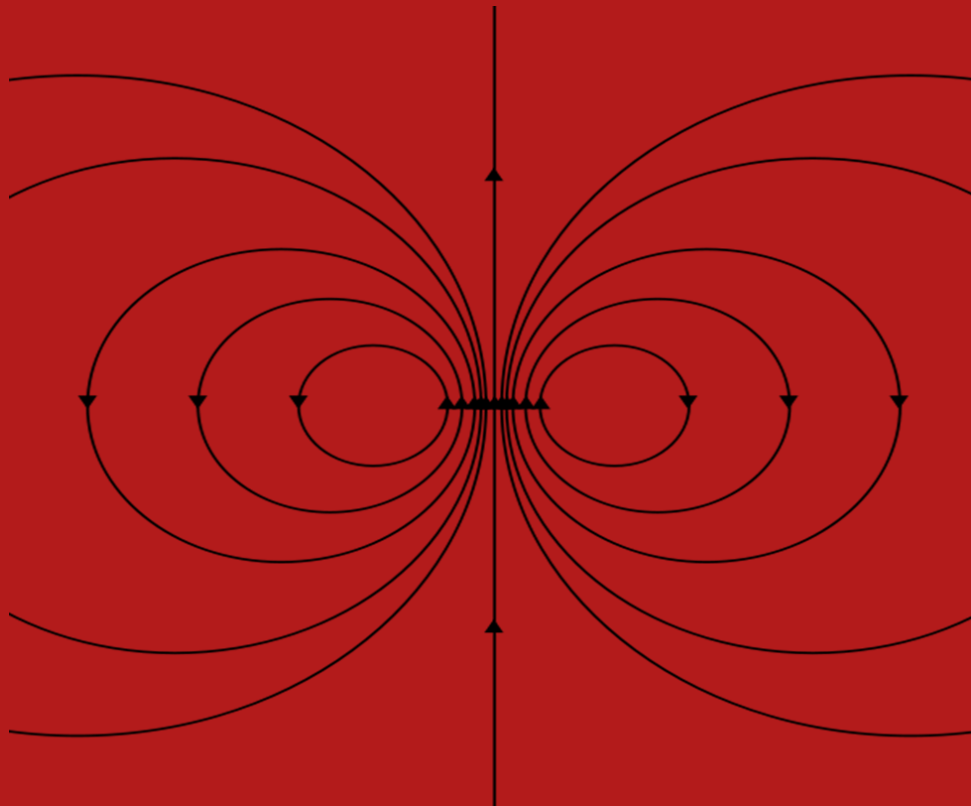


# 2<sup>nd</sup> Workshop on MRI Phase Contrast & Quantitative Susceptibility Mapping (QSM)

---

July 25-27, 2013

Cornell University, Ithaca New York



## Steering Committee:

Chair: Yi Wang, PhD, Cornell University

Co-Chair: Mark Haacke, PhD, Wayne State University

Co-Chair: Chunlei Liu, PhD, Duke University

Co-Chair: Jürgen Reichenbach, PhD, University of Jena

Richard Bowtell, PhD, University of Nottingham

Karen Tong, MD, Loma Linda University

Jeff Duyn, PhD, NINDS, NIH

Susan Gauthier, MD, Cornell University

## Program

# Welcome

Dear Colleagues:

Welcome to the 2nd International Workshop on MRI Phase Contrast & Quantitative Susceptibility Mapping (QSM) on the beautiful Cornell University campus in Ithaca, New York.

The workshop venue offers an elegant and relaxed environment that is conducive for scientific exchange and very affordable for everyone including students, junior scientists and senior faculty. The presentations during the day will provide insightful discussion on methods and applications of QSM. The receptions in the evening will provide intimate networking for colleagues from all over the world to form bonds.

Our mission is to provide a forum for all researchers interested in the physics, mathematics and scientific applications of tissue magnetic property MRI. Magnetic susceptibility is a major tissue property that changes with organ function, disease and intervention. Recently there have been a number of breakthroughs in the inverse problem of reconstructing tissue susceptibility for QSM. Subsequently, there has been an exploding interest to study tissue magnetic property and to develop clinical and scientific applications of QSM.

