

KAMIL UGURBIL

CURRICULUM VITAE

Center for Magnetic Resonance Research
University of Minnesota Medical School
2021 Sixth street SE
Minneapolis, MN 55416

Kamil@cmrr.umn.edu

Education

1971	A.B.	Columbia College, Columbia University (Physics)
1974	M.A.	Columbia University (Chemical Physics)
1976	M. Phil.	Columbia University (Chemical Physics)
1977	Ph.D.	Columbia University (Chemical Physics)

Academic Appointments

2003 - Present	Chair Professor	McKnight Presidential Endowed Chair Professor, University of Minnesota
1991 - Present	Founding Director	Center for Magnetic Resonance Research (CMRR), University of Minnesota
2003 - 2008	Director	Max Planck Institut für Biologische Kybernetik, Hochfeld Magnetresonanz Zentrum, Tübingen, Germany
1996 - 2003	Chair Professor	Margaret & H.O. Peterson Chair of Neuroradiology, University of Minnesota
1985 - present	Professor	Departments of Radiology, Neurosciences, and Medicine, University of Minnesota
1982 - 1985	Associate Professor	Dept. of Biochemistry, University of Minnesota
1979 - 1982	Assistant Professor	Biochemistry Department, Columbia University
1977 - 1979	Postdoctoral Fellow	Bell Laboratories

Honors and Awards

2019	IEEE Medal for Innovations in Healthcare Technology (IEEE=Institute of Electrical and Electronics Engineers)
2018	Haughton Award, ASFNR (American Society of Functional Neuroradiology)
2016	Vehbi Koç Award
2015	Distinguished Fellow, SAGE Center for the Study of the Mind
2014	Richard Ernst Lecture and Gold Medal (ETH, Zürich)
2014	Elected into National Academy of Inventors, USA
2013	Appointed to the fifteen-member BRAIN Initiative (USA) Working group
2013	Erwin Hahn Lecture , Erwin Hahn Institute, Essen, Germany
2013	Elected into the Academy of Device Innovators , University of Minnesota
2011	Honorary Doctorate (Doctorate Honoris Causa), University of Maastricht, Netherlands
2010	Human Connectome Project Award from NIH, Co-Principle Investigator
2010	Centennial Lecture , University of Florida, Gainesville
2010	5th Annual Glen D. Dobben Memorial Lecture , University of Illinois, Chicago
2009	Sir Peter Mansfield Lecture ESMRMB (European Society of Magnetic Resonance in Medicine and Biology)
2009	Elected Fellow of the International Society of Magnetic Resonance (ISMAR). (2009 is the first year ISMAR established ISMAR Fellowship)
2007	Elected into the National Academy of Medicine, USA
2005	Elected into the American Academy of Arts and Sciences

- 2005 **Honorary Doctorate** (Doctorate Honoris Causa), University of Utrecht, Netherlands
- 2004 **Segerfalk Award Lecturer**, University of Lund, Sweden
- 2003 **McKnight Presidential** Endowed Chair Professorship, University of Minnesota
- 2001 **Science Day Lecturer**, Swiss Federal Institute of Technology (EPFL), Lausanne
- 1996 **Margaret & H.O. Peterson Chair** Professorship, University of Minnesota
- 1997 Inducted as **Fellow, International Society of Magnetic Resonance in Medicine (ISMRM)**
- 1996 **Gold Medal** from the International Society of Magnetic Resonance in Medicine
- 1993 **Werner-Gren Distinguished Lecturer**, Karolinska Institute, Stockholm
- 1983 **NIH Research Career Development Award**
- 1980 **Irma T. Hirschl Career Scientist Award**
- 1976 Recipient of **Hammett Award for Original and Distinguished Research**
- 1974 **Columbia University, Graduate Faculties Alumni Scholar**

MEMBERSHIP in NATIONAL ACADEMIES

1. **National Academy of Medicine, USA**
2. **American Academy of Arts and Sciences**
3. **National Academy of Inventors, USA**

Appointments on Advisory and Editorial Boards

- 2017 - Scientific Advisory Board of Neurospin, INSERM-CEA-University Paris Saclay
- 2014 - Advisory Editor, *Neural Computation* Journal
- 2013 - 2014 "BRAIN" Initiative Working Group
- 2012 - 2017 National Institute of Mental Health (NIMH), Board of Scientific Advisors
- 2006 - 2016 European Research Council (ERC), Life Science Panel
- 2000 - 2013 Stanford University MR Center, Palo Alto, California; Advisory Board
- 2001 - 2006 Journal of Neurophysiology; Editorial Board
- 1987 - 2003 NMR in Biomedicine; Journal Editorial Board
- 1997 - 2003 Medical College of Wisconsin, MR Center; Advisory Board
- 1997 - 2002 Max Planck Institute, Leipzig, Germany; Program Review Board (Fachbeirat)
- 1997 - 2000 Scientific Program Committee International Society of Magnetic Resonance Imaging
- 1996 - 1999 Journal of Magnetic Resonance (JMR); Associate Editor
- 1989 - 1994 Biochemical Journal; Journal Editorial Board
- 1988 - 1994 National Magnet Lab, Massachusetts Institute of Technology; Advisory Board
- 1988 - 1991 Trustee of the Society of Magnetic Resonance in Medicine
- 1987 - 1989 Center for Nuclear Imaging Research (CNIR), University of Alabama; Advisory Board

Research Interests

My central research interest is the development and application of ultrahigh field magnetic resonance (MR) methods for neuroimaging, particularly for imaging of brain activity (functional imaging (fMRI)), and combining these methodological and instrumentation developments with neuroscience applications in the human and animal brain to advance our understanding of brain function in health and disease.

My research brings together physics and instrumentation with physiology and neurochemistry to assess cerebral function and underlying structure, physiology and neurochemistry. fMRI was first achieved simultaneously by two independent teams; one was carried out in the laboratory that I lead, the Center for Magnetic Resonance Research (CMRR) at the University of Minnesota, by the team led by me and

my colleague Seiji Ogawa from Bell laboratories. This development has been followed by a large body of seminal work from my laboratory on the mechanisms of coupling between magnetic resonance detected signals and neuronal activity.

An integral part of my research effort includes development of instrumentation and image acquisition methods for ultrahigh field (≥ 7 Tesla) imaging in humans, particularly (but not only) for pushing the boundaries of mapping brain function and connectivity. The development of ultrahigh fields for MRI was pioneered in my group in the context of this aim. The combined effort in untangling the mechanisms operative in fMRI signals and parallel technological and methodological advances for ultrahigh magnetic fields have produced some of the most advanced application of neuroimaging in general and functional brain imaging in particular, and are increasingly used world-wide. This effort also led to the development of instrumentation capable of human imaging above 10 Tesla for the first time- e.g. see https://www.nature.com/articles/d41586-018-07182-7?utm_source=twtr&utm_medium=social&utm_campaign=NGMTnature.

Recently, these advances has been extended to mapping the macro-connectome of the human brain under the auspices of the Human Brain Connectome project launched by the NIH Neuroscience Blueprint initiative, and continued through Human Connectome Project Lifespan project.

Unique Research Funding Awards:

- Principal Investigator of two NIH BRAIN Initiative Awards
- Co-Principal investigator leading the Washington University-University of Minnesota consortium that was awarded the Human Connectome Project, an NIH Neuroscience Blueprint initiative, which aims to map the human brain macro-connectome (<http://humanconnectome.org/>).
- Principal investigator of two Biotechnology Research Center (BTRC) grant from the National Center for Research Resources and subsequently National Institute of Biomedical Imaging and Bioengineering (NIBIB), NIH; one of these grants supported, uninterrupted between 1993-2018, ultrahigh field MR methodology development with particular emphasis on neuroimaging and functional brain imaging. It was subsequently replaced with a new BTRC grant from NIBIB focusing on both ultrahigh field MR and optical methods (<http://www.cmrr.umn.edu/research/>)
- Principal Investigator of one of four NIH Neuroscience Blueprint grants awarded to establish Neuroscience Center Cores.

