

# Program



## University of Michigan International Workshop on Arterial Spin Labeling MRI: Technical Updates and Clinical Experience

March 9-10, 2019  
Kahn Auditorium, Biomedical Sciences Research Building  
University of Michigan  
Ann Arbor, MI, USA



# Saturday, March 9

## Welcome

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### **8:30 – 8:45 am : Welcome and Preliminary Remarks**

Luis Hernandez-Garcia, University of Michigan

## Invited Oral Presentations

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Moderator: Matthias van Osch

### **8:45. Strategies for maximizing reliability of pseudo-continuous labeling.**

David Alsop, Ph.D.

Beth Israel Deaconess Medical Center, Boston MA

### **9:00 Velocity Selective ASL: Circumventing the arterial transit delay**

Divya Bolar, M.D., Ph.D.

University of California, San Diego

### **9:15 : Non-contrast enhanced 4-dimensional MR angiography in cerebrovascular diseases**

Lirong Yan, Ph.D.

University of Southern California

### **9:30 Translating ASL to the clinic**

Manus Donahue, Ph.D.

Vanderbilt University

### **9:45: Standardization using ASL-BIDS (Brain Imaging Data Structure)**

Henk(-Jan) Mutsaerts, M.D., Ph.D.

Amsterdam UMC/UMC Utrecht

### **10:00: Which parameters are really necessary to account for in routine ASL?**

Matthias Guenther, PhD.

Fraunhofer-Mevis

### **10:15: ASL perfusion: To quantify or not to quantify? That's the Question**

Xavier Golay, Ph.D.

UCL Institute of Neurology

## Break

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### **10:30 – 11:00 Coffee and snacks**

## Oral Sessions

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Moderators: David Alsop and Matthias Guenther

### **11:00: Metabolic and Vascular Risk Factors are Associated with Widespread Alterations in Cerebral Blood Flow**

Bradley J MacIntosh, Zahra Shirzadi, Sarah Atwi, John A Detre, Sudipto Dolui, R. Nick Bryan, Lenore J Launer, Walter Swardfager

National Institute on Aging, University of Pennsylvania, University of Texas, University of Toronto

**11:10: White matter oxygen delivery is impaired in both sickle and non sickle anemia syndromes**

Yaqiong Chai, Adam Bush, Chau Vu, Natasha Lepore, Thomas Coates, John C Wood  
Children's Hospital Los Angeles, Stanford University

**11:20: Voxelwise correlation between vascular parameters obtained with ASL and DSC as predictor of IDH-mutation status in non-enhancing glioma**

E.A.H. Warnert, F. Incekara, A.J.P.E. Vincent, J.W.Schouten, M.J. van den Bent, P.J. French, H.J. Dubbink, J.M. Kros, J.A. Hernandez-Tamames, Marion Smits  
Erasmus MC, Rotterdam

**11:30: Variable-density FSE with Compressed-Sensing for high-resolution multi-organ volumetric ASL perfusion**

Manuel Taso, Li Zhao, Arnaud Guidon, Daniel V. Litwiller, David C. Alsop  
Beth Israel Deaconess Medical Center, Children's National Medical Center, Washington, DC, GE Healthcare

**11:40: A Pipeline for ASL Quantification and Analysis using Inter-regional Differences and Support Vector Machine Learning: Application to Young Onset Alzheimer's Disease**

Jack Highton, Enrico De Vita, Jonathan Schott, David Thomas  
King's College London, University College London

**11:50: Beyond the consensus: is sacrificing part of the PCASL scan time for measurement of labeling efficiency and T1 of blood beneficial?**

Piet Bladt, Matthias J.P. van Osch, Eric Achten, Arnold J. den Dekker, Jan Sijbers  
Ghent University, Ghent, Belgium, Leiden University Medical Center, University of Antwerp, Belgium

**12:00: A novel technique to improve the reliability of pseudo continuous arterial spin labeling**

Matthias Günther, Praveen Iyyappan Valsala  
Fraunhofer MEVIS, Bremen, Germany

**12:10: Comparison of optimized pseudo-continuous arterial spin labeling protocols for cerebral blood flow measurements**

Joseph G. Woods, Michael A. Chappell, Thomas W. Okell  
Wellcome Centre for Integrative Neuroimaging

