# CURRICULUM VITAE

**Name:** Robin A. de Graaf, Ph.D.

**Term:** *Primary:* Professor with Tenure
Department of Radiology and Biomedical Imaging
*Secondary:* Department of Biomedical Engineering

**School:** Yale University School of Medicine (and the Graduate School)

**Education:** M.S. Chemistry, Utrecht University, The Netherlands, 1993
Ph.D. Chemistry, Utrecht University, The Netherlands, 1998

## Career/Academic Appointments:

| | |
|---|---|
| 1993-1994 | Research Scholar, CMRR, University of Minnesota |
| 1994-1998 | Ph.D. student, Utrecht University, The Netherlands |
| 1999-2000 | Post Doctoral Research Associate, Yale University |
| 2000-2001 | Associate Research Scientist, Yale University |
| 2001-2007 | Assistant Professor, Department of Diagnostic Radiology, Yale University |
| 2003-2007 | Assistant Professor, Department of Biomedical Engineering, Yale University |
| 2007-2017 | Associate Professor, Department of Radiology and Biomedical Imaging, Yale University |
| 2007-2017 | Associate Professor, Department of Biomedical Engineering, Yale University |
| 2017-present | Professor, Department of Radiology and Biomedical Imaging, Yale University |

## Administrative Positions

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|---|---|
| 2001-present | Technical Manager Human 4 and 7 T MR Systems |
| 2003-present | Technical Manager Animal 9.4 and 11.74 T MR Systems |

## Professional Honors & Recognition

| | |
|---|---|
| 2014 | Outstanding Teacher Award, ISMRM |
| 2011 | Outstanding Teacher Award, ISMRM |
| 2006 | Outstanding Teacher Award, ISMRM |

1998 Cum laude Ph.D. graduation

1993 Cum laude M.S. graduation

**Lectures, Courses, Web-based Education:**

2017: Basics of NMR, Weekend educational course, International Society for Magnetic Resonance in Medicine, Honolulu, Hawai'i

2016: Magnetic Field $B_0$ Shimming for MR Spectroscopy Applications, ISMRM Workshop on MR Spectroscopy, Konstanz, Germany

2016: Recent Advances in Inverse $^{1}$H-[$^{13}$C] NMR Spectroscopy, ISMRM Workshop on MR Spectroscopy, Konstanz, Germany

2016: Inverse $^{1}$H-[$^{13}$C] MR Spectroscopy on Human Brain, Maastricht University, The Netherlands

2016: Recent Advances in Inverse $^{1}$H-[$^{13}$C] MR Spectroscopy, University of Pennsylvania, Philadelphia

2015: Challenges of Conventional $^{13}$C MRS in Humans, UT Southwestern Medical Center, Dallas, TX

2014: NMR Spectroscopy. The Forgotten Molecular Imaging Modality, Mount Sinai Medical School, New York, NY

2014: Shimming: Fields, Coils and Control, Weekend educational course, International Society for Magnetic Resonance in Medicine, Milan, Italy

2013: In Situ 3D MR Metabolic Imaging of Microwave-Irradiated Rodent Brain. A New Tool for Metabolomics Research, UC Davis, USA

2013: Practical Use of Multiple-Quantum-Coherences in Spectral Editing and 2D NMR, Weekend educational course, International Society for Magnetic Resonance in Medicine, Salt Lake City, USA

2013: High Field MRI and MRS at Yale University, ISMRM Scientific workshop on Ultra High Field MRI, Noordwijk aan zee, The Netherlands

2012: NMR Methods to Study Cerebral Metabolism and Neurotransmission, Rudolf Magnus Institute Annual Symposium, Utrecht University, The Netherlands

2012: Magnetic Field Shaping in MR Imaging and Spectroscopy, Technical University Eindhoven, The Netherlands

2011: Magnetic Field Shaping in MR Imaging and Spectroscopy, Center for Magnetic Resonance Research, University of Minnesota, USA

