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& IMPROVING LIFE THROUGH MR

International Society for Magnetic Resonance in Medicine • www.ismrm.org

ISMRM Workshop on **Neurofluids:** **Anatomy, Physiology & Imaging**



21-24 September 2022
Sapienza University of Rome
Rome, Italy

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ORGANIZING COMMITTEE

Co-Chairs:

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Scientifico Eugenio Medea
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Olivier Balédent, Ph.D.
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Co-Organizers:

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Leiden University Medical Center
Leiden, The Netherlands

Lydiane Hirschler, Ph.D.
Trainee Observer
Leiden University Medical Center
Leiden, The Netherlands

OVERVIEW

Although the first description of the anatomy of brain lymphatics dates back 250 years, it is only in the past decade or so that there is groundbreaking evidence from both animal and human studies proving the existence of a brain clearance system via CSF and ISF flow. This shows that fundamental elements of the brain anatomy and physiology have been neglected for too long and that there is an urgent need for in vivo imaging technology to monitor brain clearance. It is only in the recent past that some elements of brain clearance are being imaged using cutting-edge MR techniques such as contrast-enhanced MRI, diffusion tensor imaging, perfusion-weighted imaging, MR elastography, and flow studies, to name a few. There is tremendous excitement in this field, and such discoveries have the potential to revolutionize our understanding of most neurodegenerative and neuroinflammatory diseases. The workshop will have a strong multi-disciplinary character, and attendees will get ample chances to share their knowledge, speak to experts and peers, and develop joint projects. We will also suggest protocols, spend time using selected software, and invite proffered full papers on this field.

TARGET AUDIENCE

This workshop is designed to attract scientists at all levels of career and experience who are keen on deepening their current understanding of the anatomy, physiology, and MR techniques available for imaging meningeal lymphatics and brain waste clearance pathways.

EDUCATIONAL OBJECTIVES

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

- Describe the anatomy and physiology of meningeal lymphatic pathways;
- Describe the different theories on brain clearance both regarding common elements as well as still-disputed components;
- Describe current imaging methods to probe the brain clearance system;
- Describe how diseases affect brain clearance as well as MRI of brain clearance;
- Identify gaps in our current MRI arsenal for monitoring brain clearance; and
- Identify current barriers for widespread dissemination of brain clearance MRI.

SPEAKER UPLOAD INFORMATION (Audiovisual Preview)

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, 21 September 2022: 16:00-18:00
- Thursday, 22 September 2022: 07:30-8:30
- Friday, 23 September 2022: 07:30-08:00
- Saturday, 24 September 2022: 07:30-08:00

Please see program for additional times (breaks & lunch).

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.

CERTIFICATE OF PARTICIPATION

To obtain your Certificate of Participation for this workshop, log into the ISMRM membership portal at www.ismrm.org, then click on "My Meeting Evaluations" on the menu, select "View Meeting Evaluation" by the appropriate meeting name, and follow the instructions provided.

DECLARATION OF FINANCIAL RELATIONSHIPS

The ISMRM is committed to:

1. Ensuring balance, independence, objectivity, and scientific rigor in all Continuing Medical Education programs; and
2. Presenting CME 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 a program designated for *AMA PRA Category 1 Credits™* must disclose any real or apparent financial interest or other relationship (i.e., grants, research support, consulting fee, royalty, honorarium for promotional speakers' bureau, ownership interest) that they or their spouse/partner have had in the last 12 months with "any entity producing, marketing, re-selling, or distributing health care goods or services consumed by, or used on, patients."

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Following are the names of all presenters, committee members, and other organizers who had influence upon program content. If individuals have disclosed real or apparent financial interests or relationships, the interests or relationships are described.