## Major goals of this QSM workshop include:

- To provide scientists from various backgrounds the opportunity to build connections and pool knowledge.
- To catalyze the developments of QSM technology and the translation of QSM into clinical practice.
- To educate students and fellow scientists on topics including basic and advanced biophysics of tissue susceptibility, QSM reconstruction algorithms, and clinical and scientific applications.

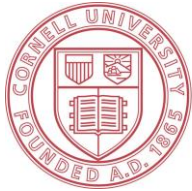
We hope you also plan some extra time to enjoy the gorgeous Finger Lake area that offers awesome vineyards and magnificent lakes and gorges.

Sincerely yours,  
The QSM 2013 Steering Committee

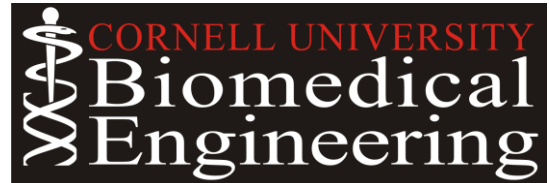
## Sponsors

---

We would like to thank the following organizations for sponsoring the workshop.



Cornell University



NATIONAL INSTITUTE OF  
NEUROLOGICAL  
DISORDERS AND STROKE

National  
Institute  
on Aging



# SIEMENS

## Endorsements

---

We would also like to thank the following organizations for their endorsement of the workshop.



IEEE



ISMRRM

ONE  
COMMUNITY  
FOR CLINICIANS  
AND SCIENTISTS



# **Workshop Information**

## Steering Committee

---

Chair: Yi Wang, PhD, Radiology and Biomedical Engineering, Cornell University

Co-Chair: Mark Haacke, PhD, Radiology and Biomedical Engineering, Wayne State University

Co-Chair: Chunlei Liu, PhD, Radiology and Brain Imaging & Analysis Center, Duke University