2011: Strategies for Probing Metabolism, Morning categorical course, International Society for Magnetic Resonance in Medicine, Montreal, Canada

2011: Novel Approaches for Magnetic Field Homogenization, Agilent User Meeting, Montreal, Canada

2011: Dynamic Shimming of the Human Brain at 7 T, MR Engineering Study Section, International Society for Magnetic Resonance in Medicine, Montreal, Canada

2011: Exploring the Spatial Resolution of NMR Spectroscopy in Neuroscience, Seminar on Cerebral Metabolism in Epilepsy, Utrecht University, The Netherlands

2011: $B_0$ shimming approaches in MR Imaging and Spectroscopy, ISMRM workshop on Ultra-High Field Systems & Applications. 7T & Beyond: Progress, Pitfalls & Potential, Lake Louis, Canada

2010: Acquisition and Processing of Meaningful MRS Data, Morning categorical course, International Society for Magnetic Resonance in Medicine, Stockholm, Sweden

2010: Magnetic Field Shaping in MR Imaging and Spectroscopy, Experimental NMR Conference, Daytona Beach, FL

2009: State-of-the-Art $^{13}C$ and $^{1}H$-[$^{13}C$] NMR. Methods to Study Cerebral Metabolism, ISMRM workshop on Hyperpolarization, University of Pennsylvania, PA

2009: NMR Spectroscopy. The Forgotten Molecular Imaging Modality, Mount Sinai Medical School, New York, NY

2008: Scalar Coupling and Spectral Editing, ISMRM workshop on MR Spectroscopy and Neurotransmitter Function in Neuropsychiatric Disorders, Quebec City, QC, Canada

2008: Introduction to NMR spectroscopy, ISMRM workshop on MR Spectroscopy and Neurotransmitter Function in Neuropsychiatric Disorders, Quebec City, QC, Canada

2008: Dynamic Shimming of the Human Brain, QNMR Symposium, Yale University

2008: NMR at High Magnetic Fields, Utrecht University, The Netherlands

2007: Hardware Correction of $B_0$ Magnetic Field Distortions, High-field NMR workshop, Asilomar, CA

2006: Bruker Data Acquisition and Processing, ISMRM Workshop on Data processing for MR spectroscopy and imaging, Warrenton, Virginia, USA

2006: Broadband decoupling at high magnetic field: Challenges and solutions, Morning categorical course, International Society for Magnetic Resonance in Medicine, Seattle, USA

2005: GABA and glutamate: Target isolation, Workshop on MR Spectroscopy for Neurophychiatric Disorders, Banff, Canada

2005: Metabolite selective NMR spectroscopy, Weekend educational session, International Society for Magnetic Resonance in Medicine, Miami, USA

2005: Energetic costs associated with glutamatergic and GABAergic neurotransmission, Brain, Amsterdam

2005: *In vivo* NMR spectroscopy at high magnetic fields, Symposium 'High-field Magnetic Resonance in Medicine', Utrecht University, The Netherlands

2004: Sophisticated RF pulses for NMR spectroscopy, Weekend educational session, International Society for Magnetic Resonance in Medicine, Kyoto, Japan

2003: *In vivo* $^{1}$H-[$^{13}$C]-NMR spectroscopy of cerebral metabolism, Workshop for high field MR imaging and spectroscopy, Minneapolis, Minnesota

2003: Sophisticated RF pulses for NMR spectroscopy, Weekend educational session, International Society for Magnetic Resonance in Medicine, Toronto

2003: *In vivo* NMR spectroscopy of cerebral neurotransmission and energy metabolism, Rudolf Magnus Lecture, Rudolf Magnus Institute for Neuroscience, Utrecht Medical Center, Utrecht, The Netherlands

2002: Nuclear Spin Gymnastics, Seminar series in bioimaging sciences, Yale University, New Haven