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Matthias J.P. van Osch, Ph.D.....	No relationships to disclose

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Moss Zhao, D. Phil.....	No relationships to disclose
Jaco J.M. Zwanenburg, Ph.D.....	No relationships to disclose

SPEAKERS

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Sung-Hong Park, Ph.D.....	No relationships to disclose
Carlo Pierpaoli, M.D., Ph.D.....	No relationships to disclose
Sara E. Qvarlander, Ph.D.....	No relationships to disclose
Geir Andre Ringstad, M.D.....	Owner of US patent 11282841B2; Board Member: BrainWideSolutions AS
Marcus Stoodley.....	No relationships to disclose
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ISMRRM & ISMRT ANNUAL MEETING & EXHIBITION

03-08 JUNE **2023**

| TORONTO

ABSTRACT DEADLINE: 09 NOVEMBER 2022



Wednesday, 21 September 2022

Registration & Setup

16:00	Registration & Speaker Upload Available	
18:00	Opening Remarks (<i>No CME Available</i>)	Nivedita Agarwal, M.D. Alessandro Bozzao, M.D. Tito Marci, Ph.D.
18:15	<i>Neurofluids: What's All the Buzz About?</i>	Nivedita Agarwal, M.D. IRCCS Eugenio Medea Bosisio Parini, Lecco, Italy
18:45	<i>How I Stumbled into Neurofluids</i>	Roxana O. Carare, M.D., Ph.D. University of Southampton Southampton, England, UK Costantino Iadecola, M.D. Weill Cornell Medicine New York, NY, USA Marijan Klarica, M.D., Ph.D. University of Zagreb Zagreb, Croatia Joanna M. Wardlaw, M.D., FRCP, FMedSci University of Edinburgh Edinburgh, Scotland, UK
19:30	Welcome Reception	

Day 1: Thursday, 22 September 2022

Basic Anatomy & Physiology of Neurofluids

07:30	Registration & Speaker Upload Available	
Session 1: Cerebrovascular Anatomy & Physiology of Neurofluids		
Moderators: Erik Bakker, Ph.D., & Kannie WY Chan, Ph.D.		
08:30	Neurovascular Structure & Function in Health & Disease	Costantino Iadecola, M.D. Weill Cornell Medicine New York, NY, USA
09:00	Anatomy & Physiology of Meningeal Lymphatics	Sung-Hong Park, Ph.D. Korea Advanced Institute of Science & Technology Daejeon, South Korea
09:30	Anatomy & Physiology of the Interstitial Fluid & Cerebrospinal Fluids	Marijan Klarica, M.D., Ph.D. University of Zagreb Zagreb, Croatia
10:00	Break & Speaker Upload Available	
10:30	Differences Between Animal & Human Anatomy & Physiology	Swati Rane Levendovszky, Ph.D. University of Washington Seattle, WA, USA
11:00	Neurofluids: The Monro-Kellie Doctrine Assessed by MRI	Noam Alperin, Ph.D. University of Miami Miami, FL, USA

