

***Dr. Ulrike Dydak***

Associate Professor  
School of Health Sciences  
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## CURRICULUM VITAE

### **Employments**

- Since 2013 Associate Professor, School of Health Sciences, Purdue University, West Lafayette, IN, USA;  
Adjunct Associate Professor of Radiology and Imaging Sciences, Indiana University School of Medicine. Indianapolis, IN, USA;  
Adjunct Associate Professor, Department of Biomedical Engineering, IUPUI, Indianapolis, IN USA
- 2007 - 2013 Assistant Professor, School of Health Sciences, Purdue University, West Lafayette, IN, USA
- 2008 - 2013 Adjunct Assistant Professor, Department of Biomedical Engineering, IUPUI, Indianapolis, IN USA
- 2007 - 2013 Adjunct Assistant Professor of Radiology, Division of Imaging Sciences, Department of Radiology, Indiana University School of Medicine, Indianapolis, IN, USA
- 2005 – 2007 Adjunct Assistant Professor of Health Sciences, Purdue University, IN, USA
- 2004 - 2008 Member of the board of directors and staff member of GyroTools Ltd: responsible for MR education (courses, on-site trainings)
- 2004 – 2007 Research Associate and Project Leader of the MR Spectroscopy group at the Institute for Biomedical Engineering, ETH and University Zürich, Switzerland
- July – Aug 2004 Visiting Professor in the Dept. of Radiology at the University of Wisconsin, Madison, WI, USA
- May– June 2004 Visiting Professor in the Dept. of Medical Imaging at the University of Toronto, Canada
- Nov 2003 Co-Founder of the software and education company “GyroTools Ltd”, Zürich, Switzerland
- 2002 - 2004 Post-doctoral research fellow at the Institute for Biomedical Engineering,

- University and ETH Zürich; ad-hoc consultant for Philips Medical Systems for 'on-site' spectroscopy trainings at various hospitals
- 1997 – 2002 Research assistant at the Institute for Biomedical Engineering, University and ETH Zürich, Switzerland
- 1996 / 97 High School Teacher for Physics and Mathematics in Innsbruck, Austria

### **University Education**

- May 2002 Dr.sc.nat (Doctor of Sciences), Federal Institute of Technology Zürich, Switzerland  
PhD thesis: „New approaches to Magnetic Resonance Spectroscopic Imaging of the Human Brain“
- 1997-2002 Ph.D. student at the Institute for Biomedical Engineering at the Federal Institute of Technology (ETH), Zürich, Switzerland
- 1998-2000 Postgraduate studies in Medical Physics, Federal Institute of Technology Zürich; Graduation as „Dipl. NDS ETHZ Medizinphysik“ in October 2000; including training and certificate as expert for radiation protection
- July 1996 Mag.rer.nat (combined B.S and M.S.), University of Vienna, Austria; graduation with honors
- 1995 - 1996 Diploma Thesis in high energy physics at CERN, Switzerland
- Summer 1994 Summer Student at CERN, Switzerland
- Summer 1993 Research Assistant at Lawrence Berkeley Laboratory, US
- 1992 / 93 exchange year at the University of California, Berkeley, US
- 1990 – 1996 studies in physics (major) and mathematics (minor) at the University of Vienna, Austria

### **Awards and Stipends**

- 2011 Outstanding New Environmental Scientist (ONES) Award, NIH/NIEHS
- 2011 Robert R. Landolt Excellence in Teaching Award
- 2009 Molecular Imaging Travel Award, Radiological Society of North America
- 2008 Magna Cum Laude Award for Education Exhibit, Radiological Society of North America
- 2008 Best Poster Award for Psychiatric Diseases, ISMRM 2008
- 2005 ASFNR outstanding presentation award at the ASNR 2005
- 2003 Innovation award of the Swiss Society for Biomedical Engineering
- 2002 Travel Fellow, Human Brain Mapping Conference 2002, Sendai, Japan
- 2001 Student travel award, ISMRM 2001, Glasgow

- 2000 Poster award, European Society for Magnetic Resonance in Medicine and Biology, Paris
- 2000 Student travel award, ISMRM 2000, Denver
- 1997 Fellowship (merit based), University of Vienna
- 1995 Fellowship (merit based), University of Vienna

### **Research Grants (summary in chronological order):**

- NIH R01 NS085136, Co-Investigator, 2014 to 2018
- Purdue University Research Foundation grant, PI, 2013-2014
- NIH/NIAMS R21, Co-Investigator, 2012-14
- Purdue University Center for Cancer Research Challenge grant, PI, 2012-2014
- Purdue University Research Foundation grant, PI, 2012-2013
- **NIH/NIEHS**, Outstanding New Environmental Scientist (ONES) Award, R01, PI, 2011-2016
- **NIH/NIEHS R21**, PI, 2009-2011
- CTSI Core Pilot Funding, PI, 2011-2012
- National Dairy Council, Co-I, 2011-2014
- American Egg Board, Co-I, 2011-2012
- CTSI Core Pilot Funding, PI, 2010-2011
- CTR/CBR Pilot Funding for Translational Research, PI, 2009-2010
- Showalter Grant, Purdue University, PI, 2009
- CTR/CBR Pilot Funding for Translational Research, Co-PI, 2009
- SGR Pilot Funding, IUSM, Co-Investigator, 2008
- Showalter Pilot Funding Grant, IUPUI, Co-Investigator, 2008
- DOD research grant, Co-Investigator, 2008
- Siemens / IU Pilot Funding, PI, 2007-2009
- Medical School Grant, Merck, Co-Investigator, 2003-2006
- Research Grant of the University Zürich, Co-Investigator, 2002-2004

### **Teaching Activity**

- ◆ Teaching of undergraduate and graduate courses at the School of Health Sciences, Purdue University, USA:
  - Molecular Imaging, Part A: Magnetic Resonance Spectroscopy, 1 CR, spring 2013 – present
  - Radiation Science Fundamentals, 3 CR, distance learning with IU, fall 2010-present
  - Radiation Instrumentation Laboratory, 2 CR, spring 2008-2010
  - Applied Health Physics, 3 CR, fall 2008-2009
  - Magnetic Resonance Spectroscopy, 1 CR, fall 2009 and spring 2011
  - Undergraduate and MS research projects (11 undergraduate students and 7 MS students in past 5 years)
- ◆ Advising of PhD and MS level students at Purdue University and IUPUI:  
Current Advising Activities:
  - Post-doctoral Fellow:
    - Zaiyang Long, PhD in medical Physics/Imaging

