

Curriculum Vitae
Benjamin B. Williams, Ph.D.

CONTACT INFORMATION

Name: Benjamin B. Williams
Home Address: 7 Austin Avenue
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EDUCATION

Ph.D. December 2003, Committee on Medical Physics, University of Chicago, Chicago, IL
Thesis: "Acquisition and reconstruction of *in vivo* electron paramagnetic resonance oxymetric images,"
Advisor: Dr. Howard J. Halpern

Bachelor of Arts, *summa cum laude*, High Honors in Physics with Distinction on the Senior Exercise,
Minor Concentration of Study in Mathematics, Kenyon College, Gambier, OH
Thesis: "The Evaluation of Several Scatter Correction Techniques for Nuclear Medicine through the use
of Monte Carlo Simulation," Advisor: Professor John Idoine

HONORS

IEEE Medical Imaging Conference Student Travel Award (2002)
Best Presentation Award, Medical Physics Journal Club, University of Chicago (2001-2002)
IEEE Medical Imaging Conference Student Travel Award (2001)
Bernard Smaller Prize for Magnetic Resonance Research, University of Chicago (1999)
Society of Nuclear Medicine Student Fellowship (1994)
Elected to Phi Beta Kappa, Kenyon College (1994)
Elected to Sigma Xi, Scientific Honor Society, Kenyon College (1993)
Elbe Johnson Award, Physics Department, Kenyon College (1992)
Kikkoman Scholarship for Student Exchange to Japan (1990)

PROFESSIONAL MEMBERSHIPS

American Association of Physicists in Medicine (AAPM), (1996 - present)
Institute of Electrical and Electronics Engineers (IEEE), (2001 - present)

RESEARCH EXPERIENCE

Research Associate, Dartmouth Medical School, Department of Radiology, Hanover, NH,
October 2003 – present

- Investigating the use of paramagnetic particulate materials to estimate heterogeneous *in vivo* tissue oxygen concentrations using EPR spectroscopy

Research Assistant, Center for EPR Imaging *In Vivo* Physiology, University of Chicago, Chicago, IL,
September 1997 – October 2003

- Investigated 3D oxygen concentration in a mouse tumor model using 250MHz electron paramagnetic resonance imaging (EPRI) and triphenylmethyl spin probes
- Developed software for EPRI, including computer controlled data acquisition, 4D filtered-backprojection (FBP) image reconstruction, and data analysis
- Implemented FBP reconstruction using multiprocessing, on a UNIX platform, for increased computational speed and the handling of large image data sets
- Theoretically modeled EPRI procedure, relating collected EPR spectra with the Radon transform, including the effects of magnetic field modulation
- Developed and evaluated novel EPRI data sampling and reconstruction algorithms for decreased image acquisition times
- Correlated EPRI oxygen measurements with Blood Oxygen Level Dependent (BOLD) MRI in mouse tumors
- Designed and performed *in vivo* mouse imaging experiments, including the administration of anesthesia, spin probes, and variable breathing atmospheres, as well as general animal care and monitoring.
- Assisted in 250MHz EPRI spectrometer electronics development, engineering, and troubleshooting.
- MATLAB, Fortran, Modula-2, GPIB, and CAMAC computer programming

Research Assistant, Kurt Rossmann Laboratory, Department of Radiology, University of Chicago, IL,
September 1995 - September 1997

- Developed and implemented strategies for the determination of the 3D position of pacemaker leads from biplane angiograms
- IDL and C computer programming

Society of Nuclear Medicine Student Fellow, Department of Nuclear Medicine, Brigham and Women's Hospital, Boston, MA, June - September 1994, June - August 1995

- Investigated the accuracy of scatter correction methods used in single photon emission computed tomography (SPECT)
- C computer programming

Laboratory Technician, Yerkes Observatory, University of Chicago, Williams Bay, WI,
August 1990 - September 1991, May - September 1992