11:30	Post-it Session with Attendees: What We Know, What We Are Assuming Without Scientific Confirmation & What Is Still in the Dark	Costantino Iadecola, M.D. Marijan Klarica, M.D., Ph.D. Swati Rane Levendovszky, Ph.D. Sung-Hong Park, Ph.D.
Scientific Sessions - Power Pitches		
12:00	Hyperparameter & Architecture Optimization of Deep Neural Network to Estimate the Choroid Plexus Volume in Multiple Sclerosis	Valentina Visani, M.Sc. University of Padova Padova, Italy
	Human Cerebral Fluid Concentrations Measured by Wearable fNIRS Technique Support the Munro–Kellie Doctrine	Teemu Myllylä, Dr. Sc. University of Oulu Oulu, Finland
	The Potential of Ultra-High Resolution T2-Weighted TSE Acquired at 7T to Assess Structures of the Glymphatic System	Hendrik Mattern, Ph.D. Otto-von-Guericke University Magdeburg, Germany
	Anatomy & Physiology of Interstitial & Cerebrospinal Fluid	Marijan Klarica, M.D., Ph.D. University of Zagreb Zagreb, Croatia
	MRI Quantification of Posterior Optic Globe Flattening in Head-Down Tilt Bed Rest Subjects & Long-Duration Spaceflight Astronauts	Stuart Sater, M.Sc. Alcyone Therapeutics Moscow, ID, USA
12:35	Lunch & Speaker Upload Available	
Session 2: Macro & Microstructural Properties of the Brain Parenchyma		
Moderators: Nivedita Agarwal, M.D. & Marco Castellaro Ph.D.		
14:00	The Perivascular Extracellular Matrix & Its Cellular Receptors as Regulators of Injury & Disease	Gregory Bix, M.D., Ph.D., FAHA Tulane University New Orleans, LA, USA
14:30	What Are Perivascular Spaces?: A Neuroanatomist Perspective	Roxana O. Carare, M.D., Ph.D. University of Southampton Southampton, England, UK
15:00	Perivascular Spaces in Clinical MRI	Joanna M. Wardlaw, M.D., FRCP, FMedSci University of Edinburgh Edinburgh, Scotland, UK
15:30	Break & Speaker Upload Available	
16:00	Advanced Imaging of PVS/Segmentation of PVS	Lydiane Hirschler, Ph.D. Leiden University Medical Center Leiden, The Netherlands
16:30	Mathematical Modelling of Brain Fluid Dynamics	Lynne E. Bilston, Ph.D. Neuroscience Research Australia & University of New South Wales Randwick, NSW, Australia
17:00	Post-it Session with Attendees	
Scientific Sessions - Power Pitches		
17:30	4D Flow MRI for the Study of Cerebrovascular Aging in a Large Cohort of Cognitively Normal Older Adults	Anthony Peret, M.D. University of Wisconsin-Madison Madison, WI, USA
	Tracking Interstitial Fluid Flow Using Low Molecular Weight Tracers Through Cisternal & Ventricular Injections in a Large Animal Model	Michael Meggysey, M.D. Johns Hopkins School of Medicine Baltimore, MD, USA

17:30	Scientific Sessions - Power Pitches (Continued)	
	<i>Investigation of Intra-Arterial Mannitol-Based Blood Brain Barrier Opening by Non-Invasive Macroscopic Sensing Techniques & Advanced Light & Electron Microscopy</i>	Mika Kaakinen, Ph.D. University of Oulu Oulu, Finland
	<i>Robotic Simulator for Human CSF System-Wide Macroscale Solute Transport: Application to Intrathecal Drug Delivery Optimization</i>	Akari Seiner, Ph.D. University of Idaho Moscow, ID, USA
	<i>Observing Clearance Pathway in the Brain Using T2 Component Analysis</i>	Koichi Oshio, M.D., Ph.D. Juntendo University Tokyo, Japan
	<i>T2 MRI visible Perivascular Spaces in Parkinson's Disease: Clinical Significance</i>	Lena Meinhold, M.Sc. University of Zurich Zurich, Switzerland
	<i>Perivascular Cerebrospinal Fluid Flow is the Primary Source of Interstitial Fluid in the Rat Brain</i>	Kristian N. Mortensen, M.Sc. Hvidovre Hospital, Danish Research Centre for Magnetic Resonance Hvidovre, Denmark
	<i>Multi-Expert System for the Differentiation Between Subjects Affected by Higher-Level Gait Disorder & Matched Controls Applied on Brain MR Images from the VESPR Cohort</i>	Klara Mogensen, M.Sc. Umeå University Umeå, Sweden
	<i>First Report of Brain Lymphatic Structures in a Marine Mammal (Tursiops Truncatus): Implications For Central Nervous System (CNS) Function, Injuries & Diseases</i>	Olivia Jackson, B.Sc. University of North Carolina Wilmington Leland, NC, USA
18:30	Adjourn	