Co-Chair: Jürgen Reichenbach, PhD, Medical Physics, University of Jena, Germany

Richard Bowtell, PhD, Physics, University of Nottingham, UK

Karen Tong, MD, Radiology, Loma Linda University

Jeff Duyn, PhD, Neurosciences, NINDS, NIH

Susan Gauthier, MD, Neurology and Neurological Sciences, Cornell University

## Local Organizing Committee

---

Tian Liu, PhD, Editor of Conference Proceedings

Mitchell Cooper, MS, Director of Online Conference Communications

Rebecca Cramer, Editorial Specialist

Robert Blanco, Conference Service Coordinator

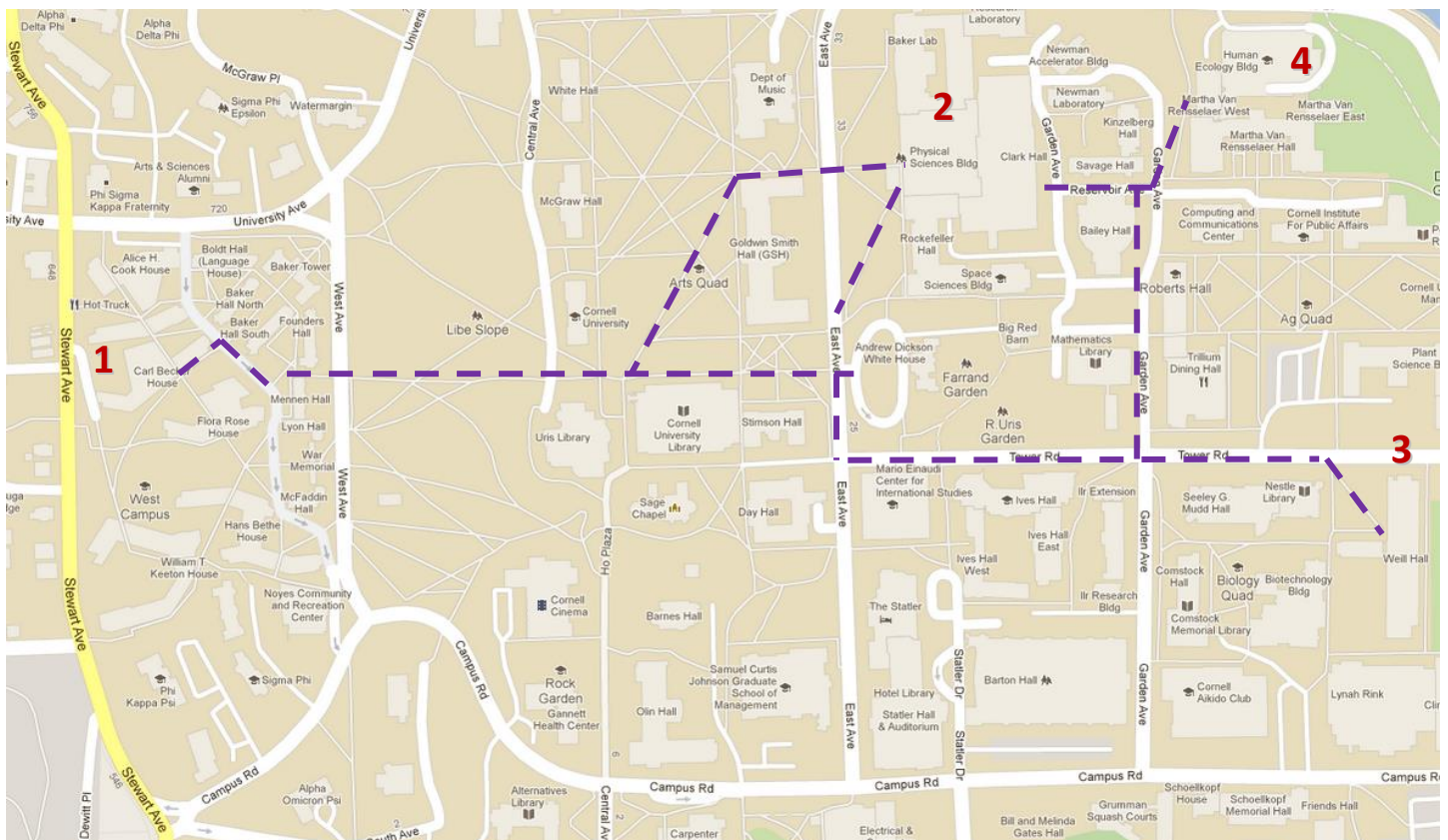
Jackie Creque, Administrative Support

Dawn Esposito, Financial Administrator

# Campus Information

Interactive campus maps can be found online at: <http://www.cornell.edu/maps/> . An overview of the campus with relevant locations is shown below.

1. Carl Becker House (Workshop Housing)
2. Physical Science Building (Workshop Venue)
3. Weill Hall (Opening Cocktail Reception)
4. Human Ecology Building Commons Lounge (Dinner Banquet)



# Conference Venue Information

---

## Venue

Physical Sciences Building

Conference Sessions:	Room 120
<i>Overflow room for conference sessions</i>	Room 401
Poster Viewing:	Baker Portico and Atrium
Speaker Ready Room:	Room 401

