

## CONTENTS

### ■ LETTER TO THE EDITOR

**Muscle Blood Flow, Oxygen Pressure, and Hemoglobin/Myoglobin Saturation: The Infernal Triad**, Pierre Abraham, Pierre Ramondou, Jeanne Hersant, and Samir Henni..... 13  
*Published online 8 March 2021*

### ■ RESPONSE

**Response to Letter to the Editor: "Muscle Blood Flow, Oxygen Pressure, and Hemoglobin/Myoglobin Saturation: The Infernal Triad"**, Shiteng Suo, Hui Tang, Qing Lu, Lan Zhang, Qihong Ni, and Jianrong Xu ..... 15  
*Published online 8 March 2021*

### ■ SPECTROSCOPIC METHODOLOGY

#### Full Papers

**Parallel Transmit Optimized 3D Composite Adiabatic Spectral-Spatial Pulse for Spectroscopy**, Xiaoxuan He, Edward J. Auerbach, Michael Garwood, Naoharu Kobayashi, Xiaoping Wu, and Gregory J. Metzger..... 17  
*Published online 26 January 2021*

**Bilateral Gradient-Echo Spectroscopic Imaging with Correction of Frequency Variations for Measurement of Fatty Acid Composition in Mammary Adipose Tissue**, Mehran Baboli, Pippa Storey, Terlika Pandit Sood, Justin Fogarty, Melanie Moccaldi, Alana Lewin, Linda Moy, and Sungheon Gene Kim ..... 33  
*Published online 2 February 2021*

**Accelerated Radial Echo-Planar Spectroscopic Imaging Using Golden Angle View-Ordering and Compressed-Sensing Reconstruction with Total Variation Regularization**, Andres Saucedo, Paul M. Macey, and M. Albert Thomas ..... 46  
*Published online 18 February 2021*

### ■ PRECLINICAL AND CLINICAL SPECTROSCOPY

#### Note

**NMR Visibility of Deuterium-Labeled Liver Glycogen In Vivo**, Henk M. De Feyter, Monique A. Thomas, Kevin L. Behar, and Robin A. de Graaf..... 62  
*Published online 15 February 2021*

### ■ IMAGING METHODOLOGY

#### Full Papers

**Temperature-Corrected Proton Density Fat Fraction Estimation Using Chemical Shift-Encoded MRI in Phantoms**, Ruvini Navaratna, Ruiyang Zhao, Timothy J. Colgan, Houchun Harry Hu, Mark Bydder, Takeshi Yokoo, Mustafa R. Bashir, Michael S. Middleton, Suraj D. Serai, Dariya Malyarenko, Thomas Chenevert, Mark Smith, Walter Henderson, Gavin Hamilton, Yunhong Shu, Claude B. Sirlin, Jean A. Tkach, Andrew T. Trout, Jean H. Brittain, Diego Hernando, Scott B. Reeder, and the RSNA Quantitative Imaging Biomarker Alliance – Proton Density Fat Fraction Biomarker Committee ..... 69  
*Published online 9 February 2021*

**Dual-Excitation Flip-Angle Simultaneous Cine and T<sub>1</sub> Mapping Using Spiral Acquisition with Respiratory and Cardiac Self-Gating**, Ruixi Zhou, Daniel S. Weller, Yang Yang, Junyu Wang, Haris Jeelani, John P. Mugler III, and Michael Salerno..... 82  
*Published online 15 February 2021*

**Magnetization-Prepared GRASP MRI for Rapid 3D T<sub>1</sub> Mapping and Fat/Water-Separated T<sub>1</sub> Mapping**, Li Feng, Fang Liu, Georgios Soultanidis, Chenyu Liu, Thomas Benkert, Kai Tobias Block, Zahi A. Fayad, and Yang Yang ..... 97  
*Published online 13 February 2021*

**Repeatability of Multinuclear Interleaved Acquisitions with Nuclear Overhauser Enhancement Effect In Dynamic Experiments in the Calf Muscle at 3T**, Alfredo L. Lopez Kolkovsky, Benjamin Marty, Eric Giacomini, Martin Meyerspeer, and Pierre G. Carlier ..... 115  
*Published online 9 February 2021*