Day 2: Friday, 23 September 2022

Waste Clearance Pathways

07:30	Registration & Speaker Upload Available	
Session 3: What Is Brain Waste Made Of? Basic Science Behind Neuronal Metabolism & Neuronal Activity		
Moderators: Hedok Lee, Ph.D. & Ruth O'Gorman Tuura, Ph.D.		
08:30	Basics of Brain Waste with a Special Focus on Amyloid & Tau	Cheryl Hawkes, D.Phil. Lancaster University Lancaster, England, UK
09:00	The Glymphatic System: Anatomy & Physiology	Yuki Mori, Ph.D. University of Copenhagen Copenhagen, Denmark
09:30	The Intramural Periarterial Drainage (IPAD) Pathway: Anatomy & Physiology	Roxana O. Carare, M.D., Ph.D. University of Southampton Southampton, England, UK
10:00	Break & Speaker Upload Available	
10:30	Alternative Pathways to Glymphatics & IPAD	Erik N. Bakker, Ph.D. Amsterdam UMC Amsterdam, The Netherlands
11:00	Imaging of BBB Permeability in Neurodegenerative & Small Vessel Diseases	Joanna M. Wardlaw, M.D., FRCP, FMedSci University of Edinburgh Edinburgh, Scotland, UK
11:30	Post-It Session with Attendees: Theories/Speculations/Ground-Truth; What if the Glymphatic Theory Was Wrong? What if the IPAD Did Not Exist? What Is the Ground Truth as of Now? What Are the Missing Links?	Erik N. Bakker, Ph.D. Cheryl Hawkes, D.Phil. Yuki Mori, Ph.D. Joanna M. Wardlaw, M.D., FRCP, FMedSci

ISMIRM RESEARCH & EDUCATION FUND



The **ISMIRM Research & Education Fund** was established to support the next generation of specialists in the field of magnetic resonance regardless of scientific discipline, geography, country of origin and resources available.

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MEET OUR STIPEND RECIPIENTS
— THE NEXT GENERATION OF MR SPECIALISTS —
AT TODAY'S WORKSHOP!

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Jianpan Huang, Ph.D.
Martin Kozar, M.Phys.
Hendrik Mattern, Ph.D.
Kristian N. Mortensen, M.Sc.
Yuhui Nie, B.A.

Shereen Nizari, Ph.D.
Charith Perera, M.Sc.
Anthony Peret, M.D.
Valentina Visani, M.Sc.
Moss Zhao, D.Phil.