Major Professor (Primary Advisor) for 3 PhD students:

- Shalmali Dharmadhikari, Medical Physics/Imaging
- Chien-Lin Yeh, Medical Physics/Imaging
- Ruoyun Ma, Medical Physics/Imaging

Co major Professor for 3 PhD students:

- Tony Clevenger, Physics, Purdue University
- Victoria Poole, Biomedical Engineering, Purdue University
- Eric Ward, Occupational Health, Purdue University

Member of Advisory Committee for 9 PhD students:

- Stefanie O'Neal, Toxicology, Purdue University
- Yingzi Liu, Medical Physics, Purdue University
- Jing Zhou, Nutrition Sciences, Purdue University
- Katherine Streit, Medical Physics, Purdue University
- Shiv Srivastava, Medical Physics, Purdue University
- Akshay Verleker, Medical Physics, Purdue University
- Wu Junqing, Medical Physics, Purdue University
- James Sivley, Nutrition Sciences, Purdue University
- Chungwein Lee, Medical Physics, Purdue University

#### Past Advising Activities:

Since 2008 I graduated 4 PhD students as major advisor, 4 PhD students as Co-major professor, 6 Master (MS) students as major professor, 2 MS students as Co-major professor and 8 PhD students as well as 19 MS students as member of their advisory committee

- ◆ Teaching in the Imaging Sciences Educational Workshop and the Clinical MRI Education Lectures (CME credit) at IU School of Medicine
- ◆ Lecturer at ISMRM Weekend Educational Courses (CME credit), 2008 & 2009
- ◆ Teaching activity for GyroTools (<http://www.gyrotools.com/courses/>) :
  - International MRS Application Course in Zuerich (yearly), since 2004
  - On-site trainings, since 2004
- ◆ Lecturer at the annual Course in Magnetic Resonance Spectroscopy, International Zurich Magnetic Resonance Education Center, 1998- 2006
- ◆ Lecturer at the annual Advanced Spectroscopy Course at Philips Medical Systems, Cleveland, US, 2005, 2006
- ◆ Guest lecturer at the University of Wisconsin, Madison (summer lecture series on MR Spectroscopy), 2004
- ◆ Lecturer at the Spectroscopy Application Workshops at Philips Medical Systems, Best, The Netherlands, 2002-2004
- ◆ Lecturer at the ETH Zurich on 'Statistics in Biomedical Engineering' (part of the course

‘Biomedical Engineering I’), 2000 & 2001, 4h/course

- ◆ Teaching Assistant for Medical Physics at the ETH Zurich, Switzerland, since 1997
- ◆ Advisor of Master’s students from the ETH Zurich and medical PhD students from the University Zürich, Switzerland, since 1998
- ◆ High School Teaching (Physics and Mathematics), Innsbruck, Austria, 1996-1997

### **Memberships**

- ad hoc member of MEDI Study Section NIH/NIBIB
- International Society for Magnetic Resonance in Medicine (ISMRM)
- German Chapter of the International Society for Magnetic Resonance in Medicine
- Society for Toxicology (SOT)
- Purdue Center for Cancer Research (PUCRR)
- past membership: International College of Neuropsychopharmacology (CINP)

### **Review for journals**

- Magnetic Resonance in Medicine (MRM)
- Neuroradiology
- Brain Imaging and Behavior
- Magnetic Resonance Imaging
- Neurotoxicology
- Cephalalgia
- J. of Occup. And Environm. Medicine
- NMR in Biomedicine
- Toxicological Sciences
- Journal of Cerebral Blood Flow and Metabolism
- Cell Biology and Toxicology
- PLoS ONE Journal of Magnetic Resonance Imaging
- Frontier in Neuroscience

### **List of Publications:**

1. Xu, J, **Dydak U**, Harezlak J, Nixon J, Dziedzic M, Gunn A.D., Karne H.S., Anand A (2013). Neurochemical Abnormalities in Unmedicated Bipolar Depression and Mania: a 2D 1H MRS Investigation. *Psychiatry Res.* 2013 Sep 30; 213(3):235-41.
2. Shin YW, Dziedzic M, Jo HJ, Long Z, Medlock C, **Dydak U**, Goddard AW (2013). Increased resting-state connectivity between the anterior cingulate cortex and the precuneus in panic disorder. *J Affect Disord.* 150(3):1091-5.
3. Long Z, Medlock C, Dziedzic M, Shin YW, Goddard A, **Dydak U** (2013). Decreased GABA levels in Anterior Cingulate Cortex/Medial Prefrontal Cortex in Panic Disorder. *Prog NeuroPsychopharmacol Biol Psychiatry* 44:131-5.