2000: Spectral editing of GABA, NIH, Bethesda

1998: Theory and applications of spectral editing, Yale University, New Haven

1998: Theory of adiabatic RF pulses, University of London, Ontario

1998: Adiabatic localization, water suppression and spectral editing, NIH, Bethesda

1998: Theory and applications of adiabatic RF pulses, CMRR, Minneapolis

1997: Theory and applications of adiabatic RF pulses, Biomedizinische NMR Forschungs GmbH am Max Planck Institut für Biophysikalische Chemie, Göttingen, Germany

1997: Advances in *in vivo* $^{1}$H NMR spectroscopy, Symposium 'Beeld -en signaalvormende technieken in de geneeskunde', deelwerkgemeenschap van het gebied medische wetenschappen (NWO), Utrecht, The Netherlands

1997: Theory and applications of adiabatic RF pulses. Applications with respect to *in vivo* NMR. Varian Benelux user meeting, Utrecht University, The Netherlands

1996: Novel approaches to *in vivo* MRS and MRI, Symposium '*In vivo* NMR-Present and future', Utrecht University, The Netherlands

1996: Spectral editing, Advanced *in vivo* NMR course, Utrecht University, The Netherlands

1996: RF pulse design, Advanced *in vivo* NMR course, Utrecht University, The Netherlands

1996: Recent developments in adiabatic pulse design, Varian user meeting, New York

1995: Introduction to *in vivo* NMR, PAC congres, Amsterdam

## PROFESSIONAL SERVICE

### Peer Review Groups/Grant Study Sections

2014 Member of Stanford University P41 Renewal Site Visit, NIBIB, NIH

2012 Reviewer, Regional Metabolomics Core Center grants, NIH

2012-2016 Ad hoc Member, Biomedical Imaging Technology (BMIT-A) Study Section

2011 Reviewer, Study Section on Clinical and Translational Imaging Applications, NIH

2011 Reviewer, National Institute on Drug Abuse (NIDA)'s Cutting-Edge Basic Research Awards (CEBRA) program, NIH

2011 Reviewer, Neurotechnology (NT) Study Section, NIH

2010 Reviewer, Special Emphasis Panel on Translational Applications, NIH

2008 Reviewer, NCCAM Basic Science Review Panel, NIH

2007 Reviewer, Bioengineering Research Partnership (BRP) Applications, NIH

2001-present Ad hoc Member, Medical Imaging (MEDI) Study Section, NIH

### Journal Service

2016-present Editorial Board Member, NMR in Biomedicine

2015-present Editorial Board Member, Journal of Magnetic Resonance

1999-present Reviewer for Analytical Chemistry, Chemical Physics Letters, Journal of Cerebral Blood Flow and Metabolism, Journal of Inherited Metabolic Disease, Journal of Magnetic Resonance, Journal of Visualized Experiments, Magnetic Resonance in Medicine, MAGMA, NeuroImage,

Neurology, NMR in Biomedicine, Plos One and Proceedings of the National Academy of Sciences.

**Professional Organizations**

**International Society for Magnetic Resonance in Medicine (ISMRM)**

| | |
|---|---|
| 2014-2016 | Member, ISMRM Committee on Education |
| 2006-2007 | Chair, Dynamic NMR Spectroscopy Study Group |
| 1993-present | Member, ISMRM |

**Yale University Service**

**Medical School Committees**

| | |
|---|---|
| 2010-present | Member, Scholar Awards Committee for Bioimaging Awards |

**Departmental Committees**

| | |
|---|---|
| 2008-present | Organizer, Work-in-Progress Seminar |
| 2007-present | Reviewer, MR Research Center Project Applications |

**BIBLIOGRAPHY:**

**Google Scholar Citations:**

https://scholar.google.com/citations?hl=en&view_op=list_works&gmla=AJsN-F5svWHKwrvWiC-mVUZ06i1EPF0xihK7NvvQk-ifOo9CqHLNUsdW3tY3y4whr554ThwT8J8cxkO5p4Cv3rA-g9P68vjn_w&user=5xHp19kAAAAJ