**12:20: Perfusion Measurement in Brain Gliomas Using Velocity-Selective Arterial Spin Labelling: Comparison with Pseudo-Continuous Arterial Spin Labelling and Dynamic Susceptibility Contrast Perfusion**

Yaoming Qu, Doris D. Lin, Dapeng Liu, Wenbo Li, Peter C. van Zijl, Zhibo Wen, Qin Qin  
Johns Hopkins University School of Medicine, Baltimore, Maryland, Southern Medical University, Guangzhou, Guangdong Province, China

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**Lunch Break**

12:30 – 2:00 Lunch served in the lobby

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**Poster Session**

Moderator: Luis Hernandez-Garcia

2:00 – 3:30 Poster session: The poster session will begin with 30 second power pitches by each author authors

**1 . Non-contrast assessment of blood-brain-barrier permeability with water-extraction-with-phase-contrast-arterial-spin-tagging (WEPCAST) MRI**

Zixuan Lin, Yang Li, Sandeepa Sur, Jinsoo Uh, Peiying Liu, Pan Su, Eboni Lance, Matthias van Osch, Hanzhang Lu

Johns Hopkins School of Medicine, Baltimore, MD, Kennedy Krieger Institute, Baltimore, MD, Leiden University Medical Center, Leiden, the Netherlands, St. Jude Children's Research Hospital, Memphis, TN

**2. Quantification of CBF in glioblastoma multiforme; challenges of ASL calibration in the presence of oedema.**

Paula L.Croal, Flora Kennedy-McConnell, Benjamin Harris, Ruichong Ma, Stasya M. Ng, Puneet Plaha, Simon Lord, Nicola R. Sibson, Michael Chappell

Oxford University Hospitals NHS Trust, University of Oxford

**3. System conditioning effects on temporal SNR and perfusion when computing GRAPPA reconstruction coefficients for accelerated EPI-based PASL imaging**

W. Scott Hoge, Jonathan R. Polimeni

Athinoula A. Martinos Center for Biomedical Imaging, Brigham and Women's Hospital, Boston, MA, Massachusetts General Hospital, Charlestown, MA, Harvard-MIT Health Sciences and Technology, Massachusetts Institute of Technology, Cambridge, MA

**4. Optimization of Velocity-Selective-Inversion Arterial Spin Labeling with 3D Acquisition**

Dapeng Liu, Wenbo Li, Peter van Zijl, Doris D. Lin, Qin Qin

F.M. Kirby Research Center for Functional Brain Imaging, Kennedy Krieger Institute, Baltimore, Maryland, Johns Hopkins University School of Medicine, Baltimore, Maryland

**5. Impact of calibration methods and processing options on CBF quantification using ASL**

Joana Pinto, Michael A. Chappell, Thomas W. Okell, Melvin Mezue, Andrew R. Segerdahl, Irene Tracey, Pedro Vilela, Patricia Figueiredo

Hospital da Luz, Lisbon, Portugal, Instituto Superior Técnico, Universidade de Lisboa, Lisbon, Portugal, University of Oxford, Oxford, UK,

**6.Accurate quantification of vascular territories using super-selective PCASL - Pitfalls and solutions**

Jonas Schollenberger, C. Alberto Figueroa, Luis Hernandez-Garcia  
University of Michigan, Ann Arbor, MI

**7. Deep Learning-based Detection of DSC-Defined Penumbra Tissue on pCASL in Acute Ischemic Stroke**

Kai Wang, Qinyang Shou, Samantha Ma, David Liebeskind, Xin Qiao, Fabien Scalzo, Jeffrey Saver, Noriko Salamon, Danny Wang

Shanghai Jiaotong University, Shanghai, China, University of California, Los Angeles, CA, University of Southern California, Los Angeles, CA

**8. Accelerating Stack of Spirals 3D RARE Using Rotated Spirals and Compressed Sensing Reconstruction**

Munsch F, Taso M, Zhao L, Lebel M, Guidon A, Alsop DC

Children's National Medical Center, Washington, DC, United States, GE Healthcare, Boston, MA, United States, GE Healthcare, Calgary, AB, Canada, Harvard Medical School, Boston, MA, United States