Scientific Sessions - Power Pitches		
12:00	<i>Effects of Impaired Meningeal Lymphatic Drainage on Cognitive Function in Patients with Mild Cognitive Impairment: A Dynamic Contrast-Enhanced MRI Study</i>	Mina Park, M.D., Ph.D. Yonsei University, Gangnam Severance Hospital Seoul, South Korea
	<i>Imaging D-Glucose in Cerebrospinal Fluid of Alzheimer's Disease Using Dynamic Glucose Enhanced MRI</i>	Jianpan Huang, Ph.D. City University of Hong Kong Hong Kong, China
	<i>Dynamic Glucose-Enhanced MRI Assesses CSF Transport in Aging Brain</i>	Zilin Chen, M. Phil. City University of Hong Kong Hong Kong, China
	<i>Posterior Fossa Decompression Surgery Increases in CSF Stroke Volume in Pediatric Patients with Chiari Malformation</i>	John Oshinski, Ph.D. Emory University Atlanta, GA, USA
	<i>Choroid Plexus Manual Segmentation: Can We Avoid Contrast-Agent in T1-W Images?</i>	Valentina Visani, M.Sc. University of Padova Padova, Italy
	<i>Changes of Intracranial & Spinal CSF & Venous Flow from Childhood to Young Adulthood Studied by Real-Time Phase Contrast MRI</i>	Prativa Sahoo, Ph.D. University Medical Center Göttingen Göttingen, Germany
	<i>Cerebrospinal Fluid Efflux Through Cervical Lymphatic Pathways Is Enhanced by Blood Pressure Lowering</i>	Jari Jukkola, M.Sc. University of Oulu Oulu, Finland
	<i>The Cervical & Meningeal Lymphatic System as a Potential Pathway for the Transport of Exosomes & Nanoparticles from Peripheral Tissues to the Brain</i>	Héctor M Ramos-Zaldívar, M.D., Ph.D. Candidate Pontificia Universidad Católica de Chile Santiago, Chile
	<i>Rate of Flux of Labelled Blood-Water Across the Blood-Cerebrospinal Fluid-Barrier Is Significantly Affected by Anaesthetic Regimen.</i>	Shereen Nizari, Ph.D. University College London London, England, UK
	<i>Signal Changes at the Cerebrospinal Fluid Area During Visual Stimulation for Functional MRI Study</i>	Geon-Ho Jahng, Ph.D. Kyung Hee University Hospital at Gangdong Seoul, South Korea
13:00	Lunch & Speaker Upload Available	
Session 4: Driving Forces of Brain Clearance		
Moderators: Mina Park, M.D., Ph.D. & Jaco Zwanenburg, Ph.D.		
14:30	<i>Influence of Cardiac/Respiratory Cycle on Waste Clearance: How Do Breathing & Blood Pressure Alter CNS Fluid Driving Forces?</i>	Lynne E. Bilston, Ph.D. Neuroscience Research Australia & University of New South Wales Randwick, NSW, Australia
15:00	<i>Vasomotor Waves & the Potential Relation with Brain Clearance</i>	Thomas Broggini, Ph.D. Universitätsklinikum Frankfurt am Main Frankfurt, Germany
15:30	<i>Space, Posture, ICP & Glymphatics</i>	Petter Holmlund, Ph.D. & Sara E. Qvarlander, Ph.D. Umeå University Umeå, Sweden
16:00	Break & Speaker Upload Available	
16:30	<i>Steps Towards a Multi-Scale View of CNS Fluid Movement & Solute Transport</i>	Vartan Kurtcuoglu, Ph.D. University of Zürich Zürich, Switzerland

2022 ISMRM Workshops



ISMRM Workshop on Diffusion MRI:
From Research to Clinic
10-14 October 2022
Amsterdam, The Netherlands



ISMRM Workshop on MRI of
Neuromodulation:
Target Engagement, Neural
Mechanism & Biomarker Development
17-19 October 2022



ISMRM Workshop on MR Safety:
From Physics & Physiology
to Policies & Practice
21-23 October 2022
New York, NY, USA



ISMRM Workshop on Cancer Imaging:
From Discovery to Diagnosis
01-04 November 2022
Pacific Grove, CA, USA

**Dates and locations subject to change.*

Visit www.ismrm.org for more information.