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| i10-index | 80 | 66 |

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1. Peer-Reviewed Manuscripts (99 total)

1. **R. A. de Graaf**, Y. Luo, M. Terpstra, H. Merkle, M. Garwood, A new localization method using an adiabatic pulse, BIR-4, *J. Magn. Reson. B* **106**, 245-252 (1995)

2. M. Garwood, B. Nease, Y. Ke, **R. A. de Graaf**, H. Merkle, Simultaneous compensation for B1 inhomogeneity and resonance offsets by a multiple-quantum NMR sequence using adiabatic pulses, *J. Magn. Reson. A* **112**, 272-274 (1995)

3. **R. A. de Graaf**, Y. Luo, M. Terpstra, M. Garwood, Spectral editing with adiabatic pulses, *J. Magn. Reson. B* **109**, 184-193 (1995)

4. **R. A. de Graaf**, K. Nicolay, M. Garwood, Single shot, $B_1$ insensitive slice selection with a gradient-modulated adiabatic pulse, BISS-8, *Magn. Reson. Med.* **35**, 652-657 (1996)

5. **R. A. de Graaf**, Y. Luo, M. Garwood, K. Nicolay, $B_1$-insensitive, single-shot localization and water suppression, *J. Magn. Reson. B.* **113**, 35-45 (1996)

6. **R. A. de Graaf**, K. Nicolay, Multislice imaging with adiabatic pulses using transverse Hadamard encoding, *J. Magn. Reson. B.* **113**, 97-101 (1996)

7. M. Terpstra, W. B. High, Y. Luo, **R. A. de Graaf**, H. Merkle, M. Garwood, Relationships among lactate concentration, blood flow and histopathologic profiles in rat C6 glioma, *NMR Biomed.* **9**, 141-150 (1996)

8. **R. A. de Graaf**, K. Nicolay, Adiabatic RF pulses: Applications to *in vivo* NMR, *Concepts Magn. Reson.* **9**, 247-268 (1997)

9. K. P. J. Braun, R. M. Dijkhuizen, **R. A. de Graaf**, K. Nicolay, W. P. Vandertop, R. H. J. M. Gooskens, K. A. F. Tulleken, Cerebral ischemia and white matter edema in experimental hydrocephalus: a combined *in vivo* MRI and MRS study, *Brain Res.* **757**, 295-298 (1997)

10. F. A. A. Mulder, **R. A. de Graaf**, R. Kaptein, R. Boelens, An off-resonance rotating frame relaxation experiment for the investigation of macromolecular dynamics using adiabatic rotations, *J. Magn. Reson.* **131**, 351-357 (1998)

11. **R. A. de Graaf**, K. Nicolay, Adiabatic water suppression using frequency selective excitation, *Magn. Reson. Med.* **40**, 690-696 (1998)

12. K. P. J. Braun, **R. A. de Graaf**, W. P. Vandertop, R. H. J. M. Gooskens, K. A. F. Tulleken, K. Nicolay, *In vivo* $^{1}$H MR spectroscopic imaging and diffusion weighted MRI in experimental hydrocephalus, *Magn. Reson. Med.* **40**, 832-839 (1998)

13. R. M. Dijkhuizen, **R. A. de Graaf**, K. A. F. Tulleken, K. Nicolay, Changes in the diffusion of water and intracellular metabolites after excitotoxic injury and global ischemia in neonatal rat brain, *J. Cereb. Blood Flow Metab.*, **19** 341-349 (1998)

14. R. M. Dijkhuizen, **R. A. de Graaf**, M. Garwood, K. Nicolay, Spatial assessment of the dynamics of lactate formation in focal ischemic rat brain, *J. Cereb. Blood Flow Metab*. **19**, 376-379 (1998)