- Assessed performance of CCD cameras in preparation for South Pole applications
- Troubleshooting of 24" reflector telescope motor drive

REFERENCES

Dr. Harold M. Swartz, Dartmouth Medical School, harold.m.swartz@dartmouth.edu

Dr. Howard Halpern, University of Chicago, h-halpern@uchicago.edu

Dr. Colin Mailer, University of Chicago, cmailer@rover.bsd.uchicago.edu

PEER REVIEWED PUBLICATIONS

Mailer C, Robinson BH, Williams BB, Halpern HJ. Spectral Fitting: The Extraction of Crucial Information from a Spectrum and a Spectral Image. *Magnetic Resonance in Medicine* 2003;49:1175-1180.

Elas M, Williams BB, Parasca A, Mailer C, Pelizzari CA, Lewis MA, Rivers JN, Karczmar GS, Barth ED, Halpern HJ. Quantitative Tumor Oxymetric Images from 4D Electron Paramagnetic Resonance Imaging (EPRI): Methodology and Comparison with Blood Oxygen Level-Dependent (BOLD) MRI. *Magn. Reson. Med.*, 49(4), 682-691, (2003)

Williams BB, al Hallaq H, Chandramouli GV, Barth ED, Rivers JN, Lewis M, Galtsev VE, Karczmar GS, Halpern HJ. Imaging spin probe distribution in the tumor of a living mouse with 250 MHz EPR: correlation with BOLD MRI. *Magn. Reson. Med.*, 47(4), 634-8, (2002).

Halpern HJ, Chandramouli GVR, Barth ED, Williams BB, Galtsev VE. Approaches to problems in high resolution in vivo spectral spatial imaging with radiofrequency EPRI. *Curr. Top. Biophys.*, 23(1), 5-10, (1999).

Hoffmann KR, Williams BB, Esthappan J, Chen SY, Carroll JD, Harauchi H, Doerr V, Kay GN, Eberhardt A, Overland M. Determination of 3D positions of pacemaker leads from biplane angiographic sequences. *Medical Physics* 24(12), 1854-1862, (1997).

Hoffmann KR, Sen A, Lan L, Williams BB, Chua KG, Doi K. 3D vascular analysis from biplane angiograms. *Radiology* 205P, 475, (1997).

Zimmerman RE, Williams BB, Chan KH, Moore SC, Kijewski MF. Limitations of DPW scatter correction for brain imaging. *Journal Of Nuclear Medicine* 38, 1902-1906, (1997).

CONFERENCE PROCEEDINGS PAPERS

Pan X, Williams BB, Halpern HJ. 3D and 4D EPRI: A theoretical investigation. *Proceedings of the VIIth International Conference on Fully 3D Reconstruction in Radiology and Nuclear Medicine*, Saint-Malo, France, (2003)

Williams BB, Ichikawa K, Kao C-M, Halpern H, X P. Deblurring and Noise Suppression in Spatial EPR Imaging. *IEEE Medical Imaging Conference Record*, Norfolk, VA, (2002).

Williams BB, Elas M, Mailer C, Parasca AD, Barth ED, Galtsev VE, Halpern HJ. Fast 4D Spectral-Spatial Electron Paramagnetic Resonance Imaging for In Vivo Oxymetry. *IEEE Medical Imaging Conference Record*, San Diego, CA, (2001).

Williams BB, Barth E, Galtsev VE, Mailer C, Halpern HJ. Two-dimensional Oxymetric Imaging using 250MHz Electron Paramagnetic Resonance. *CD-ROM Proc. of the World Congress on Medical Physics and Biomedical Engineering*, Chicago, IL, (2000).

Hoffmann KR, Williams BB, Esthappan J, Chen SY, Fiebich M, Carroll JD, Harauchi H, Doerr V, Kay GN, Eberhardt A, Overland M. Analysis of 3D motion of in-vivo pacemaker leads. *Proc. SPIE* 3034, 594-598, (1997).