Scientific Sessions - Power Pitches		
17:00	<i>Cerebral VLF Arterial & Venous Waves Become Synchronized in NREM Sleep</i>	Johanna Tuunanen, M.Sc. University of Oulu Oulu, Finland
	<i>Brain Hydrodynamic Drive of BOLD Signal Inverts in Sleep</i>	Tommi Väyrynen, M.Sc. University of Oulu Oulu, Finland
	<i>High Temporal Resolution Quantitative Contrast-Enhanced MRI for Spatial-Temporal Quantification of Cerebrospinal Fluid System Wide Intrathecal Gadolinium Pharmacokinetics in Nonhuman Primates</i>	Stuart Sater, M.Sc. Alcyone Therapeutics Moscow, ID, USA
	<i>MRI Quantification of Effects of Cranial Nerve Stimulation on Glymphatic Function</i>	Nishant Verma, M.S. University of Wisconsin-Madison Madison, WI, USA
	<i>MR-Based Computational Fluid Dynamics Simulation of Cerebrospinal Fluid Drug Delivery Pharmacokinetics in Nonhuman Primates</i>	Mohammadreza Kahni, Ph.D. Alcyone Therapeutics Moscow, ID, USA
	<i>Diurnal Changes in Cerebrovascular Dynamics Measured from 4D-Flow</i>	Leonardo Rivera-Rivera, Ph.D. University of Wisconsin-Madison Madison, WI, USA
	<i>Effect of Respiration & Subarachnoid Space Obstruction on Cerebrospinal Fluid Flow</i>	Joel Berliner, Ph.D. Macquarie University Macquarie Park, NSW, Australia
	<i>Investigating Effects of Sleep Deprivation on Glymphatic Transport Using Intravoxel Incoherent Motion MRI</i>	Swati D. Rane Levendovszky, Ph.D. University of Washington Seattle, WA, USA
	<i>Phase-Based Amplified MRI Reveals Impaired CSF Motion Dynamics in Patients with Chiari Malformation</i>	Moss Zhao, D.Phil. Stanford University Stanford, CA, USA
	<i>Neurovascular Pulsations Are Increased in Alzheimer's Disease</i>	Vesa Korhonen, Ph.D. University of Oulu Oulu, Finland
18:00	<i>Post-It Session With Attendees: How Much Do Our Assumptions Influence Our Results</i>	Lynne E. Bilston, Ph.D. Thomas Broggini, Ph.D. Petter Holmlund, Ph.D. Vartan Kurtcuoglu, Ph.D. Sara E. Qvarlander, Ph.D.
18:30	Social Event	

Day 3: Saturday, 24 September 2022

Imaging Methods

07:30	Registration & Speaker Upload Available	
Session 5: Magnetic Resonance-Based Imaging Techniques		
Moderators: Karin Markenroth Bloch, Ph.D & Moss Zhao, D. Phil.		
08:30	Diffusion-Based Imaging	Carlo Pierpaoli, M.D., Ph.D. National Institutes of Health Bethesda, MD, USA
09:00	Arterial Spin Labeling MRI (& Other Perfusion Techniques)	Matthias J.P. van Osch, Ph.D. Leiden University Medical Center Leiden, The Netherlands

09:30	Break & Speaker Upload Available	
10:00	<i>Intravenous Gadolinium-Based Imaging</i>	Shinji Naganawa, M.D., Ph.D. Nagoya University Graduate School of Medicine Nagoya, Japan
10:30	<i>Intrathecal Gadolinium-Based Imaging</i>	Geir Andre Ringstad, M.D. Oslo University Hospital Oslo, Norway
11:00	<i>Panel Discussion: Opportunities & Challenges of MRI for Brain Clearance Imaging</i>	Shinji Naganawa, M.D., Ph.D. Carlo Pierpaoli, M.D., Ph.D. Geir Andre Ringstad, M.D. Matthias J.P. van Osch, Ph.D.
Scientific Sessions - Power Pitches		
11:30	<i>Quantitative CSF & Brain Motion: Initial Studies on Next Generation 7T Scanner with High Performance Gradients & 128 Channel Receiver</i>	David Feinberg, M.D., Ph.D. University of California, Berkeley Berkeley, CA, USA
	<i>Measuring CSF Net Flow Velocity in the Human Subarachnoid Space with 7T MRI</i>	Lotte van der Voort, M.Sc University Medical Center Utrecht Utrecht, The Netherlands
	<i>4D Whole-Brain CSF Flowmetry: Slow Flow Dynamics in Ventricles & Subarachnoid Space</i>	Zijing Dong, Ph.D. Athinoula A. Martinos Center for Biomedical Imaging Charlestown, MA, USA
	<i>Concurrent Measurement of Perfusion Parameters Related to Small Blood & Lymphatic Vessels in the Human Brain</i>	Di Cao, B.Sc., Ph.D. candidate Johns Hopkins University Baltimore, MD, USA
	<i>Comparison of Pulsed Gradient Spin-Echo (PGSE) & Stimulated Echo (STE) Sequences for Measuring Creeping Flows: A Phantom Study</i>	Martin Kozar, M.Phys. University of Manchester Manchester, England, UK
	<i>Multiplied, Added, Subtracted &/or Divided Inversion Recovery (MASDIR): Technical Considerations for Optimal Clinical Implementation</i>	Letizia Losa, M.Sc. IRCCS Eugenio Medea Bosisio Parini, Italy
	<i>Clinical Implementation of Multiplied, Added, Subtracted &/or Divided (MASDIR) Sequences to Evaluate White Matter Hyperintensities</i>	Nivedita Agarwal, M.D. IRCCS Eugenio Medea Bosisio Parini, Italy
	<i>Three-Dimensional Black-Blood T1 Mapping: Sequence Design & Initial Experience</i>	Yuhui Nie, B.A. Guangzhou Medical University Guangzhou, China
	<i>Investigating Changes in Blood-Cerebrospinal Fluid Barrier Function in a Rat Model of Chronic Hypertension Using Multi-T1 ASL MRI</i>	Charith Perera, M.Sc. University College London London, England, UK
	<i>Low B-Value Diffusion Tensor Imaging (Low-B DTI) for Investigating CSF Motion</i>	Yoshitaka Bito, Ph.D. FUJIFILM Healthcare Corporation Chiba, Japan
12:30	Lunch & Speaker Upload Available	