4. Panda A, Jones S, Raghavan RS, Sandrasegaran K, Bansal N, **Dydak U** (2012). Phosphorus Liver MRSI at 3T Using a Novel Dual Tuned 8-Channel 31P/1H Coil. *Magnetic Resonance in Medicine* 68:1346-56 PMID 22287206
5. Racette B.A., Aschner M, Guilarte TR, **Dydak U**, Criswell SR, Zheng W (2012). Pathophysiology of Manganese-Associated Neurotoxicity. *Neurotoxicology* 33(4):881-6. PMC3350837
6. **Dydak U**, Jiang YM, Long LL, Zhu H, Chen J, Li WM, Edden RAE, Hu S, Fu X, Long Z, Meier D, Harezlak J, Aschner M, Murdoch JB, Zheng W. In Vivo Measurement of Brain GABA Concentrations by Magnetic Resonance Spectroscopy in Smelters Occupationally Exposed to Manganese. *Environ Health Perspect.*119:219-224, 2011. Epub 2010 Sep 28. PMID: 20876035
7. Zheng W, Fu X, **Dydak U**, Cowan DM. Biomarkers of Manganese Intoxication. *Neurotoxicology* 32:1-8, 2011.
8. Poryazova R, Schnepf B, Werth E, Khatami R, **Dydak U**, Meier D, Boesiger P, Bassetti CL. Further Evidence for Hypothalamo-Amygdala Dysfunction in Narcolepsy. *Sleep.* 2009;32(5):607-13. PMID: 19480227.
9. Walter M, Henning A, Grimm S, Schulte RF, Beck J, **Dydak U**, Schnepf B, Boeker H, Boesiger P, Northoff G. The Relationship between aberrant Neuronal Activation Patterns in the Pregenual Anterior Cingulate, Altered Glutamatergic Metabolism and Anhedonia in Major Depression. *Arch Gen Psychiatry* 2009;66(5):478-86. PMID: 19414707
10. Henning A, Schär M, Kollias S, Boesiger P, **Dydak U**. Quantitative magnetic resonance spectroscopy in the entire human cervical spinal cord and beyond at 3T. *Magn Reson Med.* 2008;59(6):1250-8. PMID: 18421679
11. Northoff G, Walter M, Schulte RF, Beck J, **Dydak U**, Henning A, Boeker H, Grimm S, Boesiger P. GABA concentration in the human anterior cingulate cortex predicts negative BOLD response in fMRI. *Nature Neuroscience*;10(12):1515-7, 2007. Epub 2007 Nov 4. PMID: 17982452
12. Schoonman GG, Sándor PS, Nirikko AC, Lange T, Jaermann T, **Dydak U**, Kremer C, Ferrari MD, Boesiger P, Baumgartner RW. Hypoxia-induced acute mountain sickness is associated with intracellular cerebral edema: a 3T magnetic resonance imaging study. *J Cereb Blood Flow Metab.* 28(1):198-206, 2008. Epub 2007 May 23. PMID: 17519973
13. **Dydak U**, Schär M. MR Spectroscopy and Spectroscopic Imaging: Comparing 3.0T versus 1.5T. Review Article. *Neuroimaging Clin N Am* 16(2):269–283, 2006. PMID: 16731366
14. **Dydak U**, Mueller S, Sandor PS, Meier D, Boesiger P, Jung HH. Cerebral Metabolic Alterations in McLeod Syndrome. *Eur Neurol* 56(1):17-23, 2006. PMID: 16914926
15. **Dydak U**, Meier D, Lamerichs R, Boesiger P. Trading Spectral Separation at 3T for Acquisition Speed in Multi Spin-Echo Spectroscopic Imaging. *AJNR Am J Neuroradiol.* 27(7):1441-6, 2006. PMID: 16908554
16. Lange T, **Dydak U**, Roberts TP, Rowley HA, Bjeljac M, Boesiger P. Pitfalls in Lactate Measurements at 3T. *AJNR Am J Neuroradiol.* 27(4):895-901, 2006. PMID: 16611787

17. Lange T, Trabesinger AH, Schulte RF, **Dydak U**, Boesiger P. Prostate spectroscopy at 3 Tesla using two-dimensional S-PRESS. *Magn Reson Med.* 56(6):1220-8, 2006. PMID: 17094089
18. Sánchez-Gonzales J, Tsao J, **Dydak U**, Desco M, Boesiger P, Pruessmann KP. Minimum-Norm Reconstruction for Sensitivity-Encoded MR Spectroscopic Imaging. *Magn Reson Med.* 55(2):287-95, 2006. PMID: 16408281
19. Trabesinger AH, Meier D, **Dydak U**, Lamerichs R, Boesiger P. Optimizing PRESS Localized Citrate Detection at 3 Tesla. *Magn Reson Med.* 54(1):51-58, 2005. PMID: 15968673
20. Sándor PS, **Dydak U**, Schoenen J, Kollias SS, Hess K, Boesiger P, Agosti M. MR-Spectroscopic Imaging during visual stimulation in subgroups of migraine with aura, *Cephalalgia* 25(7):507-518, 2005. PMID: 15955037
21. **Dydak U**, Pruessmann KP, Weiger M, Tsao J, Meier D, Boesiger P. Parallel Spectroscopic Imaging with Spin-Echo Trains, *Magn Reson Med.* 50(1): 196-200, 2003. PMID: 12815695
22. **Dydak U**, Weiger M, Pruessmann KP, Meier D, Boesiger P. Sensitivity-Encoded Spectroscopic Imaging, *Magn Reson Med.* 46(4): 713-722, 2001. PMID: 11590648
23. Do KQ, Trabesinger AH, Kirsten-Krüger M, Lauer CJ, **Dydak U**, Hell D, Holsboer F, Boesiger P, Cuénod M; Schizophrenia: Glutathione Deficit in Cerebrospinal Fluid and Prefrontal Cortex in Vivo. *Eur J Neurosci* 12(10), 3721-3728, 2000. PMID: 11029642
24. Ambuehl PM, Meier D, Wolf B, **Dydak U**, Boesiger P, Binswanger U; Metabolic Aspects of Phosphate Replacement Therapy for Hypophosphatemia After Renal Transplantation: Impact on Muscular Phosphate Content, Mineral Metabolism, and Acid/Base Homeostasis. *Am J Kidney Dis* 34(5), 875-883, 1999. PMID: 10561144

### **Patents:**

Van den Brink JS, Weiger M, Dydak U, Folkers PJM, Lamerichs RMJN, Pruessmann KP, VanMuiswinkel AMC. Magnetic Resonance Imaging Method with Sub-Sampling. International Publication number: WO 00/72034 A1, 30.11.2000.