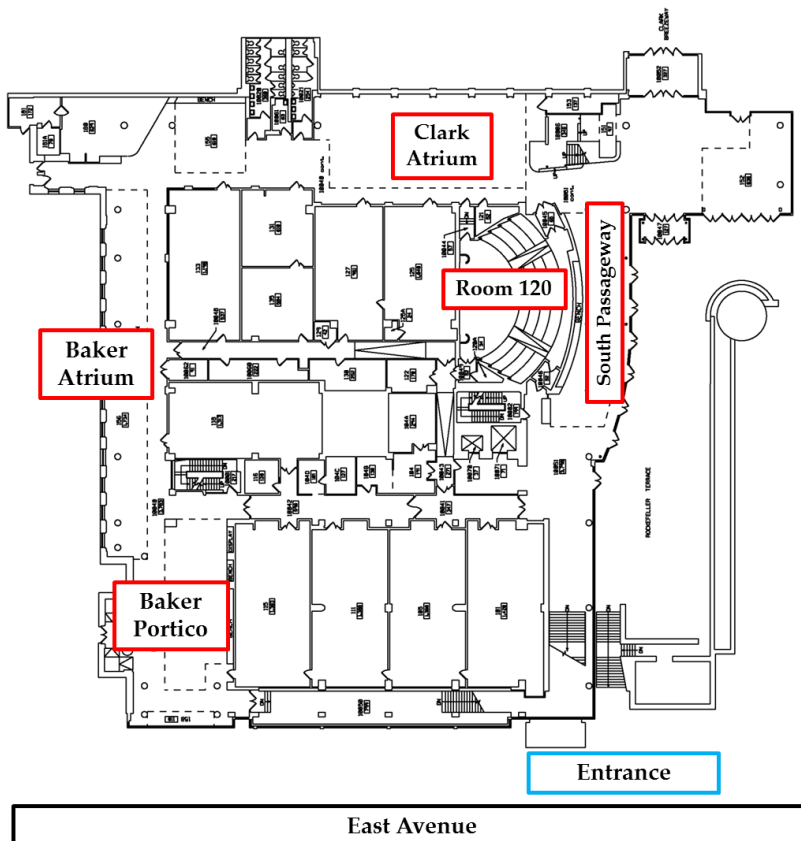
## Breakfast and Lunch

Food will be served in the South Passageway with seating in Clark Atrium. Breakfast will be available before the conference each morning at 7:15 am. Lunch times are marked in the program.

## Wireless Internet

Guest access is available on the Cornell RedRover Wi-Fi network. Look for the RedRover network on your laptop/device and follow the prompts for registering the device. More information is available here:

<http://www.it.cornell.edu/services/redrover/howto/rrguest/index.cfm>





## Housing Check-In

---

Thank you for registering for on-campus housing for the 2nd International Workshop on MRI Phase Contrast & Quantitative Susceptibility Mapping (QSM). Housing will be in Carl Becker House located on Cornell's West Campus. Becker House is an **air conditioned residence hall on campus** and within walking distance of the Physical Sciences Building and other Conference Venues.

Check-in for your housing will be at Carl Becker House. Hours for Carl Becker are as follows:

Date	Open	Close
23-Jul	8am	8pm
24-Jul	8am	11pm
25-Jul	8am	8pm
26-Jul	8am	8pm
27-Jul	8am	2pm
28-Jul	8am	12pm

For arrivals afterhours on-call assistance can be reached by dialing **607-255-7210**.

Upon arrival you will receive a door key and an access card to Carl Becker House.

Parking will be available in the West Avenue and University Avenue lots Zone 11 and Zone 1 respectively. A map can be found at the following link:

[http://transportation.fs.cornell.edu/file/Parkmobile%20Map\\_Phase1-07012013-web.pdf](http://transportation.fs.cornell.edu/file/Parkmobile%20Map_Phase1-07012013-web.pdf)

For information on how to use Cornell's Parkmobile parking system please refer to:

<http://transportation.fs.cornell.edu/parking/campusparking/visitors/parkmobile.cfm>.

If you have any questions, concerns, or need some additional information on travel or accommodations feel free to e-mail me or contact me at the office number below.

Robert Blanco  
607-255-9763

## Conference Check In

---

If you are staying in campus housing, your conference check in will be done at the time you check into housing.

If you are not staying on campus, you can check in for the conference at the Physical Science Building between 7:00 and 9:00 am on Thursday July 25<sup>th</sup>.

## **Presentation Guidelines**

---

### **Invited Talks**

Please prepare a 15 minute PowerPoint presentation. There will be 5 minutes of discussion after the presentation.

Send .ppt files to [qsmconference2013@gmail.com](mailto:qsmconference2013@gmail.com) by 6:00 p.m. the day before your talk.