Session 6: Clinical Applications		
Moderators: Marieke Wermer, M.D., Ph.D. & Yu-Chien Wu, M.D., Ph.D.		
13:30	Clinical Diseases: CAA-Related Abnormalities/Neurodegenerative Diseases/ARIA	Steven M. Greenberg, M.D., Ph.D. Massachusetts General Hospital Boston, MA, USA
14:00	CSF Egress Pathways in Aging & Alzheimer using PET	Mony de Leon, Ph.D. Weill Cornell Medicine New York, NY, USA
14:30	The Eyes as the Window to Brain Clearance	Katerina Deike-Hofmann, M.D. Universitätsklinikum Bonn Bonn, Germany
15:00	Break	
15:30	Cranio-Spinal Malformations & Neurofluid Dynamic Alterations in the Spine	Marcus Stoodley Macquarie Univesity Macquarie Park, NSW, Australia
16:00	Sleep: Imaging Findings on Neurofluids	Laura Lewis, Ph.D. Boston University Boston, MA, USA
16:30	Panel Discussion/Meet the Authors	
Session 7: Pharmacological Interventions & Neurofluids		
Moderators: Leonardo A. Rivera-Rivera, Ph.D. & Richard Wise Ph.D.		
17:00	Investigating Blood-Cerebrospinal Fluid Barrier Function Using Non-Invasive MRI	Jack A. Wells, Ph.D. University College London London, England, UK
17:30	In Silico & In Vitro Trials for Prediction of CSF Pharmacokinetics: Bridging the Gap from Physics to Biology	Bryn A. Martin, Ph.D. Alcyone Therapeutics, Inc. Moscow, ID, USA
18:00	Awards	
18:30	Adjournment	

Take the 5-minute on-site survey!

See the registration desk for questions.

This survey is not for CME credits.