### **Invited Talks**

*(selected from 52 invited talks; italic: invited talks at major international conferences)*

- 2013 Indiana Neuroimaging Symposium, “Neuroimaging for Early Diagnosis of Occupational Manganese Toxicity”, Bloomington, Indiana, Oct 25, 2013
- 2012 The Indianapolis Chapter of the Society of Neuroscience, Annual Meeting, “*In Vivo Assessment of GABA Brain Levels in Parkinson-like Motor Disorders by MRS*”, Indianapolis, IN, USA, Sept 28, 2012
- 2012 *CINP, Symposium on Panic Disorder, “GABA Imaging Findings in Panic Disorder measured by 1H MRS”, Stockholm, Sweden, June 3, 2012*

- 2012 International Symposium on Exposure to Manganese and Neurotoxicity in Welders, “Neuroimaging – quantification of Mn, Fe and metabolites (by MRS) in the brain”, Bochum, Germany, May 9, 2012
- 2011 Purdue University Center for Cancer Research (PCCCR) Scientific Retreat, “In Vivo 31P Magnetic Resonance Spectroscopy: Monitoring the Liver's Response to Radiation Treatment”, West Lafayette, IN, USA, Sept 8, 2011
- 2011 *Xi'an International Neurotoxicology Conference, “In vivo Assessment of GABA and Glutamate levels by Magnetic Resonance Spectroscopy in Manganese Exposure”, Xi'an, China, June 9, 2011*
- 2011 Chronic Disease Research Interest Group Seminar Series, Purdue, “Neuroimaging of Manganese-Induced Parkinsonism“, West Lafayette, IN, USA, Apr 18, 2011
- 2011 2010 CANMRDC 2010 Meeting, University of Illinois, “In Vivo Measurement of Neurotransmitters by MRS”, Urbana-Champaign, IL, USA, Nov 6, 2010.
- 2010 Seminar, Department of Radiology & Radiological Science, Johns Hopkins University School of Medicine, “MR Spectroscopy of GABA and 3D MRI in Smelters Exposed to Manganese”, Baltimore, MD, USA, April 2, 2010
- 2010 2010 Research Seminar, MRI group, Medical University of Vienna, Austria, “Liver 31P MRSI Using an 8-Channel Dual-Tuned 31P/1H Coil at 3T”, Vienna, Austria, Jan 18, 2010
- 2009 Manganese Health Research Program Showcase Conference, “Spectroscopy of GABA and 3D MRI in Smelters exposed to Manganese”, Lansdowne, VI, USA, June 24-25 2009
- 2009 *ISMRM Weekend Educational Courses, Imaging Strategies, “Spectroscopic Imaging: Implementation and Acceleration”, ISMRM, Honolulu, USA, April 19<sup>th</sup>, 2009*
- 2008 *ISMRM, Educational Course, Toronto, Canada, “Spectroscopic Imaging: Implementation and Acceleration”, May 4, 2008*
- 2008 Center for Magnetic Resonance Research, University of Minnesota, MN, USA, “SENSE and long Echo Trains: Fast, Parallel, and dynamic MRSI”, February 14, 2008
- 2007 ISMRM High Field Workshop, Asilomar, CA, USA, “Clinical Impact of Parallel Imaging at 3T” (March 25-28)
- 2006 Grand Rounds and lecture series, Radiology Department, University of Wisconsin, Madison, WI, USA: “Basics of MR Spectroscopy”, “MRS at 3T: New Possibilities and Challenges”, “SENSE and Long Echo Times: Fast, Parallel and Dynamic MRSI”



- 2006 *14<sup>th</sup> Meeting of the ISMRM, Seattle, WA, USA, Lunchtime Symposium Philips Medical Systems*
- 2005 *13<sup>th</sup> Meeting of the ISMRM, Miami, FL, USA. Course on MR physics and Techniques for clinicians: "MR Spectroscopy"*
- 2005 *46<sup>th</sup> Experimental Nuclear Magnetic Resonance Conference, Providence, RI, USA, "Sensitivity Encoded Spectroscopic Imaging"*
- 2005 Seminar at Vanderbilt University Institute of Imaging Science (VUIIS), Nashville, TN, USA, "MR Spectroscopic Imaging: Faster and Functional at 3T"
- 2004 *National Italian Congress of Neuroradiology (AINR), Milan, Italy. "Motivation for 3T: methodological aspects"*
- 2004 Grand Rounds, Department of Neurology, University of Wisconsin, Madison, WI, USA. "fMRI and MRS in Migraine"
- 2004 Grand Rounds, Department of Radiology, University of Wisconsin, Madison, WI, USA. "Frontiers in MR Spectroscopic Imaging: Fast, parallel and dynamic"
- 2004 Neurosciences Rounds, University of Toronto, Toronto, Canada. "Magnetic Resonance Spectroscopic Imaging: Faster and Functional"
- 2004 *42<sup>nd</sup> Annual Meeting of the American Society of Neuroradiology, Seattle, USA, Advanced Imaging Seminar: 'Advanced MRSI Techniques'*
- 2004 Radiology Seminar, University Hospital Lund, 'MRI and MRS at 3T: advantages and pitfalls'
- 2003 *41<sup>st</sup> Annual Meeting of the American Society of Neuroradiology, Washington DC, USA, 'MRSI: Faster and Functional'*
- 2002 Panorama MediClinic, Capetown, South Africa, 'Clinical Applications of MR Spectroscopy'
- 2001 MR Colloquium, Amsterdam Medical Center, The Netherlands, 'SENSE: Basics and Applications'
- 2000 MR Colloquium, VA Medical Center San Francisco, 'SENSE: Sensitivity Encoding for faster MRI and MRSI'