### **Peer-reviewed posters**

Mount your traditional poster (maximum size: 69 inches (height) x 46 inches (width)) by noon the day of your presentation in the Baker Portico or Baker Atrium (depending on your assigned poster number).

In addition, please send a 1-slide .ppt file to [qsmconference2013@gmail.com](mailto:qsmconference2013@gmail.com) by 6:00 p.m. the day before your poster presentation. This slide will be shown for introduction before your poster viewing session.

# Workshop Program

**All workshop events take place in  
Physical Sciences Building Room 120 unless otherwise noted in the program.**

### **Wednesday, July 24, 2013**

**7:30-9:00pm** Welcome Cocktail Reception (Weill Hall Atrium)

### **Thursday, July 25, 2013**

**7:15** Breakfast (South Passageway/Clark Atrium)

**8:00** Welcome, Prof Yi Wang, Conference Chair  
David J. Skorton, MD, Cornell University President  
Prof David Lee, Nobel Laureate

### **Basic Principles of Susceptibility: Biology, Physics, and QSM** **Chairs: Ferdinand Schweser PhD and Robert Turner PhD**

**8:20** Iron as biomarker for inflammation in MS lesions  
David Pitt, MD

**8:40** Connection between biology and tissue susceptibility  
Jeff Duyn, PhD

**9:00** Physics of susceptibility contrast and data acquisition  
Richard Bowtell, PhD

**9:20** From harmonic functions to field mapping and susceptibility quantification  
Lin Li, PhD

**9:40** Basic steps for doing QSM  
Tian Liu, PhD

**10:00** Coffee and tea break (South Passageway/Clark Atrium)

### **Clinical and Scientific Applications of QSM** **Chairs: Jongho Lee PhD and Karen Tong MD**

**10:20** Susceptibility changes in pediatric brain pathophysiology  
Kristen Yeom, MD

**10:40** Susceptibility and myelin water imaging: Providing a window into the MS lesion  
Susan Gauthier, MD

- 11:00** Susceptibility imaging of cerebral hemorrhage, microbleeds and hypoxia.  
Karen Tong, MD
- 11:20** Iron mapping in Parkinson's disease and neurodegenerations  
Wayne R Martin, MD
- 11:40** Susceptibility of myelin, nerves, and white matter fiber  
Chunlei Liu, PhD
- 12:00** Understanding anisotropic properties of MR signal phase in white matter  
Dmitriy Yablonskiy, PhD
- 12:20** Lunch break (South Passageway/Clark Atrium)\

### **Peer-Reviewed Presentations on QSM Applications**

**Chairs: Jan Sedlacik PhD and Derek Jones PhD**

- 1:20** Introduction of posters (2 minutes each)
- 2:04** Poster viewing and coffee break (Baker Portico and Atrium)

### **Discussion and Debate on Peer-Reviewed Presentations**

**Chairs: Jeff Duyn PhD, Robert Edelman PhD, Susan Gauthier MD, Mark Haacke PhD, Chunlei Liu PhD, Karen Tong MD**

- 3:30** Poster summary by session faculty
- 4:00** Is susceptibility change a cause or effect of diseases?
- 4:30** What are the current clinical applications for QSM?
- 5:00** Board bus in front of Physical Sciences Building for Wagner Vineyards
- 6:00** **Dinner Reception at Wagner Vineyard**