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POSTERS

POSTER	TITLE	AUTHOR
1	<i>Anatomy & Physiology of Interstitial & Cerebrospinal Fluid</i>	Marijan Klarica, M.D., Ph.D. University of Zagreb Zagreb, Croatia
2	<i>The Potential of Ultra-High Resolution T2-Weighted TSE Acquired at 7T To Assess Structures of the Glymphatic System</i>	Hendrik Mattern, Ph.D. Otto von Guericke University Magdeburg, Germany
3	<i>Human Cerebral Fluid Concentrations Measured by Wearable fNIRS Technique Support the Munro–Kellie Doctrine</i>	Teemu Myllylä, Ph.D. University of Oulu Oulu, Finland
4	<i>MRI Quantification of Posterior Optic Globe Flattening in Head-Down Tilt Bed Rest Subjects & Long Duration Spaceflight Astronauts</i>	Stuart Sater, M.Sc. Alcyone Therapeutics Moscow, ID, USA
5	<i>Hyperparameter & Architecture Optimization of Deep Neural Network to Estimate the Choroid Plexus Volume in Multiple Sclerosis</i>	Valentina Visani, M.Sc. University of Padova Padova, Italy
6	<i>Tracking Interstitial Fluid Flow Using Low Molecular Weight Tracers Through Cisternal & Ventricular Injections in a Large Animal Model</i>	Michael Meggysey, M.D. Johns Hopkins School of Medicine Baltimore, MD, USA
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9	<i>T2 MRI Visible Perivascular Spaces in Parkinson's Disease: Clinical Significance</i>	Lena Meinhold, M.Sc. University of Zurich Zurich, Switzerland
10	<i>Multi-Expert System for the Differentiation Between Subjects Affected by Higher-Level Gait Disorder & Matched Controls Applied on Brain MR Images From the VESPR Cohort</i>	Klara Mogensen, M.Sc. Umeå University Umeå, Sweden
11	<i>Perivascular Cerebrospinal Fluid Flow Is the Primary Source of Interstitial Fluid in the Rat Brain</i>	Kristian N. Mortensen, M.Sc. Hvidovre Hospital, Danish Research Centre for Magnetic Resonance Hvidovre, Denmark
12	<i>Observing Clearance Pathway in the Brain Using T2 Component Analysis</i>	Koichi Oshio, M.D., Ph.D. Juntendo University Tokyo, Japan
13	<i>4D Flow MRI for the Study of Cerebrovascular Aging in a Large Cohort of Cognitively Normal Older Adults</i>	Anthony Peret, M.D. University of Wisconsin-Madison Madison, WI, USA
14	<i>First Report of Brain Lymphatic Structures in a Marine Mammal (Tursiops Truncatus): Implications For Central Nervous System (CNS) Function, Injuries, & Diseases</i>	Olivia Jackson, B.Sc. University of North Carolina Wilmington Leland, NC, USA
15	<i>Dynamic Glucose-Enhanced MRI Assesses CSF Transport in Aging Brain</i>	Zilin Chen, M. Phil. City University of Hong Kong Hong Kong, China
16	<i>Imaging D-Glucose in Cerebrospinal Fluid of Alzheimer's Disease Using Dynamic Glucose Enhanced MRI</i>	Jianpan Huang, Ph.D. City University of Hong Kong Hong Kong, China

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18	<i>Cerebrospinal Fluid Efflux Through Cervical Lymphatic Pathways is Enhanced by Blood Pressure Lowering</i>	Jari Jukkola, M.Sc. University of Oulu Oulu, Finland
19	<i>Rate of Flux of Labelled Blood-Water Across the Blood-Cerebrospinal Fluid-Barrier Is Significantly Affected by Anaesthetic Regimen.</i>	Shereen Nizari, Ph.D. University College London London, England, UK
20	<i>Posterior Fossa Decompression Surgery Increases in CSF Stroke Volume in Pediatric Patients with Chiari Malformation</i>	John Oshinski, Ph.D. Emory University Atlanta, GA, USA
21	<i>Effects of Impaired Meningeal Lymphatic Drainage on Cognitive Function in Patients with Mild Cognitive Impairment: A Dynamic Contrast Enhanced MRI Study</i>	Mina Park, M.D., Ph.D. Yonsei University, Gangnam Severance Hospital Seoul, South Korea
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23	<i>Changes of Intracranial & Spinal CSF & Venous Flow from Childhood to Young Adulthood Studied by Real-Time Phase Contrast MRI</i>	Prativa Sahoo, Ph.D. University Medical Center Göttingen Göttingen, Germany
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