**9. 4D Vessel-Encoded pCASL Angiography in a Five-Minute Scan**

S Sophie Schauman, Mark Chiew, Thomas W Okell

University of Oxford, UK

**10. A multi-site round robin assessment of ASL using a perfusion phantom**

Oliver-Taylor, T. Hampshire, H.J. Mutsaerts, P. Clement, E. Warnert, J.P.A. Kuijter, K. Baas, J. Petr, J.C.W. Siero, J.P. Marques, S. Sunaert, R.J.H. Borra, M.J.P. van Osch, X. Golay, E. Achten AMC, Amsterdam, Netherlands, Donders Institute, Nijmegen, Netherlands, Erasmus MC, Rotterdam, Netherlands, Ghent University, Ghent, Belgium, Gold Standard Phantoms Limited, London, UK, HZDR, Dresden, Germany, ION, UCL, London, United Kingdom, KULeuven, Leuven, Belgium, LUMC, Leiden, Netherlands, MIC, UMCG, Groningen, Netherlands, RIT, Rochester NY, USA, UMCU, Utrecht, Netherlands, Spinoza Centre for Neuroimaging, Amsterdam, Netherlands, VUmc, Amsterdam, Netherlands,

**11. Using deep learning to map cerebral blood flow from multiple post-label delay arterial spin-labeled images**

Zahra Shirzadi, Daniel Djayakarsana, Nicholas J Luciw, Chinthaka C Heyn, Maged Goubran, Bradley J MacIntosh  
Sunnybrook Health Sciences Centre, University of Toronto,

**12. Optimizing Arterial Spin Labeling MRI in Rat Spinal Cord Injury**

Seongtaek Lee, Natasha Wilkins, Brian Schmit, Shekar Kurpad, Matthew Budde  
Clement J. Zablocki Veterans Affairs Medical Center, Milwaukee, WI, Marquette University, Medical College of Wisconsin, Milwaukee, WI

**13. Cerebral perfusion covariance mapping to study differences between adolescents with and without bipolar disorder**

Nicholas J. Luciw, Simina Toma, Benjamin I. Goldstein, Bradley J. MacIntosh  
Sunnybrook Health Sciences Centre, Toronto, Canada, Sunnybrook Research Institute, Toronto, Canada, University of Toronto, Toronto, Canada

**14. Fast substitution of ASL techniques by modularity of the dynamic platform-independent framework gamma-star ( $\gamma^*$ )**

Simon Konstandin, Cristoffer Cordes, Matthias Günther  
Fraunhofer MEVIS, Bremen, Germany, University of Bremen, Bremen, Germany

**15. Physiological underpinnings of variations in CBF measured by pCASL MRI**

Dengrong Jiang, Yang Li, Zixuan Lin, Sandeepa Sur, Peiying Liu, Cuimei Xu, Kaisha Hazel, George Pottanat, Sevil Yasar, Paul Rosenberg, Marilyn Albert, Hanzhang Lu  
Johns Hopkins School of Medicine, Baltimore, MD

**16. Automated subject-specific adaption of pCASL timing parameters in real time**

Nora-Josefin Breutigam, Mareike Alicja Buck, Daniel Christopher Hoinkiss,  
Federico von Samson-Himmelstjerna, Matthias Günther  
Fraunhofer MEVIS, Bremen, Germany, University of Bremen, Bremen, Germany

**17. Predicting obesity history from cross-sectional cerebral blood flow with machine learning: Arterial Spin Labeling data from the CARDIA study**

Zahra Shirzadi, Maged Goubran, Lenore J Launer, R Nick Bryan, John Detre, Walter Swardfager, Bradley J MacIntosh  
National Institute on Aging, Maryland, University of Pennsylvania, University of Texas, University of Toronto

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**Coffee Break**

3:30 – 3:45 : Coffee served in the lobby

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**Panel Discussion**

3:45 – 5:00 A panel comprised of the authors of the consensus paper and industry representatives will discuss what the field has learned since the publication of the Consensus paper

Moderator: Bradley MacIntosh

5:00 Adjournment

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**Reception**

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6:00 – 8:00 Reception at the Graduate Hotel

# Sunday, March 10

**8:30 – 8:45 am : Quick re-cap and matters arising**  
Luis Hernandez-Garcia

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## Invited Oral Presentations