**Exploring Label Dynamics of Velocity-Selective Arterial Spin Labeling in the Kidney**, Isabell K. Bones, Suzanne L. Franklin, Anita A. Hartevelde, Matthias J. P. van Osch, Sophie Schmid, Jeroen Hendrikse, Chrit Moonen, Marijn van Stralen, and Clemens Bos ..... 131  
*Published online 4 February 2021*

# CONTENTS

- Noncontrast Assessment of Blood–Brain Barrier Permeability to Water: Shorter Acquisition, Test–Retest Reproducibility, and Comparison with Contrast-Based Method,** Zixuan Lin, Dengrong Jiang, Dapeng Liu, Yang Li, Jinsoo Uh, Xirui Hou, Jay J. Pillai, Qin Qin, Yulin Ge, and Hanzhang Lu ..... 143  
*Published online 8 February 2021*
- Characterization and Compensation of  $f_0$  Inhomogeneity Artifact in Spiral Hyperpolarized  $^{13}\text{C}$  Imaging of the Human Heart,** Galen D. Reed, Junjie Ma, Jae Mo Park, Rolf F. Schulte, Crystal E. Harrison, Albert P. Chen, Salvador Pena, Jeannie Baxter, Kelly Derner, Maida Tai, Jaffar Raza, Jeff Liticker, Ronald G. Hall II, A. Dean Sherry, Vlad G. Zaha, and Craig R. Malloy ..... 157  
*Published online 5 February 2021*
- Probing the Myelin Water Compartment with a Saturation-Recovery, Multi-Echo Gradient-Recalled Echo Sequence,** Elena Kleban, Penny Gowland, and Richard Bowtell ..... 167  
*Published online 12 February 2021*
- Minimum TR Radiofrequency-Pulse Design for Rapid Gradient Echo Sequences,** Samy Abo Seada, Anthony N. Price, Joseph V. Hajnal, and Shaihan J. Malik ..... 182  
*Published online 15 February 2021*
- Region-Optimized Virtual (ROVir) Coils: Localization and/or Suppression of Spatial Regions Using Sensor-Domain Beamforming,** Daeun Kim, Stephen F. Cauley, Krishna S. Nayak, Richard M. Leahy, and Justin P. Haldar ..... 197  
*Published online 16 February 2021*
- Similarity-Driven Multi-Dimensional Binning Algorithm (SIMBA) for Free-Running Motion-Suppressed Whole-Heart MRA,** John Heerfordt, Kevin K. Whitehead, Jessica A. M. Bastiaansen, Lorenzo Di Sopra, Christopher W. Roy, Jérôme Yerly, Bastien Milani, Mark A. Fogel, Matthias Stuber, and Davide Piccini ..... 213  
*Published online 24 February 2021*
- Quantification of Intravoxel Incoherent Motion with Optimized b-Values Using Deep Neural Network,** Wonil Lee, Byungjai Kim, and HyunWook Park ..... 230  
*Published online 16 February 2021*
- Improving the Sensitivity of Spin-Echo fMRI at 3T by Highly Accelerated Acquisitions,** Antonia Barghoorn, Bruno Riemenschneider, Jürgen Hennig, and Pierre LeVan ..... 245  
*Published online 23 February 2021*
- Joint Image and Field Map Estimation for Multi-Echo Hyperpolarized  $^{13}\text{C}$  Metabolic Imaging of the Heart,** Julia Traechtler, Valery Vishnevskiy, Maximilian Fuetterer, and Sebastian Kozerke ..... 258  
*Published online 3 March 2021*
- Myofiber Strain in Healthy Humans Using DENSE and cDTI,** Kévin Moulin, Pierre Croisille, Magalie Viallon, Ilya A. Verzhbinsky, Luigi E. Perotti, and Daniel B. Ennis ..... 277  
*Published online 22 February 2021*
- Spatial Dependency and the Role of Local Susceptibility for Velocity Selective Arterial Spin Labeling (VS-ASL) Relative Tagging Efficiency Using Accelerated 3D Radial Sampling with a BIR-8 Preparation,** James H. Holmes, Mu-Lan Jen, Laura B. Eisenmenger, Tilman Schubert, Patrick A. Turski, and Kevin M. Johnson ..... 293  
*Published online 21 February 2021*
- MR Method for Measuring Microscopic Histologic Soft Tissue Textures,** Geoffrey A. Sonn, Richard E. Fan, Christian A. Kunder, Garry E. Gold, Kristin M. James, Ian D. Parker, Jean M. Carlson, Scott M. Cannizzaro, and Timothy W. James ..... 308  
*Published online 19 February 2021*
- Highly Accelerated Subtractive Femoral Non-Contrast-Enhanced MRA Using Compressed Sensing with k-Space Subtraction, Phase and Intensity Correction,** Hao Li, Martin J. Graves, Nadeem Shaida, Akash Prashar, David J. Lomas, and Andrew N. Priest ..... 320  
*Published online 1 March 2021*
- Super-Resolution Head and Neck MRA Using Deep Machine Learning,** Ioannis Koktzoglou, Rong Huang, William J. Ankenbrandt, Matthew T. Walker, and Robert R. Edelman ..... 335  
*Published online 22 February 2021*
- Whole-Brain Quantitative CEST MRI at 7T Using Parallel Transmission Methods and  $B_1^+$  Correction,** Andrzej Liebert, Katharina Tkotz, Jürgen Herrler, Peter Linz, Angelika Mennecke, Alex German, Patrick Liebig, Rene Gumbrecht, Manuel Schmidt, Arnd Doerfler, Michael Uder, Moritz Zaiss, and Armin M. Nagel ..... 346  
*Published online 26 February 2021*
- Notes**
- A Phantom Study Comparing Radial Trajectories for Accelerated Cardiac 4D Flow MRI Against a Particle Imaging Velocimetry Reference,** Philip A. Corrado, Rafael Medero, Kevin M. Johnson, Christopher J. François, Alejandro Roldán-Alzate, and Oliver Wieben ..... 363  
*Published online 5 February 2021*