Hoffmann KR, Sen A, Lan L, Metz CE, Chua KG, Williams BB, Esthappan J, Fiebich M, Mazzuco M, Doi K. Determination of 3D vessel trees from biplane images for coronary angiography. Proc CAR '97, 162-165, (1997).

Williams BB, Esthappan J, Hoffmann KR. Improved 3D reconstruction of pacemaker leads. Proc. IEEE Engineering in Medicine and Biology Society Conference, Chicago, IL, 854-856, (1997).

Hoffmann KR, Chen SY, Esthappan J, Williams BB, Metz CE, Harauchi H, Carroll JD. Evaluation of the reliability of calculated 3D vascular trees and their alignment with other views. Computers in Cardiology, 113-116, (1996).

PUBLISHED ABSTRACTS AND PRESENTATIONS

Williams BB, Ahn K-H, Mailer C, Halpern HJ. Extraction of linewidth information from spatial-spectral EPR images using spectral fitting. 44th Rocky Mountain Conference on Analytical Chemistry, EPR Symposium, Denver, CO, (2002).

Williams BB, Ichikawa K, Kao C-M, Pan X, Halpern HJ. A regularized inverse-filtering technique for suppressing noise and blurring in spatial EPR imaging. 44th Rocky Mountain Conference on Analytical Chemistry, EPR Symposium, Denver, CO, (2002).

Mailer C, Williams BB, Halpern HJ. Calibration of oxygen sensitivity of narrow line width spin labels. 44th Rocky Mountain Conference on Analytical Chemistry, EPR Symposium, Denver, CO, (2002).

Elas M, Mailer C, Williams BB, Parasca A, Barth E, Pelizzari C, Subramanian V, Ichikawa K, Rinard G, Quine RW and others. Quantitative, calibrated oxygen images of tumors in living mice with EPR imaging. 44th Rocky Mountain Conference on Analytical Chemistry, EPR Symposium, Denver, CO, (2002).

Subramanian V, Mailer C, Ichikawa K, Barth E, Williams BB, Halpern H. Fixed-frequency Operation of a Low Frequency Continuous Wave EPR Imaging Spectrometer. 44th Rocky Mountain Conference on Analytical Chemistry, EPR Symposium, Denver, CO, (2002).

Williams BB, Barth E, Mailer C, Halpern HJ. Practical Considerations for Fast CW EPRI. 9th International Meeting on EPR Studies in Viable Systems, Dartmouth College, Hanover, NH, (2001).

Elas M, Mailer C, Williams BB, Parasca A, Barth E, Rinard G, Quine RW, Eaton GR, Eaton SS, Halpern HJ. New developments in in vivo imaging at 250 MHz. 9th International Meeting on EPR Studies of Viable Systems, Dartmouth College, Hanover, NH, (2001).

Williams BB, Elas M, Mailer C, Parasca A, Barth E, Galtsev VE, Halpern HJ. Mouse tumor oxygen concentration mapping through 4-dimensional EPRI. 43rd Rocky Mountain Conference on Analytical Chemistry, EPR Symposium, Denver, CO, (2001).

Mailer C, Williams BB, Halpern HJ. Imaging experiments and line width analysis. 43rd Rocky Mountain Conference on Analytical Chemistry, EPR Symposium, Denver, CO, (2001).

Elas M, Williams BB, Mailer C, Parasca A, Barth E, Galtsev VE, Zamora M, River JM, Fan X, Karczmar GS, Halpern HJ. Tumor oxygenation mapping using 4-D spectral-spatial imaging and very low frequency EPR. 43rd Rocky Mountain Conference on Analytical Chemistry, EPR Symposium, Denver, CO, (2001).