Research Impact Statistics

h-factor: 110 (Web of Science, 2019)

Sum of Times Cited *without* self-citations: 38,780 (web of Science, 2019)

Citing articles *without* self-citations: 24,488 (web of Science, 2019)

(See details at the end of the CV)

Societies

National Academy of Medicine

American Academy of Arts and Sciences

National Academy of Inventors

International Society of Magnetic Resonance in Medicine

SELECTED CONTRIBUTIONS TO SCIENCE

1. Discovery of Functional Magnetic Resonance Imaging (fMRI). The introduction of fMRI was accomplished in two laboratories independently and simultaneously in 1991-1992, one of which was Ugurbil's at the University of Minnesota. Using manipulations of the physiologic state of the anesthetized animal, such as altering oxygen content of inhaled gas, S. Ogawa from Bell Laboratories described in 1990 the effect of deoxyhemoglobin on MR images of the brain, and named it Blood Oxygenation Dependent (BOLD) contrast. The use of this contrast mechanism for functional mapping of human brain activity was achieved in Ugurbil's laboratory in collaboration with Ogawa. This landmark effort was also accompanied by the first modeling and experimental papers aimed at elucidating the mechanism underlying the functional imaging signals.

- Ogawa S, Tank DW, Menon R, Ellermann JM, Kim SG, Merkle H, **Ugurbil K.** (1992). "Intrinsic signal changes accompanying sensory stimulation: functional brain mapping with magnetic resonance imaging." *Proc Natl Acad Sci U S A* 89(13): 5951-5955. PMID: PMC402116.
- Ogawa S, Menon RS, Tank DW, Kim SG, Merkle H, Ellermann JM, **Ugurbil K.** (1993). "Functional brain mapping by blood oxygenation level-dependent contrast magnetic resonance imaging. A comparison of signal characteristics with a biophysical model." *Biophys J* 64(3): 803-812. PMID: PMC1262394.

2. Development of high and ultrahigh magnetic fields for magnetic resonance imaging and spectroscopy. Motivated primarily by the understanding of the mechanisms underlying functional mapping signals in fMRI and the role played by the static magnetic field strength, a common thread in Ugurbil's work has been the effort to exploit very high magnetic fields for human studies in order to enhance the biological information content, accuracy, and resolution of imaging and spectroscopy signals. Ugurbil laboratory was one of the first three academic laboratories that initiated 4 Tesla (T) human imaging at approximately the same time in ~1990; subsequently, justified by a large body of 4T human data and small animal experiments conducted at 9.4T, Ugurbil and colleagues were the first to introduce 7 Tesla for studies of human brain function in ~1999, using a 7T magnet developed specifically the first time for this effort and with system development and integration undertaken by Ugurbil and colleagues. This seminal effort in ultrahigh magnetic fields was complemented with fundamental studies on the physics of high field/high frequency imaging in the human body, development of high frequency RF methods and instrumentation (such as parallel transmit concepts and hardware), and introduction of new data acquisition methods, to attain some of the most advanced neuroimaging capabilities. The data coming from this 7T system ultimately led to commercially produced 7T systems and to the evolution of such high fields as the most advanced neuroimaging and more recently body imaging platform.

- **Ugurbil K,** Garwood M, Ellermann J, Hendrich K, Hinke R, Hu X, Kim SG, Menon R, Merkle H, Ogawa S, Salmi R. (1993). "Imaging at high magnetic fields: initial experiences at 4 T". *Magn Reson Q* 9, 259-277.
- Vaughan JT, Garwood M, Collins CM, Liu W, DelaBarre L, Adriany G, Andersen P, Merkle H, Goebel R, Smith MB, **Ugurbil K.** (2001). "7T vs. 4T: RF power, homogeneity, and signal-to-noise comparison in head images." *Magn Reson Med* 46, 24-30.
- Adriany G, Van de Moortele PF, Wiesinger F, Moeller S, Strupp JP, Andersen P, Snyder C, Zhang X, Chen W, Pruessmann KP, Boesiger P, Vaughan T, **Ugurbil K.** (2005). "Transmit and receive transmission line arrays for 7 Tesla parallel imaging." *Magn Reson Med* 53, 434-445.
- Van de Moortele PF, Akgun C, Adriany G, Moeller S, Ritter J, Collins CM, Smith MB, Vaughan JT, **Ugurbil K.** (2005). "B(1) destructive interferences and spatial phase patterns at 7T with a head transceiver array coil." *Magn Reson Med* 54, 1503-1518.
- **Ugurbil K.** (2012). "The road to functional imaging and ultrahigh fields". *Neuroimage*;62(2):726-735.

- **Ugurbil K.** (2014). "Magnetic resonance imaging at ultrahigh fields". *IEEE Trans Biomed Eng*;61(5):1364-1379.
- **Ugurbil, K.**, 2017. Imaging at ultrahigh magnetic fields: History, challenges, and solutions. *Neuroimage* DOI: 10.1016/j.neuroimage.2017.07.007.

3. Understanding mechanisms underlying functional mapping signals in fMRI; towards developing high resolution and high accuracy maps of neuronal activity. The ability to obtain functional maps at the level of minimal architectural units that organize neural populations of similar properties is critical for understanding brain function. The cortical columns of neocortex are prominent examples of such structurally and functionally specialized units and have received extensive attention in studies of brain function using electrophysiology, optical imaging, and computational modeling. In addition, the differences in connectivity and cell types across the few millimeter thick cortical ribbon imply that laminar resolution is also critical in deciphering the elementary computations of the brain. However, because fMRI signals reflect neuronal activity indirectly through neurovascular coupling and vasculature, it is not possible to assume *a priori* that functional mapping signals in fMRI have high fidelity to sites of neuronal activity. Subsequent to the introduction of fMRI, Ugurbil's group made seminal and pioneering contributions towards understanding the mechanisms underlying fMRI signals, the spatial scale of neurovascular coupling, and the nature of mapping signal with different functional contrast encoding approaches; this knowledge was then exploited to develop methods (including ultrahigh field MR technology (see below)) for functional mapping at the level of cortical columns and layers in the human brain.

- Duong TQ, Kim DS, **Ugurbil K**, Kim SG. (2001). "Localized cerebral blood flow response at submillimeter columnar resolution." *Proc Natl Acad Sci U S A* 98, 10904-10909. PMID: PMC58572.
- Shmuel A, Yacoub E, Pfeuffer J, Van de Moortele PF, Adriany G, Hu X, **Ugurbil K.** (2002). "Sustained negative BOLD, blood flow and oxygen consumption response and its coupling to the positive response in the human brain." *Neuron* 36, 1195-1210.
- Shmuel A, Yacoub E, Chaimow D, Logothetis NK, **Ugurbil K.** (2007). "Spatio-temporal point-spread function of fMRI signal in human gray matter at 7 Tesla." *Neuroimage* 35, 539-552. PMID: PMC2989431.
- Yacoub E, Harel N, **Ugurbil K.** (2008). "High-field fMRI unveils orientation columns in humans." *Proc Natl Acad Sci U S A* 105, 10607-10612. PMID: PMC2492463.
- Uludag K, Muller-Bierl B, and **Ugurbil K.** (2009). "An Integrative Model for Neuronal Activity-Induced Signal Changes for Gradient and Spin Echo Functional Imaging." *Neuroimage*, 2009. 48(1): p. 150-65.

4. The Human Connectome Project. The Human Connectome Project (HCP) was a major undertaking funded by the sixteen institutes and centers of the National Institutes of Health (NIH) that support the NIH Blueprint for Neuroscience Research. HCP aims to map connections in of the human brain in the mm scale in normal adults in their mid-life. This project was awarded to a consortium led by the Washington University and the University of Minnesota, Center for Magnetic Resonance Research (CMRR) (grant number 1U54MH091657) with David Van Essen from Washington University in St. Louis and Ugurbil serving as co-PIs. Ugurbil's group was responsible for all the technical developments for image acquisition and reconstructions methods. Starting from developments already in progress in Ugurbil group, major advances for image acquisition were accomplished leading to the highest temporal and spatial resolution fMRI and diffusion weighted (dMRI) images of the human brain. These imaging approaches have redefined functional and diffusion weighted imaging. Tom Insel, the head of the NIMH, cited the HCP accomplishments as a major advance in brain sciences (<http://www.nimh.nih.gov/about/director/2015/brain-awareness.shtml>).

- **Ugurbil K**, Xu J, Auerbach EJ, Moeller S, Vu AT, Duarte-Carvajalino, et al. (2013). "Pushing spatial and temporal resolution for functional and diffusion MRI in the Human Connectome Project." *Neuroimage* 80, 80-104.