**Conference Presentations (past three years):****2013**

- Long Z, Jiang Y-M, Li X-R, Xu J, Long L, Zheng W, Murdoch JB, **Dydak U**. In Vivo Measurement of Neurotoxic Changes in Manganese-exposed Smelters and Welders, 43rd Annual Meeting of the Society for Neuroscience, San Diego, CA, Nov 9-13, 2013.
- Yeh CL, Dharmadhikari S, Long Z, McGlothan JL, **Dydak U**, Guilarte TR. Cortical Manganese Accumulation in the Non-Human Primate Brain Measured by MRI, Ohio Valley Chapter of the Society of Toxicology, Louisville, KY, USA, Sept. 23, 2013.
- Long Z, Yeh CL, Ma R, Dharmadhikari S, Ward E, Snyder S, Zauber E, Rosenthal F, **Dydak U**. Metabolic Vulnerability of Frontal Cortex to Occupational Manganese Exposure, Ohio Valley Chapter of the Society of Toxicology, Louisville, KY, Sep 23, 2013.
- Ma R, Ward E, Long Z, Snyder SA, Murdoch JB, Bainter J, Yeh CL, Dharmadhikari S, Zauber SE, Rosenthal F, **Dydak U**. Brain GABA Levels Correlate with Manganese Exposure in Welders, Ohio-Valley chapter of Society of Toxicology, Louisville, KY, USA, Sept 23 2013.
- Ma R, Long Z, Jiang Y-M, Li X-R, Edden RAE, Murdoch JB, **Dydak U**. Increase in Thalamic GABA Levels in Mn-exposed Workers, 2nd Cardiff International Symposium on MRS of GABA. Cardiff, UK, Sept 12-13 2013.
- Long Z, Murdoch JB, Ma R, **Dydak U**. GABA Fitting for MEGA-PRESS Sequences using LCModel, 2nd Cardiff International Symposium on MRS of GABA. Cardiff, UK, Sept 12-13 2013.
- Poole V, Breedlove K, Abbas K, Shenk T, Robinson M, Leverenz L, Nauman E, **Dydak U**, Talavage T. Spectroscopic Analysis of Neuro-metabolic Changes in Female Soccer Players. 2013 OHBM Annual Meeting in Seattle, WA. June 2013.
- Ward E, Rosenthal F, Zimmerman N, **Dydak U**. Manganese Exposure Assessment – The Use of Toenails as Biomarker of Manganese Exposure. Annual Meeting AIHCE, Montreal, Canada, May 18-23, 2013.
- Dharmadhikari S, McGlothan JL, Edden R, Barker PB, Schneider J, **Dydak U**, Guilarte TR. Neurochemical Alterations in Non-human Primates Following Manganese- exposure: A 1H Magnetic Resonance Spectroscopy Study, Campbell-Klatte Annual Symposium, Indianapolis, Indiana, May 21, 2013.
- Clevenger T, Panda A, Jones S, Sandrasegaran K, Cardenes H, **Dydak U**. 31P MRSI as an Early Indicator of Response to Radiation Treatment in Liver Cancer. *ISMRM 20th Scientific Meeting & Exhibition, Salt Lake City, UT, USA, April 20-26 2013. Proc. Intl. Soc. Mag. Reson. Med. 21:5896*
- Dharmadhikari S, **Dydak U**, Dziedzic M, Romito L, Byrd K. Single voxel MEGA-edited GABA and short TE 1H MRS in hippocampus and other brain regions implicated in bruxism. *ISMRM 20th Scientific Meeting & Exhibition, Salt Lake City, UT, USA, April 20-26 2013. Proc. Intl. Soc. Mag. Reson. Med. 21:4185*
- Long Z, Jiang Y-M, Li X-R, Xu J, Long LL, Zheng W, Murdoch JB, **Dydak U**. GABA levels correlates with occupational manganese exposure and motor tests in smelters. *ISMRM 20th*

*Scientific Meeting & Exhibition, Salt Lake City, UT, USA, April 20-26 2013. Proc. Intl. Soc. Mag. Reson. Med. 21:2120*

Long Z, Jiang YM, Li XR, Xu J, Long LL, Zheng W, Murdoch JB, **Dydak U**. Comparison of Brain Metabolite Changes in Manganese-exposed Welders and Smelters. ISMRM 20th Scientific Meeting & Exhibition, Salt Lake City, UT, USA, April 20-26 2013. Proc. Intl. Soc. Mag. Reson. Med. 21:2128,

Poole V, Leverenz L, Nauman E, Talavage T, **Dydak U**. 1H MRS Suggests Chronic and Acute Injury in High School Football Players. *ISMRM 20th Scientific Meeting & Exhibition, Salt Lake City, UT, USA, April 20-26 2013. Proc. Intl. Soc. Mag. Reson. Med. 21:4317, Abstract*

Dharmadhikari S, McGlothan JL, Edden R, Barker P, Schneider J, Guilarte TR, **Dydak U**, Guilarte TR. Neurochemical alterations in the non-human primate brain during chronic exposure to manganese: a 1H MRS study. *Society of Toxicology 52nd Annual Meeting, San Antonio, TX, USA, March 10-14 2013. Toxicol Sci suppl. 132(1):1866*

Long Z, Jiang YM, Li XR, Xu J, Long LL, Zheng W, Murdoch JB, **Dydak U**. Elevated Regional Signal Intensity Indices in Mn-exposed Welders. *SOT Annual Meeting, San Antonio, TX, USA, March 10-14 2013.*

Dharmadhikari S, Yeh CL, McGlothan JL, Edden R, Barker P, Schneider J, Guilarte TR, **Dydak U**, Guilarte TR. MRI and 1H MRS evaluation of chronic manganese exposure in non-human primates. AAPM ORVC Spring Educational Symposium, March 1-2, 2013.

## 2012

Dharmadhikari S, **Dydak U**, Dziedzic M, Romito L, Byrd K. Quantification of GABA and other metabolite levels in brain regions implicated in PTSD, temporomandibular disorder, and traumatic brain injury. Poster presentation at *Society for Neuroscience, New Orleans, USA, Oct 13-17 2012.*

Poole VN, Breedlove E, Robinson M, Breedlove K, Leverenz L, Nauman E, **Dydak U**, Talavage T. Asymptomatic High School Contact Sports Athletes exhibit metabolic changes that correlate with head collision history. Poster presentation at *Society for Neuroscience, New Orleans, USA, Oct 13-17 2012. (Best Poster Award to Ms. Poole at Indianapolis Society for Neuroscience meeting, Sept 28, 2012)*

Brander WS, Jones SR, Conley TB, Sayer D, Zhou J, Fisher S, **Dydak U**, Campbell WW. Changes in Estimated of Muscle Lipid Contamination Following Transition from Standing to Supine. *Ohio River Valley Chapter of AAPM meeting, Indianapolis, IN, Oct 12, 2013.*

Jones S, Panda A, Cardenas Hm Fletcher J, Hutchins G, **Dydak U**. Spatially Resolved Evaluation of Radiation Induced Metabolic Response in Normal and Malignant Liver with 3D 31P MRSI. *Purdue University Center for Cancer Research (PUCCR) Scientific Retreat, West Lafayette, IN, USA, Sept 13, 2013.*