Williams BB, Mailer C, Barth E, Galtsev VE, Halpern HJ. An analysis of signal height dependence on gradient strength, spatial spin distribution, and modulation amplitude in CW EPRI. 42nd Rocky Mountain Conference on Analytical Chemistry, EPR Symposium, Broomfield, CO, (2000).

Williams BB, Mailer C, Barth E, Galtsev VE, Halpern HJ. An effective field-frequency lock for VLF EPR in vivo spectroscopy. 42nd Rocky Mountain Conference on Analytical Chemistry, EPR Symposium, Broomfield, CO, (2000).

Halpern HJ, Williams BB, Mailer C, Galtsev VE, Barth E, Chandramouli GV. Holding the line: Extraction of EPR line parameters with in vivo radiofrequency EPR imaging (EPRI). 42nd Rocky Mountain Conference on Analytical Chemistry, EPR Symposium, Broomfield, CO, (2000).

Galtsev VE, Mailer C, Williams BB, Barth E, Halpern HJ. Instrumental solutions for low frequency in vivo EPR spectroscopy. 42nd Rocky Mountain Conference on Analytical Chemistry, EPR Symposium, Broomfield, CO, (2000).

Williams BB, Barth E, Galtsev VE, Halpern HJ. Minimization of data acquisition times for 3D spectral-spatial imaging of living mouse tumors. 41st Rocky Mountain Conference on Analytical Chemistry, EPR Symposium, Denver, CO, (1999).

Williams BB, Chandramouli GV, Barth E, Galtsev VE, Halpern HJ. Information content in radiofrequency EPR spectral-spatial images of tumors in living mice. 41st Rocky Mountain Conference on Analytical Chemistry, EPR Symposium, Denver, CO, (1999).

Galtsev VE, Barth E, Williams BB, Halpern HJ. Direct amplification low frequency CW EPR spectroscopy. 41st Rocky Mountain Conference on Analytical Chemistry, EPR Symposium, Denver, CO, (1999).

Halpern HJ, Barth E, Chandramouli GV, Galtsev VE, Williams BB, Rosen GM. In vivo pharmacokinetics of a novel, stable nitric oxide spin trapping adduct, DTCS. 40th Rocky Mountain Conference on Analytical Chemistry, EPR Symposium, Denver, CO, (1998).

Halpern HJ, Chandramouli GV, Williams BB, Barth E, Galtsev VE. Challenges of 3- and 4-dimensional in vivo spectral-spatial EPR imaging at radiofrequencies with narrow-line spin probes. 40th Rocky Mountain Conference on Analytical Chemistry, EPR Symposium, Denver, CO, (1998).

BB Williams, J Esthappan, KR Hoffmann. Temporal Interpolation of Vessel-like Structures in Cardiac Biplane Angiography. 39th Annual Meeting and Exhibition of the American Association of Physicists in Medicine, Milwaukee, WI, (1997).

A Sen, L Lan, BB Williams, K Doi, KR Hoffmann. Quantitative Evaluation of Vessel Tracking Techniques on Clinical Coronary Angiograms. 39th Annual Meeting and Exhibition of the American Association of Physicists in Medicine, Milwaukee, WI, (1997).

KR Hoffmann, A Sen, K Chua, L Lan, BB Williams, CE Metz, M Mazzucco, M Fiebich, J Esthappan, K Doi. 3D Vascular Analysis from Biplane Angiograms. 39th Annual Meeting and Exhibition of the American Association of Physicists in Medicine, Milwaukee, WI, (1997).

INVITED PRESENTATIONS

Davis Heart & Lung Research Institute, Ohio State University, "In vivo oxymetry: CW-EPR imaging at 250 MHz," (April 28, 2003)

EPR Center for the Study of Viable Systems, Dartmouth Medical School, "In vivo oxymetry: CW-EPR imaging at 250 MHz," (March 4, 2003)

Kenyon College Physics Colloquium, "In-vivo Oxymetry Using Electron Paramagnetic Resonance Imaging," (September 28, 2001).