- Van Essen DC, Smith SM, Barch DM, Behrens TE, Yacoub E, **Ugurbil K**, WU-Minn HCP Consortium. (2013). "The WU-Minn Human Connectome Project: An overview." *Neuroimage* 80, 62-79.
- Smith SM, Miller KL, Moeller S, Xu J, Auerbach EJ, Woolrich MW, Beckmann CF, Jenkinson M, Andersson J, Glasser MF, Van Essen DC, Feinberg DA, Yacoub ES, **Ugurbil K**. (2012). "Temporally-independent functional modes of spontaneous brain activity." *Proc Natl Acad Sci U S A* 109, 3131-3136.
- Xu J, Moeller S, Auerbach EJ, Strupp J, Smith SM, Feinberg DA, Yacoub E, **Ugurbil K**. 2013. "Evaluation of slice accelerations using multiband echo planar imaging at 3 T." *Neuroimage* 83, 991-1001.
- Vu AT, Auerbach E, Lenglet C, Moeller S, Sotiropoulos SN, Jbabdi S, Andersson J, Yacoub E, **Ugurbil K**. "High resolution whole brain diffusion imaging at 7T for the Human Connectome Project". *Neuroimage* 2015;122:318-331.

5. In vivo magnetic resonance spectroscopy and applications to studies in the human brain. One of the first pioneering efforts towards using magnetic resonance to extract biochemical and physiologic information non-invasively in intact biological systems was started in Bell Laboratories Biophysics group where Ugurbil worked after his PhD. In this small group, Ugurbil and colleagues introduced and demonstrated the use of magnetic resonance spectroscopy in intact biological systems. Many years later many of these techniques were used to study bioenergetics of neuronal function in the human brain at ultrahigh magnetic fields in Ugurbil's laboratory in the University of Minnesota. Some publications that exemplify this effort are listed below.

- **Ugurbil K**, Brown TR, den Hollander JA, Glynn P, Shulman RG. (1978). "High-resolution ¹³C nuclear magnetic resonance studies of glucose metabolism in *Escherichia coli*." *Proc Natl Acad Sci U S A* 75, 3742-3746.
- Brown TR, Kincaid BM, **Ugurbil K**. (1982). "NMR chemical shift imaging in three dimensions." *Proc Natl Acad Sci U S A* 79, 3523-3526.
- **Ugurbil K**, Rottenberg H, Glynn P, and Shulman R G. (1982). "Phosphorus-31 nuclear magnetic resonance studies of bioenergetics in wild-type and adenosinetriphosphatase(1-) *Escherichia coli* cells." *Biochemistry* 21(5): 1068-1075.
- Gruetter R, Weisdorf SA, Rajanayagan V, Terpstra M, Merkle H, Truwit CL, Garwood M, Nyberg SL, **Ugurbil K**. (1998). "Resolution improvements in in vivo ¹H NMR spectra with increased magnetic field strength". *J Magn Reson*;135(1):260-264.
- Chen W, Zhu XH, Gruetter R, Seaquist ER, Adriany G, **Ugurbil K**. (2001). "Study of tricarboxylic acid cycle flux changes in human visual cortex during hemifield visual stimulation using (1)H-¹³C MRS and fMRI." *Magn Reson Med* 45, 349-355.
- Mangia S, Tkac I, Gruetter R, Van de Moortele PF, Maraviglia B, **Ugurbil K**. (2007). "Sustained neuronal activation raises oxidative metabolism to a new steady-state level: evidence from ¹H NMR spectroscopy in the human visual cortex." *J Cereb Blood Flow Metab* 27, 1055-1063.

6. Design of novel RF pulses, and MR acquisition sequences. Development of new methods for MR image or spectra acquisitions and radio-frequency (RF) pulse design, and improvements of such methods has been an integral part of Ugurbil's work from the very beginning of his career. Some of the most commonly used methods in the biomedical applications of MR were introduced by Ugurbil and his colleagues and include, for example, chemical shift imaging for spectroscopy; adiabatic "plane-rotation" RF pulses, their optimization, and their use in spatial-spectroscopic encoding; parallel transmit methods for RF pulse design for improved RF homogeneity and power deposition constraint; high contrast anatomical imaging at high magnetic fields; and most notably for recent efforts to study the human brain, the introduction of slice accelerated multiband (MB), simultaneous multislice (SMS) imaging for fMRI and diffusion imaging (for tractography), which has transformed the way studies of human brain connectivity and function is currently performed. Few examples of publications that cover these efforts include:

- Brown TR, Kincaid BM, **Ugurbil K**. (1982). "NMR chemical shift imaging in three dimensions". *Proc Natl Acad Sci U S A*;79(11):3523-3526.

- **Ugurbil K**, Garwood M, Rath A, Bendall MR. (1988). "Amplitude and Frequency/Phase Modulated Refocusing Pulses that Induce Plane Rotations Even in the Presence of Inhomogeneous Fields". *J Magn Reson*;78:472-497.
- Merkle H, Wei H, Garwood M, **Ugurbil K**. (1992). "B1-Insensitive Heteronuclear Adiabatic Polarization Transfer for Signal Enhancement". *J of Magn Reson*;99:480-494.
- Lee JH, Garwood M, Menon R, Adriany G, Andersen P, Truwit CL, **Ugurbil K**. (1995). "High contrast and fast three-dimensional magnetic resonance imaging at high fields". *Magn Reson Med*;34(3):308-312.
- Moeller S, Yacoub E, Olman CA, Auerbach E, Strupp J, Harel N, **Ugurbil K**. (2010). "Multiband multislice GE-EPI at 7 tesla, with 16-fold acceleration using partial parallel imaging with application to high spatial and temporal whole-brain fMRI". *Magn Reson Med*;63(5):1144-1153.
- Auerbach EJ, Xu J, Yacoub E, Moeller S, **Ugurbil K**. (2013). "Multiband accelerated spin-echo echo planar imaging with reduced peak RF power using time-shifted RF pulses". *Magn Reson Med*;69(5):1261-1267.
- Wu X, Schmitter S, Auerbach EJ, Moeller S, **Ugurbil K**, Van de Moortele PF. (2013). "Simultaneous multislice multiband parallel radiofrequency excitation with independent slice-specific transmit B1 homogenization". *Magn Reson Med*;70(3):630-638.

INVITED LECTURES (This list contains invitation up to and including October 2006. Lectures given in 2006-2009 were *not* tracked. A separate list is provided for invited Lectures in 2009 and later)

1. Third Annual Conference on Molecular Structural Methods in Biological Research, Stanford, CA, 1977.
2. Gordon Conference on Biopolymers, Plymouth, NH, 1978.
3. American Physical Society, New York, NY, March 1980.
4. Xth International Conference on Magnetic Resonance in Biological Systems, Stanford, CA, September 1982.
5. Winter meeting of the Norwegian Biochemical Society, January 1984.
6. 1984 Pacific Slope Biochemical Conference, University of California, Santa Cruz, CA, July 1984.
7. Third Annual Scientific Meeting of the Society of Magnetic Resonance in Medicine, New York, NY, August 1984.
8. XI International Conference on Magnetic Resonance in Biological Systems, Goa, India, September 1984.
9. Conference on Cardiovascular Imaging, Bethesda, MD, September 16-18, 1984.
10. Conference on NMR of Living Systems, Stockholm Sweden, December 1984.
11. 5th Annual Scientific Meeting at the Society of Magnetic Resonance in Medicine, Montreal, Canada, August 1986.
12. Conference on *in vivo* NMR Spectroscopy, New York Academy of Sciences, New York, NY, September 1986.
13. Annual Meeting of the American College of Cardiology, March 1987.
14. American Chemical Society Meeting, Chicago, IL, June 1987.
15. Southern Regional NMR Conference, September 1987.
16. Annual Meeting of the American College of Cardiology, March 1988.
17. Annual Meeting Federation of American Societies for Experimental Biology (FASEB), May 1988.
18. US-Italy Cardiovascular Conference, June 1988.
19. Conference on Emerging Technologies for Simultaneous Spatial and Spectral Resolution in *in vivo* NMR, June 1988.
20. Gordon Conference on NMR in Biology and Medicine, 1988.