Clevenger T, Panda A, Jones S, **Dydak U**. Accelerated 31P Liver Magnetic Resonance Spectroscopic Imaging. *Purdue University Center for Cancer Research (PUCCR) Scientific Retreat, West Lafayette, IN, USA, Sept 13, 2013.*

- Panda A, Heberlein K, Neji R, **Dydak U**. Implementing GRAPPA for fast 2D MRSI on Siemens MAGNETOM Trio. Oral presentation at *American IDEA User Group Meeting, Utah Center for Advanced Imaging Research, Salt Lake City, UT, June 4-6 2012*.
- Panda A, Jones S, Raghavan RS, Heberlein K, Neji R, **Dydak U**. Accelerated In-vivo Liver 31P MRSI using GRAPPA. Accepted for presentation at *ISMRM 20th Scientific Meeting & Exhibition, Melbourne, Australia, May 5-11 2012. Proc. Intl. Soc. Mag. Reson. Med. 20:4422*.
- Xu J, West JD, Saykin AJ, **Dydak U**. "Assessment of automated brain region directed 3D proton spectroscopy data analysis pipeline", accepted for presentation at *ISMRM 20th Scientific Meeting & Exhibition, Melbourne, Australia, May 5-11, 2012*.
- Xu J, Brenna CM, West JD, **Dydak U**, Saykin AJ. "3D MRSI of brain neurochemical changes in breast cancer patients treated with chemotherapy", accepted for presentation at *ISMRM 20th Scientific Meeting & Exhibition, Melbourne, Australia, May 5-11, 2012*.
- Long Z, Xu J, McGlothlan JL, Edden R, Barker P, Guilarte TR, **Dydak U**. Baseline Comparison of Brain Metabolites between Rhesus Monkeys and Humans by MRS. accepted for presentation at *ISMRM 20th Scientific Meeting & Exhibition, Melbourne, Australia, May 5-11, 2012. Proc. Intl. Soc. Mag. Reson. Med. 20:4435*.
- Jones S, Panda A, Cardenes H, Fletcher J, Hutchins G, and **Dydak U**. A Spatially Resolved Evaluation of Radiation Induced Metabolic Response in Normal and Malignant Liver with 3D 31P MRSI, accepted for presentation at *ISMRM 20th Scientific Meeting & Exhibition, Melbourne, Australia, May 5-11, 2012. Proc. Intl. Soc. Mag. Reson. Med. 20: 1536*.
- Panda A, Jones S, Dydak U. Implementation of GRAPPA Algorithm for Fast 2D <sup>31</sup>P Liver MRSI. Oral presentation at *37th Annual Campbell-Klatte Lecture Series, Indianapolis, IN, April 17 2012. (Best presentation award 1st Place to Mr. Panda)*
- Jones S, Panda A, Dydak U. A Spatially Resolved Evaluation of Radiation Induced Metabolic Response in Normal and Malignant Liver with 3D <sup>31</sup>P MRSI. Oral presentation at *37th Annual Campbell-Klatte Lecture Series, Indianapolis, IN, April 17 2012*.
- Dharmadhikari S, Xu J, Epur A, Zheng W, **Dydak U**. Increased cortical GABA levels in Manganese-treated rats. *SOT Annual Meeting, San Francisco, USA, March 11-15 2012*.
- Long Z, Xu J, McGlothlan JL, Edden R, Barker P, Guilarte TR, **Dydak U**. Baseline Comparison of Brain Metabolites between Rhesus Monkeys and Humans by MRS, *SOT Annual Meeting, San Francisco, USA, March 11-15, 2012*.
- Long Z, Jiang YM, Li XR, Xu J, Long LL, Zheng W, Murdoch J, **Dydak U**. Comparison of Brain Metabolite Changes in Manganese-exposed Welders and Smelters, accepted for presentation at *SOT Annual Meeting, San Francisco, USA, March 11-15, 2012*.

## 2011

- Panda A, Jones S, Sandrasegaran K, **Dydak U**. Efficacy of <sup>31</sup>P MRS in Evaluation of Hepatocellular Carcinoma Response to Targeted Radiation Therapy. *Radiological Society of North America (RSNA) Annual Meeting, Chicago, IL, USA, Nov 27-Dec 2 2011*.