# CONTENTS

**Simultaneous  $T_1$ ,  $T_2$ , and  $T_{1\rho}$  Relaxation Mapping of the Lower Leg Muscle with MR Fingerprinting,** Azadeh Sharafi, Katherine Medina, Marcelo W. V. Zibetti, Smita Rao, Martijn A. Cloos, Ryan Brown, and Ravinder R. Regatte.....372  
*Published online 8 February 2021*

## ■ PRECLINICAL AND CLINICAL IMAGING

### Full Papers

**High-Frequency Electrical Properties Tomography at 9.4T as a Novel Contrast Mechanism for Brain Tumors,** Clémentine Lesbats, Nitish Katoch, Atul Singh Minhas, Arthur Taylor, Hyung Joong Kim, Eung Je Woo, and Harish Poptani .....382  
*Published online 2 February 2021*

**Clinical Routine Acquisition Protocol for 3D Relaxation-Compensated APT and rNOE CEST-MRI of the Human Brain at 3T,** Steffen Goerke, Johannes Breitling, Andreas Korzowski, Daniel Paech, Moritz Zaiss, Heinz-Peter Schlemmer, Mark E. Ladd, and Peter Bachert .....393  
*Published online 14 February 2021*

**Longitudinal Study of Sub-Regional Cerebral Viscoelastic Properties of 5XFAD Alzheimer's Disease Mice Using Multifrequency MR Elastography,** Shreyan Majumdar and Dieter Klatt .....405  
*Published online 18 February 2021*

## ■ BIOPHYSICS AND BASIC BIOMEDICAL RESEARCH

### Full Papers

**Multi-Component  $T_2^*$  Relaxation Modelling in Human Achilles Tendon: Quantifying Chemical Shift Information in Ultra-Short Echo Time Imaging,** Muhammad A. R. Anjum, Felix M. Gonzalez, Anshuman Swain, Johannes Leisen, Zahra Hosseini, Adam Singer, Monica Umpierrez, and David A. Reiter .....415  
*Published online 15 February 2021*

**Diffusion Interactions Between Crossing Fibers of the Brain,** Sergey V. Buldyrev, Xiangyi Meng, Timothy G. Reese, Farzad Mortazavi, Douglas L. Rosene, H. Eugene Stanley, and Van J. Wedeen.....429  
*Published online 22 February 2021*

## ■ COMPUTER PROCESSING AND MODELING

### Full Papers

**Assessment of Carotid Stiffness by Measuring Carotid Pulse Wave Velocity Using a Single-Slice Oblique-Sagittal Phase-Contrast MRI,** Soroush Heidari Pahlavian, Steven Yong Cen, Xiaoming Bi, Danny J. J. Wang, Helena Chang Chui, and Lirong Yan .....442  
*Published online 5 February 2021*