21. XIII International Conference on Magnetic Resonance in Biological Systems, August 1988.
22. Soc. of Magnetic Resonance in Medicine, Annual Conference, August 1988.
23. International Conference on Magnetic Resonance Spectroscopy and Imaging, Winnipeg, Manitoba, February 1989.
24. AIChE Conference, St. Paul, MN, February 1989.
25. *In Vivo* Magnetic Resonance Workshop, San Francisco, CA, March 1989.
26. Energy and Myocardial Ionic Homeostasis, Baltimore, MD, May 1989.
27. Annual Meeting of the Association of University Radiologists, Seattle, WA, May 1989.
28. Society of Nuclear Medicine Annual Meeting, St. Louis, MI, June 1989.
29. Topical Workshop on Localized NMR Spectroscopy, Max-Planck Institut, Gottingen, FRG, June 1989.
30. American Heart Association Meeting, Santa Fe, NM, July 1989.
31. Physiological Society, Annual Meeting, October 1989.
32. American Chemical Society, Miami, FL, September 1989.
33. Japan NMR meeting, Tokyo, Japan, November 1989.
34. American Chemical Society, Pacific Basin Meeting. Workshop on NMR spectroscopy, Honolulu, HI, December 1989.
35. National Institutes of Health Workshop on Sudden Cardiac Death, September 1990.
36. Society of Magnetic Resonance Imaging, Annual Meeting, Feb. 1990.
37. Workshop on *in vivo* Magnetic Resonance Spectroscopy, San Francisco, CA, March 1990.
38. Workshop on Special Topics in Medical Magnetic Resonance, Whistler, British Columbia, July 1990.
39. Workshop on *in vivo* Magnetic Resonance Spectroscopy, St. Louis, MO, March 1991.
40. Annual Meeting of the International Society for Heart Research, Cincinnati, OH, June 1991.
41. Seeing into Materials; Imaging Complex Structures, Princeton, N.J., May 6-8, 1991.
42. Annual Meeting of the Society of Magnetic Resonance in Medicine, teaching program, San Francisco, CA, August 1992.
43. Southwestern Regional NMR Meeting, Santa Fe, NM, June 1991.
44. Society of Magnetic Resonance in Medicine, 1991 Annual meeting teaching session
45. Living NMR, Bijvoet Symposium, Utrecht, Netherlands, September 1991.
46. NMR in Biology and Medicine, Madrid, Spain, November 1991.
47. Workshop on Cardiovascular NMR, Atlanta, GA, December 1991.
48. In Vivo Spectroscopy Workshop, San Francisco CA, March 1992.
49. ENC Conference, Assilomar, CA, March 30 - April, 1992.
50. Second International Sokolov Conference on Magnetic Resonance Spectroscopy and Imaging, Winnipeg, Manitoba, May 8 - 9, 1992.
51. Princeton Conference, Detroit, MI, May 29 - 30, 1992.
52. High Field Imaging and Spectroscopy, Bethesda MD, June 1992.
53. Society of Magnetic Resonance in Medicine, 1992 annual Conference, Educational Program, Berlin, Germany, August 1992.
54. XV International Conference on Magnetic Resonance in Biological Systems, Jerusalem, Israel August 1992.
55. Conference on Energy Production in Hypertrophied Hearts, Beaune, France, September 9 - 11, 1992.
56. World Conference on Superconductivity, Munich, Germany, September 16 - 18, 1992.
57. Cardiovascular Science and Technology Conference, Bethesda, MD, December 12- 14, 1992.

58. XII Annula Meeting of GERM, (Groupe d'Etude en Resonance Magnetique), Gien, Toulon, France, Mach 28 - April 2, 1993.
59. Annual Meeting of the American Society of Neuroradiology, Vancouver, May 13-20, 1993.
60. 40th Annual Meeting of the Society of Nuclear Medicine, Categorical Seminar Course, Toronto, Canada, June 7, 1993.
61. Workshop on Functional Imaging, June 17-20, 1993.
62. Science Innovation' 93, Boston, MA, August 6-10, 1993.
63. Society of Magnetic Resonance in Medicine, 1993 annual Conference, Educational Program, New York, NY, August 1993.
64. 2nd International Conference on Magnetic Resonance Microscopy (The Heidelberg Conference), Heidelberg, Germany, September 6-9, 1993.
65. Conference on Brain Plasticity. Dana Point, CA, October 27-29, 1993.
66. 1st Midwest Course on Functional Magnetic Resonance Imaging Milwaukee, WI, November 6, 1993.
67. 9th TMIN Symposium, "New Horizon's in Neuropsychology", Tokyo, Japan, November 24 - 25, 1993.
68. Annual Meeting of the American Association for the Advancement of Science, San Francisco, CA, February 18 - 23, 1994.
69. 38th Annual Meeting of the Biophysical Society, New Orleans, LA, March 6 - 10, 1994.
70. 19th Princeton Conference, Boston, MA, March 18-20, 1994.
71. Functional MRI Workshop, Amsterdam, The Netherlands, April 13 - 14, 1994.
72. 42nd Meeting of the AUR, Boston, MA, May 3 - 8, 1994.
73. 77th Canadian Society for Chemistry- Conference and Exhibition "Biomedical NMR Spectroscopy", Winnipeg, Canada, May 29 - June 2, 1994.
74. XIX CINP Congress, "Symposium on Neuroimaging in Children and Adolescents", Washington, D.C., June 27 - July 1, 1994.
75. Symposium "Neuroscience 1994 Finland", Kuopio, Finland, June 17 - 18, 1994.
76. Society of Magnetic Resonance, 1994 annual Conference, Educational Program, San Francisco, CA, August 6-12, 1994.
77. Society of Magnetic Resonance, 1994 annual Conference, Main Program (Plenary Talk), San Francisco, CA, August 6-12, 1994.
78. XVIth International Conference on Magnetic Resonance in Biological Systems. Amsterdam, August 14-19, 1994.
79. Workshop on Magnetic Resonance Techniques and Epilepsy Research, October 6-8, 1994.
80. The Use of Functional MRI for Studies of Brain Development and Developmental Psychopathology, MacArthur Foundation Chicago, IL, November 1994.
81. Salk Institute McDonnell-Pew Center for Cognitive Neuroscience, Planning meeting for fMRI, October 26, 1995.
82. Functional Magnetic Resonance Imaging Workshop, University of Wisconsin, Madison, WI, November 5, 1994.
83. European Congress of Radiology, Vienna, Austria, March 5-9, 1995.
84. Advances in Physiological Chemistry by In Vivo NMR, Woods Hole, Massachusetts, March 22-24, 1995.
85. 82nd Annual Assembly of the Swiss Society of Medical Radiology- 100th year of Rontgen Celebrations. Zurich, Switzerland, August 13 - 18, 1995.
86. International Society for Magnetic Resonance (ISMR)- 1995 Annual Meeting. Sydney, Australia, July 16 - 22, 1995.

87. Federation of European Biological Societies (FASEB), Annual Meeting, Basel, Switzerland, August 24 -29, 1995.
88. Radiological Society of North America, Chicago, IL, November 30, 1995.
89. XIth Conference The Bio-clinical Interface "Recent Advances in Psychiatry" Rouffach, France, September 20 -22, 1995.
90. 4th Annual Bristol-Myers Squibb Symposium on Cardiovascular Research "Animal Models of Cardiac Dysfunction", Minneapolis, MN, September 28 - 29, 1995.
91. 10th International Tokyo Institute of Psychiatry Symposium "Visualization of Information Processing in the Human Brain" Recent Advances in MEG and Functional MRI" Tokyo, Japan, October 12 - 13, 1995.
92. The American Physical Society, Fall meeting of the Division of Nuclear Physics, Bloomington, IN, October 25 -28, 1995.
93. 3rd Conference on the Application of Magnetic Resonance to the Cardiovascular System, sponsored by the American Heart Association San Francisco, CA, January 13 - 17, 1996.
94. Fourth Scientific Meeting and Exhibition of the International Society of Magnetic Resonance in Medicine, April 27 - May 3, 1996.
95. XIIth International Biophysics Congress, Amsterdam, The Netherlands, August 11 -16, 1996.
96. XVIIth International Conference on Magnetic Resonance in Biological Systems, Keystone, CO, August 18 -23, 1996.
97. 22nd European Congress of Neuroradiology and VI Advanced Course, Milan, Italy ,September 17-21, 1996.
98. Garmisch Meeting, Garmisch, Germany, January 22 - 26, 1997.
99. Minnesota Highfield Workshops, University of Minnesota, March 7 -10, 1997.
100. 7th Chianti Workshop on Magnetic Resonance, San Miniato, Italy, May 25 -31, 1997.
101. 24th Congress, Scandinavian Society of Anesthesiologists, Stockholm, Sweden, June 10-13, 1997.
102. IMA Workshop - Statistics in the Health Science, University of Minnesota, July 14-18, 1997.
103. Analysis of Neural Data, Marine Biological Labs, Woods Hole, MA, August 18-22, 1997.
104. XII Biological Psychiatry Meeting, Rouffach, France, September 24-26, 1997.
105. Perfusion Imaging Workshop, Bethesda, MD, October 20, 1997.
106. Digital Summit, Minneapolis, MN, October 22, 1997.
107. ISMRM Fast MRI Workshop: Methodological Perspectives and Advances in Cardiac, Neuro, Angiography and Abdominal Imaging, Asilomar Conference Center, Monterey, CA, October 27-29, 1997.
108. High Field NMR: A New Millennium Resource, Washington, DC, January 15-16, 1998.
109. The 4th AHA, 1st SCMR Conference on MR of the Cardiovascular System, Atlanta, GA, January 30-February 1, 1998.
110. Massachusetts General Hospital MRI Conference, Kauai, Hawaii, February 16-21, 1998.
111. Bioengineering Research: Building the Future of Biology and Medicine, Washington, DC, February 27-28, 1998.
112. McDonnell Foundation Workshop: Cerebral Metabolism and Human Cognition: New Approaches to Functional Neuroenergetics, St. Louis, MO, May 20-21, 1998.
113. Conference: Functional Mapping of the Human Brain, Montreal, Canada, June 8 - 10, 1998.
114. Enrico Fermi School of Physics in Lake Como; Magnetic Resonance Investigation of the Brain Milan, Italy, June 28 - June 3, 1998.
115. 29th AMPERE –13th ISMAR Joint Conference on Related Phenomena; Berlin, Germany, August 2-7, 1998.
116. First International Conference on Functional Brain Imaging in Neurology and Psychiatry; Athens, Greece, September 12-15, 1998.