- Jones S, Panda A, **Dydak U.**  $^{31}\text{P}$  MRSI of Human Liver metabolism: Bridging the Gap between Therapy and Diagnostic Imaging, *PUCCR Annual Scientific Retreat, West Lafayette, IN, USA, Sept 8, 2011*
- Long Z, Xu J, Li XR, Long LL, Jiang YM, Zheng W, **Dydak U.** Neuroimaging of Brain Manganese and GABA as Biomarkers of Occupational Manganese Exposure. *Xi'an International Neurotoxicology Conference, Xi'an, China, June 5-11, 2011* (oral presentation).
- Dydak U,** Xu J, Epur A, Li XR, Streitmatter S, Long LL, Zheng W, Jiang YM. Brain Regions showing Manganese Accumulation in the Human versus the Rat Brain. Accepted for presentation at *ISMRM 29<sup>th</sup> Scientific Meeting & Exhibition, Montreal, Canada, May 7-13, 2011. Proc. Intl. Soc. Mag. Reson. Med. 19:239* (oral presentation)
- Dydak U,** Xu J, Marjanska M, Posse S. 3D GABA Spectroscopic Imaging using MEGA-PEPSI. Accepted for presentation at *ISMRM 29<sup>th</sup> Scientific Meeting & Exhibition, Montreal, Canada, May 7-13, 2011. Proc. Intl. Soc. Mag. Reson. Med. 19:1428*
- Jones S, Panda A, **Dydak U.** Whole Liver  $^{31}\text{P}$  Metabolite Mapping with 3D CSI. Accepted for presentation at *ISMRM 29<sup>th</sup> Scientific Meeting & Exhibition, Montreal, Canada, May 7-13, 2011. Proc. Intl. Soc. Mag. Reson. Med. 19:1429*
- Murdoch JB, **Dydak U.** Modeling MEGA-PRESS macromolecules for a better grasp of GABA. Accepted for presentation at *ISMRM 29<sup>th</sup> Scientific Meeting & Exhibition, Montreal, Canada, May 7-13, 2011. Proc. Intl. Soc. Mag. Reson. Med. 19:1394.*
- Long Z, Murdoch JB, Goddard AW, **Dydak U.** Do Cortical GABA Levels Correlate with Age? Accepted for presentation at *ISMRM 29<sup>th</sup> Scientific Meeting & Exhibition, Montreal, Canada, May 7-13, 2011. Proc. Intl. Soc. Mag. Reson. Med. 19:4054*
- Long Z, Murdoch JB, Xu J, **Dydak U.** GABA Fitting for MEGA-PRESS Sequences with Different Selective Inversion Frequencies. Accepted for presentation at *ISMRM 29<sup>th</sup> Scientific Meeting & Exhibition, Montreal, Canada, May 7-13, 2011. Proc. Intl. Soc. Mag. Reson. Med. 19:1399 (ISMRM student travel award to Z. Long)*
- Conley T, Jones S, **Dydak U,** Talavage T, Tamer G, Grindle M, Campbell W. Research Imaging Techniques to Assess Human Skeletal Muscle Size and Composition. *Indiana CTSI 3rd Annual meeting, April 25 2011.*
- Poole V, Talavage T, **Dydak U.** Reproducibility of Metabolite Quantification in the College Student Brain. *Poster Presentation at Interdisciplinary Graduate Program Spring Reception, Purdue University, April 20, 2011.*
- Long Z, Jiang YM, Li XR, Xu J, Long LL, Zheng W, **Dydak U.** Neuroimaging of Manganese Toxicity: GABA and Metabolic Changes in the Human Brain. *SOT Annual Meeting, Washington D.C., USA, March 6-10 2011. Toxicol Sci suppl.*
- Xu J, Li XR, Jun X, Streitmatter S, Long LL, Zheng W, Jiang YM, **Dydak U.** Neuroimaging of Manganese Toxicity: Effect of Exposure Time on Mn Accumulation in the Human Brain. *SOT Annual Meeting, Washington D.C., USA, March 6-10 2011. Toxicol Sci suppl.*
- Epur A, Xu J, Zheng W, **Dydak U.** Neuroimaging of Manganese Toxicity: Therapeutic Effect of Para-Aminosalicylic Acid in a Rat Model. *SOT Annual Meeting, Washington D.C., USA, March 6-10 2011. Toxicol Sci suppl.*

Panda A, **Dydak U.** Clinical Challenges in Implementing 31P MR Spectroscopy of Focal Liver Lesions. *AAPM Ohio River Valley Spring 2011 Educational Symposium, Cincinnati, OH, USA, March 3-4, 2011.* (oral presentation)

Jones S, Panda A, **Dydak U.** Whole Liver <sup>31</sup>P Metabolite Mapping with 3D CSI. *AAPM Ohio River Valley Spring 2011 Educational Symposium, Cincinnati, OH, USA, March 3-4, 2011.*

### **Ongoing Research Support**

Dydak (PI)

Purdue Research Foundation Research Award 06/01/2013 – 05/31/2014

*GABA MR spectroscopy as a potential biomarker for Parkinson disease*

This project will use magnetic resonance spectroscopy to study the hypothesis that increased basal ganglia GABA levels might serve as early biomarker in Parkinson's Disease.

Role: PI

Louis (PI)

**NIH/NINDS R01** NS085136 09/15/2013 – 08/31/2018

*In Vivo Quantification of Cerebellar GABA and NAA in Essential Tremor*

This project makes use of MRS to measure GABA levels in the cerebellar dentate and NAA in the cortex in a longitudinal study to elucidate the underlying pathophysiology of essential tremor

Role: Co-I

Talavage (PI)

08/01/2012 – 07/31/2014

Indiana CTSI, Spinal Cord and Brain Injury Research Fund (SCBI 207-32)

*MR Spectroscopic Quantification of Brain Injury in High School Athletes*

To assess metabolic changes and their association with hit history and cognitive outcomes in high school football players.

Role: Co-PI

Dydak (PI)

**NIH/NIEHS ONES R01** ES020529 09/12/2011 – 04/30/2016

*Neuroimaging for Early Diagnosis of Manganese Toxicity in Humans and Rodents*

This grant aims to develop and use novel MRI and MRS techniques to find biomarkers of effect and explore the underlying mechanism of Manganese neurotoxicity in the human and the rodent brain.

Role: PI

Dydak (PI)

Purdue University Center for Cancer Research Challenge Grant 04/01/2012-03/31/2014

*3D 31P MRSI of Human Liver: A Spatially-resolved Study of Normal and Malignant Tissue Response to Radiation Therapy*

Role: PI

Neu (PI)

**NIH/NIAMS R21** MH098931

09/01/2012 – 08/31/2014

*Combined Biophysical and Biochemical Study of Single Cells*

The objective of this application is to develop a hybrid magnetic resonance-based nanotechnology that enables simultaneous imaging and spectroscopy of single cells.

Role: Co-I

**Completed Research Support**

Campbell W (PI)

National Dairy Council

09/01/2011 - 09/30/2013

*Effects of milk protein concentrate on blood pressure, inflammation, muscle composition, and metabolic health in overweight/obese adults*

To assess the effects of an energy restriction, higher protein diet achieved using milk protein concentrate beverage supplements on blood pressure, inflammation, muscle composition, and metabolic health in overweight/obese adults before, at mid-point and after a 16-wk dietary intervention.

Role: Co-I

Dydak (PI)

06/01/2012 – 05/31/2013

Purdue Research Foundation Research Award

*MR spectroscopy for understanding brain gamma-aminobutyric acid (GABA) alteration and its association with dopamine (DA) neuronal degeneration in manganese (Mn)-induced Parkinsonism*

Role: PI

Dydak (PI)

09/05/2009 – 06/30/2011

**NIH/NIEHS R21 ES017498**

Effect of Manganese Exposure on GABA and Glutamate in Human Brains by MRS

This project will apply novel MRI/MRS techniques to explore the changes in brain metabolism caused by Mn exposure among smelting workers and patients with Mn-induced Parkinsonism.