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Moderator: Xavier Golay

**8:45: ASL in cancer**  
Marion Smits, M.D., Ph.D.  
Erasmus MC, Rotterdam/NL

**9:00: Pediatric ASL**  
Esben T. Petersen, Ph.D.  
Technical University of Denmark

**9:15: Inferring more than just perfusion from ASL**  
Michael Chappell, Ph.D.  
Oxford University

**9:30: MR fingerprinting ASL: multiparametric assessment of brain hemodynamics**  
Hanzhang Lu, Ph.D.  
Johns Hopkins University

**9:45: Artificial intelligence and ASL**  
Greg Zaharchuk, MD., Ph.D.  
Stanford University

**10:00 ASL in the body**  
Danny JJ Wang, Ph.D.  
University of Southern California

**10:15 ASL in Alzheimer's and Dementia**  
Sudipto Dolui, Ph.D.  
University of Pennsylvania

**10:30 : New acquisition methods for ASL: what is ripe for clinical practice?**  
Matthias van Osch, Ph.D.  
Leiden University Medical Center, NL

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## Break

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10:45 – 11:00 Coffee and snacks

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## Oral Sessions

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Moderators: Hanzhang Lu and Marion Smits

**11:00: Estimation of time-dependent labeling efficiency in Arterial Spin Labeling within 20 seconds**  
Matthias Günther  
Fraunhofer MEVIS, Bremen, mediri GmbH, Heidelberg, Germany, University of Bremen, Germany

**11:10: Convolutional Neural Network based Automatic Planning for Pseudo-Continuous Arterial Spin Labeling**

Karsten Sommer, Thomas Lindner, Kim van de Ven, Michael Helle  
Philips Healthcare, Best, The Netherlands, Philips Research, Hamburg, Germany, University Hospital Schleswig-Holstein Campus Kiel, Kiel, Germany

**11:20: ASL spatial heterogeneity as a cognitive group classifier in Alzheimer's disease**

Zahra Shirzadi, Bojana Stefanovic, Henri JMM Mutsaerts, Mario Masellis, Bradley J MacIntosh  
University of Toronto

**11:30: Optimizing MRF-ASL Scan Design for Precise Quantification of Brain Hemodynamics**

Anish Lahiri, Jeffrey A Fessler, Luis Hernandez-Garcia  
University of Michigan, Ann Arbor, MI

**11:40: Higher insular activation predicts treatment response to TMS for major depressive disorder**

Tessa R. Abagis, Stephan F. Taylor, Luis Hernandez-Garcia,  
University of Michigan

**11:50: A Non-Invasive Hybrid PET/MR Approach for Validation of ASL in Clinical Studies**

Tracy Ssali, Lucas Narciso, Justin Hicks, Udunna Anazodo, Elizabeth Finger, Mike S Kovacs, Matthias Günther, Frank S Prato, Keith St Lawrence  
Department of Medical Biophysics, Western Ontario, London, Canada, Fraunhofer Institute for Medical Image Computing MEVIS, Bremen, Germany, Lawson Health Research Institute, London, Canada,

**12:00: Does partial volume correction improve the repeatability of arterial spin labeling perfusion imaging?**

F. Kennedy McConnell, A. Segerdahl, T. Okell, M. Mezue, I. Tracey, M. Chappell  
University of Oxford, Oxford, United Kingdom, University of Oxford, Oxford, United Kingdom

**12:10: Neurovascular uncoupling in schizophrenia: A bimodal meta-analysis of brain perfusion and glucose metabolism**

Niron Sukumar, Priyadharshini Sabesan, Udunna Anazodo, Lena Palaniyappan  
Lawson Health Research Institute, London, Ontario, Canada, University of Western Ontario, London, Ontario, Canada

**12:20: Velocity Selective ASL in the Rat at 9.4T**

Matthew Budde, Seongtaek Lee, Briana Meyer  
Marquette University & Medical College of Wisconsin, Milwaukee, WI, Medical College of Wisconsin, Milwaukee, WI

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**Lunch Break**

12:40 – 2:00 Lunch served in the lobby

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**Town Hall Meeting**

2:00 Town Hall meeting : Looking toward the future. What should be included in a follow up set of recommendations?

Moderator: Luis Hernandez-Garcia

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**Coffee Break**

3:30 -4:00: Coffee and Snacks served in the lobby



## Final Remarks

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**4:00: Dismissal**

**4:15 – 5:30. Authors' meeting.**

The authors of the original consensus paper will meet to discuss a potential update publication.