117. Mayo Clinic and University of Minnesota Joint Symposium on Neuroscience, Rochester, MN, March 5, 1999.
118. MCP Hahnemann University Research Day, Drexel University, Philadelphia, PA, May 5-6, 1999.
119. International Society for Magnetic Resonance In Medicine, Philadelphia, PA, May 23-28, 1999.
120. 5th International Conference on Functional Mapping of the Human Brain, Dusseldorf, Germany, June 23-26, 1999.
121. Workshop Spectroscopy, Microscopy & fMRI Applications, Vienna, Austria, July 2-4, 1999.
122. Brain Imaging Symposium-IBRO Jerusalem, Israel, July 11-15, 1999.
123. Lauterbur Symposium, Chicago, IL, September 17-18, 1999.
124. NCI Imaging 2020 Conference Caltech, September 26-30, 1999.
125. Cognitive Neuroscience, Institute of Neurology, Wellcome Department of Cognitive Neurology, London, February 15-18, 2000.
126. International Society for Magnetic Resonance In Medicine, Denver, CO, April 2-7, 2000.
127. Experimental NMR Conference (ENC) Asilomar, CA, April 10-13, 2000.
128. Biomedical Information Engineering Workshop Istanbul, Turkey, June 24-28, 2000.
129. Satellite Meeting on Diagnostic NMR, Siena, Italy, August 15-19, 2000.
130. XIX International Conference on Magnetic Resonance in Biological Systems, Florence, Italy, August 20-25, 2000.
131. Autumn School in Cognitive Neuroscience, Oxford, England, September 26-29, 2000.
132. HFSP 11th Workshop: New Approaches and Emerging Concepts in Functional Neuroenergetics, Strasbourg, Germany, October 10-12, 2000.
133. Workshop on "Understanding the BOLD Phenomena and its Applications", Chapel Hill, NC, October 26-28, 2000.
134. International Society of Magnetic Resonance in Medicine, Glasgow, Scotland, April 21-27, 2001.
135. 9th Chianti Workshop, San Miniato, Italy, May 26-June 1, 2001.
136. Organization of Human Brain Mapping, Brighton, England, June 9-14, 2001.
137. Magnet Technology Conference, Geneva, Switzerland, September 24-28, 2001.
138. GDCh Jahrestagung Chemie 2001, Wursburg, Germany, September 25-27, 2001.
139. NIMH/NIH Workshop, Laguna Beach, CA, January 9-11, 2002.
140. 43rd ENC Meeting, Asilomar, CA, April 14-19, 2002.
141. Athens Brain Conference, Athens, Greece, May 8-12, 2002.
142. McGovern Institute Symposium, MIT, Boston, MA, May 13-14, 2002.
143. International Society for Magnetic Resonance in Medicine, Honolulu, HI, May 18-24, 2002.
144. 16th European Experimental NMR Conference, Prague, Czech Republic, June 9-14, 2002.
145. Office of National Drug Control Policy Demand Reduction Technology Symposium, Cambridge, MA, July 8-10, 2002.
146. European Society for Magnetic Resonance in Medicine and Biology 2002, Cannes, France, August 22-25, 2002.
147. Gordon Research Conference, New London, NY, July 28-August 2, 2002.
148. Brainstorm 2002: The Future of Neuroimaging, Athens, Greece, September 19-21, 2002.
149. International Symposium on Highfield MRI in Clinical Applications, Bonn, Germany, October 11-12, 2002.
150. Institute of Electrical and Electronics Engineers-Engineering in Medicine and Biology Meeting, Houston, TX, October 23-26, 2002.
151. Inaugural Functional Neuroimaging Symposium, Birmingham, AL, November 8-9, 2002.
152. First Eastern Mediterranean Congress of Magnetic Resonance Imaging & Second National Congress of Magnetic Resonance Imaging, Izmir, Turkey, December 12-14, 2002.

153. Institute of Electrical and Electronics Engineers-Engineering in Medicine and Biology Conference, Capri, Italy, March 20-22, 2003.
154. 44th Experimental Nuclear Magnetic Resonance Conference, Savannah, GA, March 30-April 4, 2003.
155. 9th International Congress on Schizophrenia Research, Colorado Springs, CO, April 1-2, 2003.
156. New NMR Strategies for Brain, Erice, Sicily, April 4-10, 2003.
157. University of Florida, Gainesville, FL, April 21-22, 2003.
158. Dartmouth, Hanover, NH, May 18-20, 2003.
159. Japan - Seiji Ogawa Symposium, May 20-25, 2003.
160. Symposium in Honor of Robert Shulman, New Haven, CT, June 17, 2003.
161. VISN Meeting, San Antonio, TX, July 11, 2003.
162. International Society for Magnetic Resonance in Medicine Eleventh Scientific Meeting and Exhibition, Toronto, Ontario, May 10-16, 2003.
163. 19th International Congress of Biochemistry & Molecular Biology, Toronto, Canada, July 20-24, 2003.
164. Society for Clinical Neurophysiology Annual Meeting, Freiburg, Germany, October 8-12, 2003.
165. Mini High-field Workshop, November 6-7, 2003.
166. 2nd International Conf on Chemistry and its Applications, Doha, Qatar, December 6-9, 2003.
167. Creative Concepts Conference, Vail, CO, December 11-14, 2003.
168. NMR: A Tool for Biology VI, Pasteur, France, February 2-4, 2004.
169. Biophysical Society, Annual Meeting, Baltimore, MD, February 14-18, 2004.
170. 3rd Annual Design of Medical Devices Conference, Minneapolis, MN, April 9, 2004.
171. Jornada Paulista de Radiologia Conference, Sao Paulo City, Brazil, April 21-24, 2004.
172. Segerfalk Lecture and Symposium, Lund, Sweden, May 6-8, 2004.
173. International Society for Magnetic Resonance in Medicine Twelfth Scientific Meeting and Exhibition, Kyoto, Japan, May 15-21, 2004.
174. Gordon Conference, Colby College, ME, August 8-13, 2004.
175. MIND Institute Meeting, Santa Fe, NM, October 7-10, 2004.
176. Headache Mediterranean Summer School, Santorini, Greece, October 9-12, 2004.
177. International Society of Magnetic Resonance Conference, Ponte Verda Beach, FL, October 24-28, 2004.
178. Frontiers of BioMedical Imaging Symposium, Chicago, IL, November 8-10, 2004.
179. Wissenschaftliches Symposium, Heidelberg, Germany, November 20, 2004.
180. Annual Meeting of Psychiatric Association of Turkey, 9th Annual Spring Symposium, Antalya, Turkey, April 13-17, 2005.
181. International Society for Magnetic Resonance in Medicine 13th Scientific Meeting and Exhibition, South Beach Miami, FL, May 5-13, 2005.
182. Gordon Conference on Magnetic Resonance, New London, CT, June 5-10, 2005.
183. Ultrahigh Magnetic Field MRI Symposium, Tokyo, Japan, October 1-3, 2005.
184. 2005 Minerva-Gentner Symposium, A Dive into Magnetic Resonance, Eilat, Israel, December 11-13, 2005.
185. DFG Excellence Academy for Medical Technology, Munich, Germany, February 13-18, 2006.
186. Biomedical Magnetic Resonance Imaging and Spectroscopy at Very High Fields, Würzburg, Germany, February 16-18, 2006.
187. Ten Years of 3 Tesla- What is Next?, Berlin, Germany, February 20-21, 2006.
188. 31st FEBS Congress, Istanbul, Turkey, June 24-29, 2006.
189. Gordon Conference on In Vivo Magnetic Resonance, Mt Holyoke College, South Hadley, MA, July

23-26, 2006.