**PreQual: An Automated Pipeline for Integrated Preprocessing and Quality Assurance of Diffusion Weighted MRI Images,** Leon Y. Cai, Qi Yang, Colin B. Hansen, Vishwesh Nath, Karthik Ramadass, Graham W. Johnson, Benjamin N. Conrad, Brian D. Boyd, John P. Begnoche, Lori L. Beason-Held, Andrea T. Shafer, Susan M. Resnick, Warren D. Taylor, Gavin R. Price, Victoria L. Morgan, Baxter P. Rogers, Kurt G. Schilling, and Bennett A. Landman.....456  
*Published online 3 February 2021*

**Accelerated White Matter Lesion Analysis Based on Simultaneous  $T_1$  and  $T_2^*$  Quantification Using Magnetic Resonance Fingerprinting and Deep Learning,** Ingo Hermann, Eloy Martínez-Heras, Benedikt Rieger, Ralf Schmidt, Alena-Kathrin Golla, Jia-Sheng Hong, Wei-Kai Lee, Wu Yu-Te, Martijn Nagtegaal, Elisabeth Solana, Sara Llufrui, Achim Gass, Lothar R. Schad, Sebastian Weingärtner, and Frank G. Zöllner.....471  
*Published online 5 February 2021*

**Effect of Brain Normalization Methods on the Construction of Functional Connectomes from Resting-State Functional MRI in Patients with Gliomas,** Henry Szu-Meng Chen, Vinodh A. Kumar, Jason M. Johnson, Melissa M. Chen, Kyle R. Noll, Ping Hou, Sujit S. Prabhu, Donald F. Schomer, and Ho-Ling Liu.....487  
*Published online 2 February 2021*

**Deep Learning-Based T1-Enhanced Selection of Linear Attenuation Coefficients (DL-TEsLA) for PET/MR Attenuation Correction in Dementia Neuroimaging,** Yasheng Chen, Chunwei Ying, Michael M. Binkley, Meher R. Juttukonda, Shaney Flores, Richard Laforest, Tammie L. S. Benzinger, and Hongyu An .....499  
*Published online 8 February 2021*

**Finite Element Simulations of Hyperpolarized Gas DWI in Micro-CT Meshes of Acinar Airways: Validating the Cylinder and Stretched Exponential Models of Lung Microstructural Length Scales,** Ho-Fung Chan, Guilhem J. Collier, Juan Parra-Robles, and Jim M. Wild.....514  
*Published online 23 February 2021*

**QSM Reconstruction Challenge 2.0: A Realistic in Silico Head Phantom for MRI Data Simulation and Evaluation of Susceptibility Mapping Procedures,** José P. Marques, Jakob Meineke, Carlos Milovic, Berkin Bilgic, Kwok-Shing Chan, Renaud Hedouin, Wietske van der Zwaag, Christian Langkammer, and Ferdinand Schweser.....526  
*Published online 26 February 2021*

# CONTENTS

## Notes

**Temperature-Based MRI Safety Simulations with a Limited Number of Tissues,** Giuseppe Carluccio, Can Akgun, John Thomas Vaughan, and Christopher Collins .....543  
*Published online 5 February 2021*

**Three-Dimensional Spatially Resolved Phase Graph Framework,** Xiang Gao, Valerij G. Kiselev, Thomas Lange, Jürgen Hennig, and Maxim Zaitsev .....551  
*Published online 19 February 2021*

**Local SAR Compression Algorithm with Improved Compression, Speed, and Flexibility,** Stephan Orzada, Thomas M. Fiedler, Harald H. Quick, and Mark E. Ladd .....561  
*Published online 26 February 2021*

## ■ HARDWARE AND INSTRUMENTATION

### Full Papers

**Minimum Electric-Field Gradient Coil Design: Theoretical Limits and Practical Guidelines,** Peter B. Roemer and Brian K. Rutt .....569  
*Published online 9 February 2021*

**Unshielded Bent Folded-End Dipole 9.4 T Human Head Transceiver Array Decoupled Using Modified Passive Dipoles,** Nikolai I. Avdievich, Georgiy Solomakha, Loreen Ruhm, Anke Henning, and Klaus Scheffler .....581  
*Published online 25 February 2021*