15. Y. Luo, J. Rydzewski, **R. A. de Graaf**, R. Gruetter, M. Garwood, T. Schleich, *In vivo* observation of lactate methyl proton magnetization transfer in rat C6 glioma tissue, *Magn. Reson. Med.* **41**, 676-685 (1999)

16. **R. A. de Graaf**, A. van Kranenburg, K. Nicolay, Off resonance metabolite magnetization transfer measurements on rat brain *in situ*, *Magn. Reson. Med.* **41**, 1136-1144 (1999)

17. F. Groenendaal, **R. A. de Graaf**, G. van Vliet, K. Nicolay, Effects of hypoxia-ischemia and inhibition of nitric oxide synthase on cerebral energy metabolism in newborn piglets, *Ped. Res.* **45**, 827-833 (1999)

18. B. P. J. van der Sanden, A. Heerschap, P. F. J. W. Rijken, **R. A. de Graaf**, K. Nicolay, A. J. van der Kogel, Global HDO uptake in human glioma xenografts is related to the perfused capillary distribution*, Magn. Reson. Med.* **42**, 479-489 (1999)

19. M. J. Kruiskamp, **R. A. de Graaf**, G. van Vliet, K. Nicolay, Magnetic coupling of creatine/phosphocreatine protons in rat skeletal, as studied by $^{1}$H magnetization transfer MRS, *Magn. Med. Reson*. **42**, 665-672 (1999)

20. K. P. J. Braun, P. van Eijsden, W. P. Vandertop, **R. A. de Graaf**, R. H. J. M. Gooskens, K. A. F. Tulleken, K. Nicolay, Cerebral metabolism in experimental hydrocephalus: an *in vivo* $^{1}$H and $^{31}$P MR spectroscopic study, *J. Neurosurg*. **91**, 660-668 (1999)

21. **R. A. de Graaf**, A. van Kranenburg, K. Nicolay, *In vivo* $^{31}$P NMR diffusion measurements of phosphocreatine and ATP in rat skeletal muscle, *Biophys. J*. **78**, 1657-1664 (2000)

22. **R. A. de Graaf**, R. M. Dijkhuizen, K. P. J. Braun, G. J. Biessels, K. Nicolay, Glucose detection by homonuclear spectral editing, *Magn. Reson. Med*. **43**, 621-626 (2000)

23. **R. A. de Graaf**, D. L. Rothman, *In vivo* detection and quantification of scalar coupled $^{1}$H NMR resonances, *Concepts Magn. Reson.* **13**, 32-76 (2001)

24. M. J. Kruiskamp, **R. A. de Graaf**, J. van der Grond, R. Lamerichs, K. Nicolay, Magnetic coupling between water and creatine protons in human brain and skeletal muscle, as measured using inversion transfer $^{1}$H-MRS. *NMR Biomed*. **14**, 1-4 (2001)

25. G. J. Biessels, K. P. Braun, **R. A. de Graaf**, P. van Eijsden, W. H. Gispen, K. Nicolay, Cerebral metabolism in streptozotocin-diabetic rats: an *in vivo* magnetic resonance spectroscopy study, *Diabetologia* **44**, 346-353 (2001)

26. **R. A. de Graaf**, K. P. J. Braun, K. Nicolay, Single-shot diffusion trace $^{1}$H NMR spectroscopy, *Magn.Reson. Med.* **45**, 741-748 (2001)

27. **R. A de Graaf**, J.W. Pan, F.Telang, J-H. Lee, P. Brown, E. J. Novotny, H. P. Hetherington, D. L. Rothman, Differentiation of glucose transport in human brain gray and white matter, *J. Cereb. Blood. Flow Metab*. **21**, 483-492 (2001)

28. Y. Luo, **R. A. de Graaf**, L. Delabarre, A. Tannus, M. Garwood, Achieving uniform outer volume suppression in the presence of RF inhomogeneities, *Magn. Reson. Med.* **45**, 1095-1102 (2001)