## **Friday, July 26, 2013**

**7:15** Breakfast (South Passageway/Clark Atrium)

### **Quantitative Susceptibility Mapping (QSM)**

**Chairs: Ludovic de Rochefort PhD and Jürgen Reichenbach PhD**

**8:00** Phase processing for QSM  
Ferdinand Schweser, PhD

**8:20** Inversion algorithms: k-space based approaches  
Karin Shmueli, PhD

**8:40** Inversion algorithm: image space based approaches  
Ludovic de Rochefort, PhD

**9:00** Pulse sequence consideration  
Wei Li, PhD

**9:20** Susceptibility tensor imaging  
Cynthia Wisnieff

**9:40** Coffee/Tea Break (South Passageway/Clark Atrium)

### **Frontiers for QSM**

**Chairs: Richard Bowtell PhD and Jeff Duyn PhD**

**10:00** Applications of Short Echo QSM  
Mark Haacke, PhD

**10:20** MRI oximetry for quantifying CMRO<sub>2</sub> and vascular reactivity  
Felix Wehrli, PhD

**10:40** Neuronal connectivity, tractometry and susceptibility  
Derek Jones, PhD

**11:00** Iron metabolism  
James Connor, PhD

**11:20** Human brain atlas for quantitative susceptibility and iron mapping  
Peter van Zijl, PhD

**11:40** Electromagnetic property imaging  
Daniel Sodickson, PhD

**12:00** Lunch break (South Passageway/Clark Atrium)

**Peer-Reviewed Presentations on QSM Techniques**

**Chairs: Sam Wharton PhD and Yi Wang PhD**

**1:00** Introduction of posters (2 minutes each)

**1:52** Poster viewing and coffee break (Baker Portico and Atrium)

**Discussion and Debate on Peer-Reviewed Presentations**

**Chairs: Richard Bowtell PhD, Jürgen Reichenbach PhD, Ludovic de Rochefort PhD, John Schenck MD, Yi Wang PhD, Peter van Zijl PhD**

**3:30** Poster summary by session faculty

**4:00** What have we learned so far about QSM technical developments and applications? How do we standardize QSM methods?

**4:30** What are the unresolved issues and immediate targets of investigation in QSM?

**5:00** Break for day

**6:00** Banquet & Poster Awards at Human Ecology Building Commons Lounge

## **Saturday, July 27, 2013**

**7:15** Breakfast (South Passageway/Clark Atrium)

### **Advanced Mathematical Methods for Reconstructing QSM**

**Chairs: Tian Liu PhD and Jin Keun Seo PhD**

**8:00** Large scale inverse problems in imaging  
Julianne Chung, PhD

**8:20** Optimization Techniques for Quantitative Mapping in MRI  
Ashish Raj, PhD

**8:40** Compressive sensing  
Michael Lustig, PhD

**9:00** Parameter choice for regularization  
Rosemary Renaut, PhD

**9:20** Total generalized variation  
Kristian Bredies, PhD

**9:40** Coffee and tea break (South Passageway/Clark Atrium)

### **Advanced Electromagnetic Mapping and Applications**

**Chairs: Stephen Ropele PhD and Alan Wilman PhD**

**9:50** MRI electric impedance tomography  
Eung Je Woo, PhD

**10:10** Electric property tomography  
Ulrich Katscher, PhD

**10:30** EPT updates  
Jose Marques, PhD

**10:50** CISSCO method for measuring susceptibility  
Norman Cheng, PhD

**11:10** Fiber susceptibility model  
Sam Wharton, PhD



- 11:30** Iron and metallic biochemistry in cellular and animal models  
Michael Garrick, PhD
- 11:50** MS iron  
Robert Zivadinov, PhD
- 12:10** Deep brain stimulation  
Brian Kopell, MD
- 12:30** Summary
- 1:00** **Boxed Lunch (South Passageway/Clark Atrium) and post-meeting activities  
(organize/leave from Physical Sciences Building)**

## Poster Sessions

---

### Thursday, July 25, 2013

1:20-2:03 pm (2 minute PowerPoint introduction of posters in Room 120)

2:04-3:30 pm (Poster viewing and coffee break in Baker Portico and Atrium)