190. AFAR-NYAS Conf on Imaging the Aging Brain, New York, NY, May 16-17, 2006.
191. High Field Cardiovascular MR Workshop Sponsored by NIH, Washington, DC, September 21-22, 2006.
192. Horizons of NMR Based Research at the beginning of 21th Century, Ulm, Germany, October 13, 2006

INVITED LECTURES (2009 to latest update (20 Oct 2016))

1. International Society of Magnetic resonance in Medicine. April 21, 2009; Honolulu, Hawaii
2. Human Brain Mapping (HBM) 2009: Keynote Lecture; San Francisco, USA. June 22, 2009
3. ESMRMB. Sir Peter Mansfield Lecture; Antalya, Turkey. October 1, 2009
4. EMBS. Keynote Lecture; September 4, 2009
5. Siemens 7T User Meeting LEIPZIG. September 13, 2009, Leipzig, Germany
6. Extremely High field MRI Workshop; Soul, South Korea for November 6, 2009
7. fMRI symposium: Institute of Neurobiology Queretaro (Mexico); November 18, 2009
8. University College LONDON; February 4, 2010, London, UK
9. OXFORD University; February 5, 2010, Oxford, UK
10. University of Florida Centennial Lecture; March 9, 2010
11. Montreal Neurological Institute; April 9, 2010, Montreal, Canada
12. Berlin, MR Symposium, Max Delbrueck Center; April 16, 2010 to April 17, 2010, Berlin, Germany
13. 51st ENC, Keynote Lecture; April 22, 2010. Daytona Beach, Florida
14. Copenhagen Ultrahigh field workshop; May 9, 2010
15. Biomedical Imaging Workshop. May 24, 2010, Minneapolis, MN
16. Chemistry-Biology Symposium at University of Minnesota, May 26, 2010
17. Human Brain Mapping (HBM) 2010: Advanced fMRI Course; June 6, 2010, Barcelona
18. World Wide Magnetic Resonance Conference July 4, 2010 to July 9, 2010; Florence, Italy
19. 5th Annual Glen D. Dobben Memorial Lecture, University of Illinois, Chicago
20. Duke University, Center for Molecular and Biological Imaging Symposium on Data Visualization, 12 December 2010
21. Lecture as Recipient of Honorary Doctorate from University of Maastricht; January 20, 2011, Maastricht, Netherlands
22. ASFNR Annual Meeting. Keynote Lecture, 4 March 2011
23. Gairdner Foundation. Hotchkiss Brain Institute Symposium, March 17, 2011, Calgary
24. UltraHighField (UHF) MR symposium, 24 June 2011, Berlin, Germany,
25. Stanford University, Department of Psychology, March 9, 2011
26. Keynote Lecture, International Conference on Medical Physics (ICMP), 17-20 April, 2011, Porto Alegre, Brazil
27. Cold Spring Harbor Laboratory (CSHL), Workshop on Circuits and Connectivity in the Vertebrate Brain, July 17, 2011, Cold Spring Harbor
28. Fifth Workshop of CInAPCe Neurosciences Research Network, 9-13 August 2011; São Paulo, Brazil
29. National Institutes of Health, Seminar. 17 August 2011. Bethesda, Maryland

30. 33rd Annual International Conference of the IEEE Engineering in Medicine and Biology (EMBC) Society, 1 Sept 2011, Boston
31. ISMRM Workshop on Mapping Functional Networks for Brain Surgery, 6-9 Sept 2011, Milan, Italy
32. Frontiers in Biomedical NMR Symposium 27 Oct 2011; Tel Aviv, Israel
33. 8th Annual Memphis Bioluminescence Imaging Symposium, 3-4 Nov 2011, Memphis, Tennessee
34. 13th National Medical Physics Congress, 17-19 Nov 2011; Çesme, Turkey
35. Lecture at The Institute for Therapeutics Discovery and Development, February 3, 2012
36. Workshop on Cerebrovascular Organization, 18-22 February 2012; Orlando, Florida
37. 3rd UltraHigh Field Magnetic Resonance symposium, Berlin B.U.F.F. 8 June 2012, Berlin Germany
38. 3rd Biennial Resting State Meeting, 5-8 Sept. 2012; Magdeburg, Germany. Plenary Lecture
39. World Congress on Medical Physics and Biomedical Engineering (WC2012), 26-31 May 2012, Peking, China. Plenary Lecture
40. Plenary Lecture ICMRBS (International Conference on Magnetic Resonance in Biological Systems), August 19-24, 2012, Lyon France
41. Lecture, ETH (Eidgenössische Technische Hochschule), Opening Symposium for the "Bruker-Richard R. Ernst Center of Excellence in Magnetic Resonance", September 18, 2012
42. Imaging in 2020 Conference, September 30 - Oct 4, 2012, Jackson Hole, Wyoming
43. Society of Neuroscience 2012 Annual Meeting (SfN, 2012), 13-17 October 2012, New Orleans
44. Lecture, Georgia Institute of Technology/Emory University, 11 December 2012
45. Plenary Lecture, Symposium to Celebrate Twenty years of fMRI, January 12-13, 2012
46. Opening Plenary Lecture, SCMR (Society of Cardiovascular Magnetic Resonance) 2013 Annual Meeting, February 1- 5, 2013
47. Stanford University Radiology Grand Rounds, February 5, 2013
48. ISMRM Ultra High Field Workshop, Amsterdam, Netherlands, March 2, 2013
49. Symposium in Brain Imaging in Nijmegen, Netherlands, March 6, 2013
50. International Society of Magnetic Resonance (ISMRM) 2013 Annual Meeting, 20-26 April 2013, Salt Lake City. Plenary Lecture on Human Connectome.
51. Cardiac MR Sunrise Course, ISMRM 2013 Salt Lake City, April 25, 2013
52. Lecture UCLA, May 2, 2013
53. International Society for Magnetic Resonance (ISMRM) 2013-18th Triennial Conference May 19-24 May 2013 Rio de Janeiro, Brazil. Plenary Lecture
54. Brain Dynamics Workshop Institute of Theoretical Applied Physics (ITAP), July 1, 2013 to July 4, 2013
55. Lecture, University of Iowa, September 12, 2013
56. Lecture for NIH Council of Councils, October 24, Bethesda, Maryland
57. Erwin Hahn Lecture, Erwin Hahn Institute, Essen Germany, Sept. 19, 2013
58. David Van Essen Symposium, October 14, 2013
59. 4th Siemens UHF User Meeting,, Nov 15-16, Vienna, Austria
60. Lecture, Duke University, November 26, 2013
61. Key Note: American Society for Functional Neuro-Radiology (ASFNR) Feb 17, 2014, Miami, Florida