29. **R. A. de Graaf**, D. L. Rothman, Detection of γ-aminobutyric acid (GABA) by longitudinal scalar order difference editing, *J. Magn. Reson.* **152**, 124-131 (2001)

30. J. W. Pan, F. W. TeLang, J.-H. Lee, **R. A. de Graaf**, D. L. Rothman, D. T. Stein, H. P. Hetherington, Measurement of beta-hydroxybutyrate in acute hyperketonemia in human brain, *J. Neurochem.* **79**, 539-544 (2001)

31. J. W. Pan, **R. A. de Graaf**, K. F. Petersen, G. I. Shulman, H. P. Hetherington, D. L. Rothman, [2,4-$^{13}C_2$]-β-hydroxybutyrate metabolism in human brain*, J. Cereb. Blood Flow Metab*. **22**, 890-898 (2002)

32. **R. A. de Graaf**, P. B. Brown, G. F. Mason, D. L. Rothman, K. L. Behar, Detection of [1,6-$^{13}C_2$]-glucose metabolism in rat brain by *in vivo* $^{1}$H-[$^{13}$C]-NMR spectroscopy, *Magn. Reson. Med.* **49**, 37-46 (2003)

33. G. F. Mason, K. F. Petersen, **R. A. de Graaf**, T. Kanamatsu, T. Otsuki, D. L. Rothman, A comparison of $^{13}$C NMR measurements of the rates of glutamine synthesis and the tricarboxylic acid cycle during oral and intravenous administration of [1-$^{13}$C]-glucose, *Brain Res Brain Res Protoc*. **10**, 181-190 (2003)

34. **R. A. de Graaf**, D. L. Rothman, K. L. Behar, Adiabatic RARE imaging, *NMR Biomed*. **16**, 29-35 (2003)

35. **R. A. de Graaf**, P. B. Brown, S. McIntyre, D. L. Rothman, T. W. Nixon, Dynamic shim updating (DSU) for multi-slice signal acquisition, *Magn. Reson. Med*. **49**, 409-416 (2003)

36. **R. A. de Graaf**, K. L. Behar, Quantitative $^{1}$H NMR spectroscopy of blood plasma metabolites, *Anal. Chem*. **75**, 2100-2104 (2003)

37. A. B. Patel, **R. A. de Graaf**, G. F. Mason, D. L. Rothman, R. G. Shulman, K. L. Behar, Coupling of Glutamatergic Neurotransmission and Neuronal Glucose Oxidation over the Entire Range of Cerebral Cortex Activity, *Ann. N. Y. Acad. Sci.* **1003**, 452-453 (2003)

38. X. Zhang, A. B. Patel, **R. A. de Graaf**, K. L. Behar, Determination of liposomal encapsulation efficiency using proton NMR spectroscopy, *Chem. Phys. Lipids*. **127**, 113-120 (2004)

39. **R. A. de Graaf**, G. F. Mason, A. B. Patel, D. L. Rothman, K. L. Behar, Regional glucose metabolism and glutamatergic neurotransmission in rat brain *in vivo*, *Proc. Natl. Acad. Sci. USA* **101**, 12700-12705 (2004)

40. A. B. Patel, **R. A. de Graaf**, G. F. Mason, T. Kanamatsu, D. L. Rothman, R. G. Shulman, K. L. Behar, Glutamate/glutamine cycling and glucose oxidation increase proportionally in rat cortex during acute bicuculline-induced seizures, *J. Cereb. Blood Flow Metab.* **24**, 972-985 (2004)

41. A. B. Patel, G. M. Chowdhury, **R. A. de Graaf**, D. L. Rothman, R. G. Shulman, K. L. Behar, Cerebral pyruvate carboxylase flux is unaltered during bicuculline-seizures, *J. Neurosci. Res.* **79**, 128-138 (2005)

42. **R. A. de Graaf**, Theoretical and experimental evaluation of broadband decoupling techniques for *in vivo* NMR spectroscopy, *Magn. Reson. Med.* **53**, 1297-1306 (2005)