#	Name	Affiliation	Title
1	Takoua Kaaouana	CNRS UMR7225	Discriminating brain microbleeds using phase contrast MRI in a multicentre clinical setting
2	Huan Tan	NorthShore University HealthSystem	Characterizing Cerebral Cavernous Malformation with Quantitative Susceptibility Mapping: A Feasibility Study
3	Wei Liu	NICOE	Can Quantitative Susceptibility Mapping Be Used to Longitudinally Monitor Brain Hemorrhages in Patients with Traumatic Brain Injury
4	R. Ehsan Hamtaei	Wayne State University	3D Model of the Optic Radiation using Susceptibility Weighted Imaging
5	Michael Dayan	Weill Medical College of Cornell University	Structural and functional correlates of the cerebellum as assessed from cerebellar atrophy: a voxel based morphometry and tractography study
6	Huan Tan	NorthShore University HealthSystem	Feasibility of In vivo Quantitative Susceptibility Mapping (QSM) in the Kidneys
7	Till Hühnhagen	Berlin Ultrahigh Field Facility	Toward Probing Myocardial Microstructure Using Susceptibility Sensitized MRI of the Human Heart at 7.0 T: Assessment and Implications of Static Magnetic Field Variations
8	Jon Thacker	Northwestern	R2' and delta_R2'in Kidneys: Evaluation of BOLD based Susceptibility Contrast
9	Ying Dong	Texas A&M University	Brachytherapy Seed Identification Using Susceptibility Mapping
10	Diego Hernando	University of Wisconsin-Madison	Susceptibility-Based Estimation of Liver Iron Concentration Using a Fat-Referenced Approach
11	Jeam Haroldo Oliveira Barbosa	University of Sao Paulo	Are transverse relaxation rates and susceptibility maps equivalent in Parkinson's disease studies?
12	Andrew D. Schweitzer	Weill Medical College of Cornell University	QSM for Characterization of the Motor Cortex in ALS and other Motor Neuron Diseases
13	Hongfu Sun	University of Alberta	Validation of QSM for brain iron mapping in multiple sclerosis using postmortem studies
14	Guochun Fu	Karolinska Institute	Iron Clusters in white matter studied by microscopic MRI and histological methods

15	Ulrike Löbel	University Medical Center Hamburg-Eppendorf	R2* Relaxometry and Quantitative Susceptibility Mapping for the Assessment of Brain Iron Deposits in a Patient With Mitochondrial Membrane Protein-associated Neurodegeneration
16	Avery J.L. Berman	McGill University	The effect of dissolved oxygen on the magnetic susceptibility of blood
17	Audrey P Fan	MIT	Quantitative Oxygenation Venography from MRI Susceptibility
18	Pinar S. Özbay	ETH Zürich	Effects of supplemental oxygen in QSM
19	Dávid Balla	Max Planck Institute	Functional QSM at 9.4T with single echo gradient-echo and EPI acquisition
20	Jingwei Zhang	Weill Medical College of Cornell University	Cerebral Metabolic Rate of Oxygen (CMRO2) Quantitative Mapping Using Quantitative Susceptibility Mapping (QSM)

### Friday, July 26, 2013

1:00-1:51 pm (2 minute PowerPoint introduction of posters in Room 120)

1:52-3:30 pm (Poster viewing and coffee break in Baker Portico and Atrium)

#	Name	Affiliation	Title
21	Saifeng Liu	Wayne State University	Rapid Background Phase Removal using Double-Echo Data
22	Dong Zhou	Weill Medical College of Cornell University	Removal of Background Field Using Relaxation Method
23	Ryan Topfer	University of Alberta	Edge-Extended Harmonic Phase Processing Incorporating Priors
24	Sagar Buch	McMaster University	Susceptibility Mapping of the Sinuses and bones in the Head using Short TE
25	Shuai Wang	University of Electronic Science & Technology of China	Noise Effects In Bayesian Quantitative Susceptibility Mapping Methods
26	Russell Dibb	Duke University	Gd-Enhanced Susceptibility Contrast and Anisotropy in the Three-pool Model of White Matter
27	Rajika Maddage	Ecole Polytechnique Fédérale de Lausanne	Towards in vivo manganese quantification at 14.1T using Susceptibility Mapping
28	Hongchen Wang	Univ Paris-Sud	Precision Limit of Contrast Agent with R2* (Magnitude) and Quantitative Susceptibility Mapping (Phase)
29	Jan Sedlacik	University Medical Center Hamburg-Eppendorf	On the influence of particle size in MR iron quantification