Role: PI

Dydak (PI)

01/01/2011 – 12/31/2012

CTSI Core Pilot Funding

*In-Vivo GABA MRS of Metal Toxicity in the Human Brain*

To install and test the GABA-editing technique MEGA-PRESS at the Purdue MRI scanner and acquire pilot data in five Mn-exposed welders.

Role: PI

Dydak (PI)

01/01/2010 – 12/31/2012

CTSI Core Pilot Funding

Development of Fast GABA Mapping in the Human Brain

To develop and test the technique of MEGA-PEPSI for GABA spectroscopic imaging in phantoms and in vivo.

Role: PI

- Janle E (PI) 05/01/2012 – 04/30/2013  
Mead Johnson  
*Assessment of the bioavailability and functionality of brain-targeting polyphenol metabolites in piglets*  
Role: Co-I
- Campbell W (PI) 01/01/2011 – 12/31/2012  
American Egg Board –Egg Nutrition Center  
*Effect of increased egg-based protein intake on muscle composition, metabolic health and systemic inflammation in obese older adults.*  
Role: Co-I
- Goddard and Dydak (PIs) 03/01/2009 – 02/28/2011  
Indiana CBR/CTR Pilot Grant  
GABA Neuronal Dysfunction in Panic Disorder: Assessing the Effect of Family History  
The major goals of the project are to demonstrate that the magnitude of the cortical GABA deficit in patients with panic disorder is related to the presence or absence of a family history of panic disorder by MRS.  
Role: Co-PI
- Anand/Dydak (PI) 08/01/2009 – 06/30/2013  
Indiana CBR/CTR Pilot Grant (CTSI)  
Neurochemistry of Mood Regulating Circuit in Bipolar Disorder: An Ultrafast Whole Brain Magnetic Resonance Spectroscopy (MRS) Study  
The major goal of this pilot project is to use the whole brain PEPSI-MRSI sequence to assess brain metabolism and its changes in untreated patients with bipolar disorder.  
Role: Co-PI
- Dydak/Sandrasegaran (PI) 07/01/2009 – 06/30/2011  
Indiana CBR/CTR Pilot Grant (CTSI)  
31P magnetic resonance spectroscopy in liver cancer: Evaluation of response to yttrium-90 radio-embolization therapy  
The major goal of this pilot project is to test feasibility and reproducibility of acquiring 31P MRSI data from liver cancer tumors treated with yttrium-90 radio-embolization.  
Role: PI
- Sandrasegaran (PI) 09/01/2008 - 08/31/2010  
Showalter Trust Award – Indiana University  
*Determination of Response Of Hepatocellular Cancer to Stereotactic Body Radiation Therapy: Value of Diffusion-Weighted Magnetic Resonance Imaging and Phosphorus-31 MR Spectroscopy*  
Diffusion-Weighted MRI and Phosphorus-31 MR Spectroscopy are applied to monitor the response of hepatocellular cancer to stereotactic Body Radiation Therapy.  
Role: Co-investigator
- Dydak (PI) 07/01/2009 – 06/30/2010  
Showalter Trust Award – Purdue University



New Therapeutic Treatment of Manganese Parkinsonism by Para-amino Salicylic Acid: Magnetic Resonance Imaging and Spectroscopy Study

The major goals of the project are to explore the effects of Para-amino salicylic acid as a therapeutic agent for manganese by means of MRS in the rat.

Dydak (PI) 12/01/2007 – 09/30/2010  
IUSM – Siemens Pilot Funding Program  
*Implementation and Evaluation of fast MRSI techniques for brain and body MRSI at 3T*  
Implementation and optimization of parallel spectroscopic imaging methods (SENSE and GRAPPA), as well as an EPI-based and a multiple-spin-echo based technique on a Siemens 3T MRI scanner. Evaluation of the optimal techniques for applications in human brain and breast.  
Role: PI

Sandrasegaran (PI) 03/01/09 – 02/28/10  
Society of Gastrointestinal Radiologists  
*Early Prediction of the Response of Hepatocellular Cancer to Yttrium-90 Radio-embolization using MRI and MR Spectroscopy*  
This study will investigate the value of diffusion-weighted MRI and 1H-MRS to monitor the response of hepatocellular cancer to Yttrium-90 Radio-embolization therapy.  
Role: Co-investigator

Zheng (PI) 04/01/08 - 03/31/09  
U.S. DoD USAMRMC W81XWH-05-1-0239  
MRI and MRS in Manganese-Exposed Smelting Workers: Relationship to External and Internal Exposure Indices  
This study will use magnetic resonance imaging and spectroscopic techniques to mechanistically explore Mn-elicited neuronal damage among a well-established smelter cohort in Zunyi, China.  
Role: Co-investigator

34250603 Sandor (PI) 09/24/2003 – 12/31/2006  
Merck Medical School Grant,  
*Neuronal activity and metabolism in the common forms of migraine, including central effects of rizatriptan, studied with functional magnetic resonance techniques.*  
This study investigated changes in metabolism during extended periods of visual stimulation in common forms of migraine, including the effects of the medication rizatriptan, by means of dynamic MR spectroscopic imaging.  
Role: Co-Investigator

SEP TH-7/02-2 Boesiger (PI) 06/2002 – 06/2005  
Strategic Excellence Projects, ETH Zurich  
*User lab MRI: New Magnetic Resonance Imaging Techniques for the Assessment of Brain and Heart Function*  
Methodological developments of high field (3T) MRI and MRS techniques for the assessment of brain and heart function  
Role: Co-Investigator

54250601 Sandor (PI) 10/01/2002 – 12/31/2004

Research Grant of the University Zurich

*Neuronal activity and metabolism in the common forms of migraine and the effect of prophylaxis studied with functional magnetic resonance techniques.*

This study investigated possible changes in metabolism during extended periods of visual stimulation in patients with common forms of migraine and control subjects by means of dynamic MR spectroscopic imaging.

Role: Co-Investigator