workshop on Ensuring RF Safety in MRI: Current Practices & Future Directions*

15–17 October 2017 • Cleveland Museum of Art, Cleveland, OH, USA

*ISMRM Workshop on Magnetic Resonance Fingerprinting*

26–29 October 2017 • Chicago, IL, USA

*ISMRM–SNMMI Co-Provided Workshop on PET MR*

04–06 February 2018 • Atlanta, GA, USA

*ISMRM Workshop on MRI of the Placenta*

18–20 February 2018 • Washington D.C., USA

*ISMRM-RSNA Co-Provided Workshop on High-Value MRI*

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## ISMRM FUTURE ANNUAL MEETINGS

16–21 June 2018 • Paris, France

*Joint Annual Meeting ISMRM-ESMRMB 2018 • SMRT 27<sup>th</sup> Annual Meeting: 15–18 June 2018*

11–17 May 2019 • Montreal, QC, Canada

*ISMRM 27<sup>th</sup> Annual Meeting & Exhibition • SMRT 28<sup>th</sup> Annual Meeting: 11–12 May 2019*

18–24 April 2020 • Sydney, NSW, Australia

*ISMRM 28<sup>th</sup> Annual Meeting & Exhibition • SMRT 29<sup>th</sup> Annual Meeting: 18–19 April 2020*

The ISMRM wishes to thank the following supporters for their contribution to the ISMRM Workshop on Osteoarthritis Imaging (10<sup>th</sup> International Workshop for Osteoarthritis Imaging)

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