43. G. F. Mason, I. L. Petrakis, **R. A. de Graaf**, R. Gueorguieva, E. Guidone, V. Coric, C. N. Epperson, D. L. Rothman, J. H. Krystal, Cortical gamma-aminobutyric acid levels and the recovery from ethanol dependence: preliminary evidence of modification by cigarette smoking, *Biol. Psychiatry* **59**, 85-93 (2006)

44. **R. A. de Graaf**, A. B. Patel, D. L. Rothman, K. L. Behar, Acute regulation of steady-state GABA levels following GABA-transaminase inhibition in rat cerebral cortex, *Neurochem. Int.* **48**, 508-517 (2006)

45. A. B. Patel, **R. A. de Graaf**, D. L. Martin, G. Battaglioli, K. L. Behar, Evidence that GAD mediates increased GABA synthesis during intense neuronal activity in vivo, *J. Neurochem.* **97**, 385-396 (2006)

46. K. M. Koch, S. McIntyre, T. W. Nixon, D. L. Rothman, **R. A. de Graaf**, Dynamic shim updating on the human brain, *J. Magn. Reson.* **180**, 286-296 (2006)

47. **R. A. de Graaf**, P. B. Brown, S. McIntyre, T. W. Nixon, K. L. Behar, D. L. Rothman, High magnetic field water and metabolite proton $T_1$ and $T_2$ relaxation in rat brain *in vivo*, *Magn. Reson. Med*. **56**, 386-394 (2006)

48. K. M. Koch, P. B. Brown, D. L. Rothman, **R. A. de Graaf**, Sample-specific diamagnetic and paramagnetic passive shimming, *J. Magn. Reson*. **182**, 66-74 (2006)

49. K. M. Koch, X. Papademetris, D. L. Rothman, **R. A. de Graaf**, Rapid magnetostatic field calculations in magnetic resonance, *Phys. Med. Biol*. **51**, 6381-6402 (2006)

50. G. F. Mason, K. F. Petersen, **R. A. de Graaf**, G. I. Shulman, D. L. Rothman, Measurements of the anaplerotic rate in the human cerebral cortex using $^{13}C$ magnetic resonance spectroscopy and [1-$^{13}C$] and [2-$^{13}C$] glucose, *J. Neurochem.* **100**, 73-86 (2007) [PMCID: PMC2995551]

51. D. E. Befroy, K. F. Petersen, S. Dufour, G. F. Mason, **R. A. de Graaf**, D. L. Rothman, G. I. Shulman, Impaired mitochondrial substrate oxidation in muscle of insulin-resistant offspring of type 2 diabetic patients, *Diabetes* **56**, 1376-1381 (2007) [PMCID: PMC2995532]

52. L. I. Sacolick, D. L. Rothman, **R. A. de Graaf**, Unpaired adiabatic refocusing pulses for volume selection in spectroscopic imaging, *Magn. Reson. Med*. **57**, 548-553 (2007)

53. K. M. Koch, L. I. Sacolick, T. W. Nixon, S. McIntyre, D. L. Rothman, **R. A. de Graaf**, Dynamically shimmed multivoxel $^{1}H$ magnetic resonance spectroscopy and multislice magnetic resonance spectroscopic imaging of the human brain, *Magn. Reson. Med.* **57**, 587-591 (2007)

54. **R. A. de Graaf**, D. L. Rothman, K. L. Behar, High resolution NMR spectroscopy of rat brain in vivo through indirect zero-quantum-coherence detection, *J. Magn. Reson.* **187**, 320-326 (2007) [PMCID: PMC2788487]

55. Q. Qin, M. Does, J. C. Gore, **R. A. de Graaf**, 2D arbitrary shape selective excitation summed spectroscopy (ASSESS), *Magn. Reson. Med*. **58**, 19-26 (2007)