62. Neuroscience Seminar at Stanford University. Feb 6, 2014, Stanford University, Palo Alto California
63. NIH P41 Director's Meeting, Mar 24, 2014, Washington DC
64. UT Southwestern Symposium on Imaging Brain Injury. May 1, 2014, Dallas, Texas
65. MR Center Opening Symposium Maastricht. May 19, 2014, Maastricht, Netherlands
66. Richard Ernst Medal Lecture, May 20, 2014, Zurich, Switzerland
67. Lecture, Sabancı University, İstanbul., May 28, 2014, Istanbul, Turkey
68. Neuroscience Congress, Istanbul. May 29, 2014, Istanbul, Turkey
69. Keynote Joint Turkish-German Symposium on Human Neuroscience Jun 5, 2014, Berlin, Germany
70. Berlin Ultrahigh Field Facility (BUFF) Ultra High Field SYMPOSIUM. Jun 20, 2014, Berlin Germany
71. Plenary Lecture: International Congress of Clinical Chemistry and Laboratory, Jun 22, 2014 to Jun 26, 2014, Istanbul, Turkey
72. Grand Rounds – UCSF Memory and Aging Center UCSF, Aug 8, 2014, San Francisco, CA 94158
73. 4th Biennial Resting-State Brain Connectivity Conference at MIT. Sep 11, 2014, MIT, Cambridge Massachusetts
74. Lecture at NIH, on Human Connectome Project, Sept 24, 2014, Bethesda Maryland
75. GE Global Research Whitney Symposium. Oct 20, 2014, Niskayuna, NY 12309
76. Seminar: CORNELL NYC. Oct 30, 2014, New York, NY
77. Mini Medical School. University of Minnesota, Oct 27, 2014
78. Seminar, UT Health Science Center, San Antonio, Nov 21, 2014
79. University of California Santa Barbara, Feb 23, 2015, and Mar 02, 2015; Santa Barbara, California
80. International Congress on Schizophrenia Research: Mar 30, 2015 to Mar 31, 2015. Colorado Springs CO
81. Weizmann Institute May 3, 2015, Rehovot Israel
82. High-resolution MRI meeting in Salerno, May 7, 2015 to May 9, 2015, Salerno Italy
83. CSH-Asia meeting on International Brain Project, June 19-22, 2015, Shanghai, China
84. Ultra High Field MRI Meeting BERLIN-BUCH, Jun 26, 2015, Berlin Germany
85. Lecture at UCLA, Aug 10, 2015
86. IEEE Milano, Annual Meeting, Keynote, Aug 25, 2015 to Aug 27, 2015, Milano Italy
87. Ultra-high field MRI: Transition to Human 7T in Finland. Oct 8, 2015 to Oct 9, 2015, Helsinki Finland
88. Columbia Chemistry Department Colloquium, Oct 22, 2015, New York NY
89. Brain Sciences Annual lecture, University of Minnesota, Dec 18, 2015 Minneapolis, MN
90. NeuroScience Colloquium, University of Minnesota, Dec 2, 2015, Minneapolis, Minnesota
91. Royal Society meeting on fMRI: Interpretation of BOLD; a dialogue between cognitive and cellular neuroscience, Jan 28, 2016 to Jan 29, 2016, Royal Society Chicheley Hall, London
92. UltraHighField MRI ISMRM workshop, Mar 6, 2016 to Mar 9, 2016, Heidelberg Germany
93. 2016 Keystone Symposia on The Brain. Alpbach Austria, May 22, 2016 to May 27, 2016,

Alpbach, Austria

94. The BRAIN FORUM, May 26, 2016 to May 27, 2016, Lausanne Switzerland
95. Plenary FEBS 2016. Sep 3, 2016 to Sep 8, 2016, Kuşadası
96. Keynote MICCAI 2016, Oct 17, 2016 to Oct 21, 2016, Athens Greece

PEER REVIEWED PUBLICATIONS:

1. Studies of Individual Carbon Sites of Azurin from *Pseudomonas aeruginosa* by Natural Abundance Carbon-13 Nuclear Magnetic Resonance Spectroscopy. K Ugurbil, RS Norton, A Allerhand and R Bersohn. *Biochemistry* . 16: 86-894, 1977.
2. Nuclear Magnetic Resonance Study of Exchangeable and Non-Exchangeable Protons in Azurin from *Pseudomonas aeruginosa*. K Ugurbil, and R Bersohn. *Biochemistry*. 16: 3016-3023, 1977.
3. Study of the Triplet State Properties of Tyrosines and Tryptophan in Azurins using Optically Detected Magnetic Resonance. K Ugurbil, AH Maki, and R Bersohn (1977) *Biochemistry* . 16: 901-902, 1977.
4. Tyrosine Emission in the Tryptophanless Azurin from *Pseudomonas fluorescence*. K Ugurbil and R Bersohn. *Biochemistry* . 16: 895-900, 1977.
5. Nuclear Magnetic Resonance and Chemical Modification Studies of Bovine Erythrocyte Superoxide Dismutase: Evidence for Zinc Promoted Organization of the Active Site Structure. SJ Lippard, AR Burger, K Ugurbil, MW Pantaliano and JS Valentine. *Biochemistry* . 16: 1136-1141, 1977.
6. Physical and Chemical Studies of Bovine Erythrocyte Super Oxide Dismutase. SJ Lippard, AR Burger, K Ugurbil, JS Valentine and MW Pantaliano (1977) *Advances in Chemistry* Series No. 162, ed. K.N. Raymond, p. 251, (Book Chapter).
7. Nuclear Magnetic Resonance Measurements of ATPase Kinetics in Aerobic *E. coli* Cells. TR Brown, K Ugurbil and RG Shulman (1977) *Proc. Natl. Acad. Sci.*. 74: 5551-5553, 1977.
8. *In vivo* ³¹P NMR Studies of Bacterial and Mammalian Cells. RG Shulman, G Navon, S Ogawa, T Yamane, P Glynn, TR Brown, K Ugurbil and H Rottenberg. Proc. of Conference, University of Missouri (1977), (Book Chapter).
9. ³¹P High Resolution NMR Studies of Bioenergetics in *E. coli*. RG Shulman, G Navon, S Ogawa, T Yamane, TR Brown, K Ugurbil, P Glynn and H Rottenberg. Proc. of Conference, Spetsai, Greece (1977), (Book Chapter).
10. ³¹P NMR Study of Bioenergetics and Glycolysis in Anaerobic *E. coli* Cells. K Ugurbil, RG Shulman, H Rottenberg and P Glynn. *Proc. Natl. Acad. Sci. USA*. 75: 2244-2248, 1978.
11. High Resolution ³¹P and ¹³C Magnetic Resonance Studies of Glucose Metabolism in *E. coli*. K Ugurbil, TR Brown, JA den Hollander, P Glynn and R. Shulman. *Proc. Natl. Acad. Sci. USA* . 75: 3742-3746, 1978.
12. Adenine Nucleotide Storage and Secretion in Platelets as Studied by ³¹P Nuclear Magnetic Resonance. K Ugurbil, H Holmsen and RG Shulman. *Proc. Natl. Acad. Sci. USA* . 76: 2227-2231, 1979.
13. High Resolution ³¹P and ¹³C NMR Studies of *E. coli* *In Vivo*. K Ugurbil, RG Shulman and TR Brown (1979) In: Magnetic Resonance in Biology, p. 537-589, editor RG Shulman, Academic Press, New York, N.Y., (Book Chapter).
14. Cellular Applications of ³¹P and ¹³C Nuclear Magnetic Resonance. RG Shulman, TR Brown, K Ugurbil, S Ogawa, SM Cohen and JA den Hollander. *Science*. 205: 160-166. 1979.