30	Guochun Fu	Karolinska Institute, Zhejiang University, NINDS	Correlations among $R2^*$ , susceptibility, and FA in white matter of the human brain
31	Dmitriy A. Yablonskiy	Washington University, St. Louis	Structural Disorder as a Mechanism of Phase Contrast in Multiple Sclerosis Lesions
32	Se-Hong Oh	University of Pennsylvania	Origin of $B_0$ orientation dependent $R2^*$ ( $=1/T2^*$ ) in white matter: the effects of magnetic susceptibility, magic angle, tissue iron and temperature
33	Jie Luo	Washington University, St. Louis	Magnetic Susceptibility Induced MR Signal Frequency Shift in White Matter - Experimental Comparison Between Lorentzian Sphere and Generalized Lorentzian Approaches
34	Alexander L. Sukstanskii	Washington University, St. Louis	On the role of neuronal magnetic susceptibility and structure symmetry on Gradient Echo MR signal formation
35	Yi Wang	Weill Medical College of Cornell University	Quantitative susceptibility mapping (QSM) forward problem: Proton, electron, Lorentz correction, susceptibility and chemical shift
36	Petra Schmalbrock	The Ohio State University	Consideration of Echo Dependent Center of k-Space Offsets in Phase Preprocessing
37	Zachary Rodgers	University of Pennsylvania	High-temporal-resolution, simultaneous quantification of intravascular blood flow and oxygen saturation with BRISK k-space sampling
38	Dongyeob Han	Yonsei University	Multi-echo QSM using flyback readout gradients with z-shimming
39	Bo Xu	Weill Medical College of Cornell University	Flow Compensated Quantitative Susceptibility Mapping in Vessel Imaging
40	Daeun Kim	University of Pennsylvania	Direct Visualization of Short $T2^*$ Phase (ViSTa Phase)
41	Sung-Min Gho	Yonsei University	Radio Frequency (RF) effects in Quantitative susceptibility mapping (QSM)
42	Carsten Stueber	Max Planck Institute	Simulated and measured $T1$ , $T2^*$ and Quantitative Susceptibility Maps (QSM) of human brain
43	Sung Suk Oh	University of Pennsylvania	An Improved Susceptibility Weighted Imaging Method using Multi-Echo Acquisition
44	Joseph Dagher	The University of Arizona	Robust high resolution MR phase measurement
45	Andreas Deistung	University Jena	Enhancement of Brain Structures by Combining Quantitative Susceptibility Mapping and Relaxometry

## Evening Social Events

---

Details on the evening social events are below:

- July 24, 7:30 – 9:00 pm. Welcome Cocktail Reception in Weill Hall Atrium.
- July 25, 6:00 – 9:00 pm. Offsite dinner reception at Wagner Vineyards. Transportation will leave from the Physical Sciences Building at 5:00 pm.
- July 26, 6:00 – 9:00 pm. Dinner Banquet and Poster Awards in the Human Ecology Commons Lounge.

## Saturday Afternoon Social Events

---

For participants staying until the 27th, we invite you to join us for post-meeting afternoon activities. Capacity for each event is limited due to transportation with the exception of the Cornell campus tour. Priority will be given to those who RSVP'd prior to the event.

- A tour of the Cornell Campus including the Cornell Plantations and Art Museum
- A wine tour of local Finger Lakes wineries
- A hiking tour at a nearby New York State Park

Tours will leave from the Physical Sciences Building at the end of the conference on Saturday.



## **Ithaca Area Information**

---

### **Public Transportation**

Ithaca's public transportation system is called the TCAT. More information on fares and schedules can be found here: <http://www.tcatbus.com/>

### **Taxis**

University Taxi: (607) 277-7777  
Cayuga Taxi: (607) 277-TAXI (8294)  
Yellow Cab Co: (607) 277-CABS (2227)

### **Groceries, Off-campus dining, and ATMS**

The Cornell campus bookstore has a bank inside and some dry goods/food. For more information on the bookstore location and hours: <http://store.cornell.edu/>

The Collegetown area close to campus also has small grocery/convenience stores, ATMS, and various dining options.