56. Q. Qin, J. C. Gore, **R. A. de Graaf**, M. Does, Quantitative $T_2$ measurement of a single voxel with arbitrary shape using pinwheel excitation and CPMG acquisition, *MAGMA* **20**, 233-240 (2007) [PMCID: PMC2634838]

57. T. W. Nixon, S. McIntyre, D. L. Rothman, **R. A. de Graaf**, Compensation of gradient-induced magnetic field perturbations, *J. Magn. Reson.* **192**, 209-217 (2008) [PMCID: PMC2485241]

58. **R. A. de Graaf**, P. B. Brown, D. L. Rothman, K. L. Behar, Natural abundance $^{17}$O NMR spectroscopy of rat brain *in vivo*, *J. Magn. Reson*. **193**, 63-67 (2008) [PMCID: PMC2587261]

59. J. van der Zijden, P. van Eijsden, **R. A. de Graaf**, R. M. Dijkhuizen, $^{1}$H/$^{13}$C MR spectroscopic imaging of regionally specific metabolic alterations after experimental stroke, *Brain* **131**, 2209-2219 (2008)

60. G. M. Chowdhury, M. Banasr, **R. A. de Graaf**, D. L. Rothman, K. L. Behar, G. Sanacora, Chronic riluzole treatment increases glucose metabolism in rat prefrontal cortex and hippocampus, *J. Cereb. Blood Flow Metab.* **28**, 63-67 (2008) [PMCID: PMC2739056]

61. **R. A. de Graaf**, G. M. I. Chowdhury, P. B. Brown, D. L. Rothman, K. L. Behar, *In situ* 3D magnetic resonance metabolic imaging of microwave-irradiated rat brain: a new tool for metabolomics research, *J. Neurochem.* **109**, 494-501 (2009) [PMCID: PMC2843429]

62. L. Jiang, R. I. Herzog, G. F. Mason, **R. A. de Graaf**, D. L. Rothman, R. S. Sherwin, K. L. Behar, Recurrent antecedent hypoglycemia alters neuronal oxidative metabolism *in vivo*, *Diabetes* **58**, 1266-1274 (2009) [PMCID: PMC2682668]

63. F. Boumezbeur, G. F. Mason, **R. A. de Graaf**, K. L. Behar, G. W. Cline, G. I. Shulman, D. L. Rothman, K. F. Petersen, Altered brain mitochondrial metabolism in healthy aging as assessed by *in vivo* magnetic resonance spectroscopy, *J. Cereb. Blood Flow Metab.* **30**, 211-221 (2010) [PMCID: PMC2949111]

64. P. van Eijsden, K. L. Behar, G. F. Mason, K. P. Braun, **R. A. de Graaf**, *In vivo* neurochemical profiling of rat brain by $^{1}$H-[$^{13}$C]-NMR spectroscopy: cerebral energetics and glutamatergic/GABAergic neurotransmission, *J. Neurochem*. **112**, 24-33 (2010) [PMCID: PMC2843425]

65. C. Juchem, T. W. Nixon, S. McIntyre, D. L. Rothman, **R. A. de Graaf**, Magnetic field homogenization of the human prefrontal cortex with a set of localized electrical coils, *Magn. Reson. Med.* **63**, 171-180 (2010) [PMCID: PMC3046864]

66. A. B. Patel, **R. A. de Graaf**, D. L. Rothman, K. L. Behar, G. F. Mason, Evaluation of cerebral acetate transport and metabolic rates in the rat brain *in vivo* using $^{1}$H-[$^{13}$C] NMR, *J. Cereb. Blood Flow Metab*. **30**, 1200-1213 (2010) [PMCID: PMC2879471]

67. C. Juchem, T. W. Nixon, S. McIntyre, D. L. Rothman, **R. A. de Graaf**, Magnetic field modeling with a set of individual localized coils, *J. Magn. Reson*. **204**, 281-289 (2010) [PMCID: PMC2884296]

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Not applicable.

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