15. ^{13}C Nuclear Magnetic Resonance Studies of Anaerobic Glycolysis in Suspensions of Yeast Cells. JA den Hollander, TR Brown, K Ugurbil and RG Shulman. *Proc. Natl. Acad. Sci. USA*. 76: 6096-6100, 1979.
16. Phosphorus-31 Nuclear Magnetic Resonance Studies of the Effect of Oxygen upon Glycolysis in Yeast. JA den Hollander, K Ugurbil, TR Brown and RG Shulman. *Biochemistry*. 20: 5871-5880, 1981.
17. Nucleotide Compartmentation: Radioisotopic and Nuclear Magnetic Resonance Studies. K Ugurbil and H Holmsen (1981) In: Platelets in Biology and Pathology-2, p. 147-177. Ed. JL Gordon, Elsevier, North Holland, Amsterdam, (*Book Chapter*).
18. NMR Studies of Intracellular pH and Phosphate Metabolism During Cell Cycle of *Saccharomyces cerevisiae*. RJ Gillies, K Ugurbil, J den Hollander and RG Shulman. *Proc. Natl. Acad. Sci. USA*. 78: 2125-2129, 1981.
19. ^{31}P Nuclear Magnetic Resonance Studies of Intact Anchorage-Dependent Mouse Embryo Fibroblasts. K Ugurbil, D Guernsey, TR Brown, N Tobkes, P Glynn and IS Edelman. *Proc. Natl. Acad. Sci. USA*. 78: 4843-4847, 1981.
20. Chemical Shift Imaging in 3D. TR Brown, BM Kincaid and K Ugurbil. *Proc. Natl. Acad. Sci. USA*. 79: 3523-3526, 1982.
21. ^{31}P Nuclear Magnetic Resonance Studies of Bioenergetics in Wild Type and ATPase - *E. coli* Cells. K Ugurbil, RG Shulman, H Rottenberg and P Glynn. *Biochemistry*. 21: 1068-1075, 1982.
22. Spatial Range of Electron Transfer Processes. The Complex Cytochrome C - $\text{Fe}(\text{CN})_6$. JJ Hopfield and K Ugurbil (1982) In: Electron Transport and Oxygen Utilization, ed. Ho, C., pp. 81-84, Elsevier, New York, N.Y., (*Book Chapter*).
23. Observation of Mitochondrial Phosphate in Intact Heart by ^{31}P NMR. P Garlick, T Brown, R Sullivan and K Ugurbil. *J. Cell. Mol. Cardiol.* 15: 409-416, 1983.
24. ^{31}P NMR Studies of Nucleotide Storage in the Dense Granules of Pig Platelets. K Ugurbil, M Fukami and H Holmsen. *Biochemistry*. 23: 409-416, 1984.
25. Protons Nuclear Magnetic Resonance Studies of Amine and Nucleotide Storage in Dense Granules of Platelets. K Ugurbil, M Fukami and H Holmsen. *Biochemistry*. 23: 416-428, 1984.
26. High Resolution Proton NMR Studies of Perfused Rat Hearts. K Ugurbil, M Petein, R Maidan, S Michurski, JN Cohn and A From (1984) *FEBS Lett.*, 167: 73-78, 1984.
27. Histamine Uptake in Pig Platelets and Isolated Dense Granules. M Fukami, H Holmsen and K Ugurbil. *Biochemical Pharmacology*. 33: 3869-3874, 1984.
28. Biophysical Measurements Using Nuclear Magnetic Resonance. TR Brown and K Ugurbil (1984) in: Structural and Resonance Techniques in Biological Research, pp. 2-84, Ed., DL Rousseau. Academic Press, New York, NY, (*Book Chapter*).
29. Storage Mechanisms in Dense Granules; Studies with Nuclear Magnetic Resonance. K Ugurbil (1985) in: Platelet Responses and Metabolism, ed. H Holmsen. CRC Press, Boca Raton, USA, 153-70, (*Book Chapter*).
30. Removal of the Broad Resonance in ^{31}P NMR Spectra of Intact Tissues. WJ Thoma, LM Henderson and K Ugurbil. *J. Magn. Reson.* 61: 141-144, 1985.
31. ^1H NMR Studies of Electron Exchange Kinetics of *Pseudomonas aeruginosa* Azurin. K Ugurbil and S Mitra. *Proc. Natl. Acad. Sci., USA*, 82: 2039-2043, 1985.
32. Magnetization Transfer Measurements of Individual Rate Constants in the Presence of Multiple Reactions. K Ugurbil. *J. Magn. Reson.* 64: 207-219, 1985.
33. Magnetization Transfer Measurements of Creatine Kinase and ATPase Rates in Intact Hearts.

- K Ugurbil. *Circulation* . 72: (Supp. IV), 94-96, 1985.
34. Selective Detection of Resonances from Protons Attached to ^{13}C Nuclei. P Kingsley-Hickman and K Ugurbil. *J. Magn. Reson.* 64: 339-342, 1985.
 35. Measurement of an Individual Rate Constant in the Presence of Multiple Exchanges: Application to Myocardial Creatine Kinase Rates. K Ugurbil, M Petein, R Maiden, S Michurski and A From. *Biochemistry*. 25: 100-108, 1986.
 36. ^{13}C Nuclear Magnetic Resonance Studies of Anaerobic and Aerobic Glycolysis in *Saccharomyces cerevisiae*. JA den Hollander, K Ugurbil, TR Brown, M Bednar, C Redfield and RG Shulman. *Biochemistry* . 25: 203-212, 1986.
 37. ^{31}P and ^{13}C NMR Studies of Intermediates of Aerobic and Anaerobic Glycolysis in *Saccharomyces cerevisiae*. JA den Hollander, K Ugurbil and RG Shulman. *Biochemistry* . 25: 212-219, 1986.
 38. ^{31}P NMR Measurement of ATP Synthesis Rate in Perfused Intact Hearts. P Kingsley-Hickman, EY Sako, PA Andreone, JA St Cyr, S Michurski, JE Foker, AHL From, M Petein and K Ugurbil. *FEBS Lett.* 198: 159-163, 1986.
 39. Cd-113 NMR Study of Bovine Thrombin Fragment I and Factor X. PB Kingsley-Hickman, GL Nelsestuen and K Ugurbil. *Biochemistry* . 25: 3352-3355, 1986.
 40. *In vivo* Spatially Localized Surface Coil NMR Spectroscopy Utilizing a Fourier Series Window Function and Two Surface Coils (1986) M Garwood, K Ugurbil, T Schleich, M Petein, E Sublett, AHL From and R Bache. *J. Magn. Reson.* 69: 576-581, 1986.
 41. P-31 NMR Studies of Respiratory Regulation in the Intact Myocardium. AH. From, M Petein, S Michurski, S Zimmer and K Ugurbil. *FEBS Lett.* 206: 257-261, 1986.
 42. pH Measurements by ^{31}P NMR in Bacterial Suspensions Using Phenyl Phosphonate as a Probe. WJ Thoma, JG Steiert, RL Crawford and K Ugurbil. *Biochim. Biophys. Res. Commun.* 138: 1106-1109, 1986.
 43. Saturation Transfer Studies of ATP- P_i Exchange in Isolated Perfused Rat Liver. WJ Toma and K Ugurbil. *Biochim. Biophys. Acta.* 893: 225-231, 1987.
 44. Amplitude and Phase Modulated Pulses to Achieve 90° Plane Rotations with Highly Inhomogeneous B_1 Fields. K Ugurbil, M Garwood and RM Bendall. *J. Magn. Reson.* 72: 117-185, 1987.
 45. Adiabatic Refocusing Pulse Which Compensates for Variable RF Power and Off-Resonance Effects. RM Bendall, K Ugurbil and M Garwood, D Pegg. *Magn. Reson. in Medicine* . 4: 493-499, 1987.
 46. Fourier Series Windows On and Off-Resonance Using Multiple Coils and Longitudinal Modulation. M Garwood, PM Robitaille and K Ugurbil. *J. Magn. Reson.* 75: 244-261, 1987.
 47. ^{31}P NMR Studies of the Kinetics and Regulation of Oxidative Phosphorylation in the Intact Myocardium. K Ugurbil, PB Kingsley-Hickman, EY Sako, S Zimmer, P Mohanakrishnan, PML Robitaille, WJ Thoma, A Johnson, JE Foker and AHL From (1987) *Annals N.Y. Acad. Sci.* 508, 265-287, (Book Chapter).
 48. ^{31}P NMR Studies of ATP Synthesis and Hydrolysis Kinetics in the Intact Myocardium. PB Kingsley-Hickman, EY Sako, P Mohanakrishnan, PML Robitaille, JE Foker, AHL From and K Ugurbil. *Biochemistry* .26: 7501-7510, 1987.
 49. Amplitude and Frequency/Phase Modulated Refocusing Pulses that Induce Plane Rotations Even in the Presence of Inhomogeneous Fields. K Ugurbil, M Garwood, A Rath and MR Bendall. *J. Magn. Reson.* 78, 472-497, 1988.
 50. Optimization of Modulation Functions to Improve Insensitivity of Adiabatic Pulses to Variations

- in B₁ Magnitude. K. Ugurbil, M. Garwood and A. Rath. *J. Magn. Reson.* 80: 448-469, 1988.
51. ATP Synthesis Kinetics and Mitochondrial Function in the Postischemic Myocardium as Studied by ³¹P NMR. EY Sako, PB Kingsley-Hickman, AHL From, JE Foker and K Ugurbil. *J. Biol. Chem.* 263: 10600 - 10607, 1988.
 52. Magnetic Resonance Imaging with Adiabatic Pulses Using a Single Surface Coil for RF Transmission and Signal Detection. M Garwood, K Ugurbil, AR Rath, MR Bendall, BD Ross, SL Mitchell and H Merkle. *Magn. Reson. in Med.* 9: 25-34, 1988.
 53. ³¹P NMR Studies on the Effects of Some Chlorophenols on *E. coli* and Pentachlorophenol Degrading Bacteria. JG Steiert, WJ Thoma, K Ugurbil and RL Crawford. *J. Bacteriol.* 10: 4954-4957, 1988.
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