

BIOGRAPHICAL SKETCH

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NAME Timothy J. Carroll, Ph.D.		POSITION TITLE Assistant Professor of Biomedical Engineering and Radiology	
eRA COMMONS USER NAME TCARROLL			
EDUCATION/TRAINING (Begin with baccalaureate or other initial professional education, such as nursing, and include postdoctoral training.)			
INSTITUTION AND LOCATION	DEGREE (if applicable)	YEAR(s)	FIELD OF STUDY
University of Illinois, Urbana, IL	BS	1985	Physics
University of Illinois, Chicago, IL	PhD	1994	High Energy Physics
Max Plank Institute, Munich, Germany	Fellow	1994-7	High Energy Physics
University of Wisconsin, Madison, WI	Fellow	1997-9	Medical Imaging

A. Positions and Honors**Positions**

June 1984– June 1986 Technician. University of Illinois, Urbana, IL, High Energy Physics Research Grp
 Sept. 1986– May 1994 Research Assistant. Fermi National Accelerator Laboratory
 May 1994 – Dec 1997 Postdoctoral Fellow. Max-Planck Institut fuer Physik, Munich, Germany
 Jan 1997 – Jan 2000 Postdoctoral Trainee, University of Wisconsin-Madison
 Jan 2000 – Feb 2002 Assistant Scientist. University of Wisconsin-Madison
 April 2002 – Oct 2003 Visiting Scientist. University of Wisconsin-Madison
 Mar 2002 – present Assistant Professor. Northwestern University
 Sep 2006 – present Associate Editor: **Radiology**

June 2002 – present Scientific Reviewer for **Radiology**.
 Dec 2003, Dec 2004 **Radiology** Editors Recognition Award for reviewing with “Distinction”.
 June 2004-present Scientific Reviewer for **Journal of Magnetic Resonance Imaging**.
 March 2005-present Scientific Reviewer for **American Journal of Roentgenology**.
 July 2005-present Scientific Reviewer for **American Journal of Neuroradiology**.
 July 2005-present Scientific Reviewer for **Magnetic Resonance in Medicine**.
 Dec 2004 Abstract Reviewer **Intl Soc Magn Reson Med (ISMRM)**.

Honors

Sept 1999 Awarded US Patent No 6,195,579 B1: “Contrast Detection and Guided Reconstruction in Contrast-Enhanced Magnetic Resonance Angiography”, **Timothy J. Carroll** and Charles A. Mistretta.
 Oct 2001 Awarded US Patent No 6,381,486: “Magnetic Resonance Angiography with Vessel Segmentation”, Thomas Grist, Yousef Mazaheri, **Timothy J. Carroll** and Charles A. Mistretta.
 April 2003: Awarded US Patents No. 6,546,275 “Determination of the Arterial Input Function In Dynamic Contrast-Enhanced MRI”, **Timothy J. Carroll**

B. Selected peer-reviewed publications (in chronological order)

Dr Carroll has authored 42 peer-reviewed publications, 6 invited publications, 3 book chapters, and holds 3 US patents, 2 provisional Patents.

1) The E665 Collaboration (Adams MR, *et al.*). “Shadowing in the Muon-Xenon Inelastic Scattering Cross Section at 490 GeV”, *Phys Lett B* 287; 375-380: 1992.

- 2) The E665 Collaboration (M.R. Adams *et al.*). "The Saturation of Shadowing at Very Low x_{Bj} ", *Phys Rev Lett* 68; 3266-3269: 1992.
- 3) The E665 Collaboration (Adams MR, *et al.*). "Measurement of the Ratio σ_n/σ_p in Inelastic Muon-Nucleon Scattering at Very Low x and Q^2 ", *Phys Lett B* 309; 477-482: 1993.
- 4) The E665 Collaboration (Adams MR, *et al.*). "Scaled Energy (z) Distributions of Charged Hadrons Observed in Deep-Inelastic Muon Scattering at 490 GeV from Xenon and Deuterium Targets", *Phys Rev D* 50; 1836-1873: 1994.
- 5) The E665 Collaboration (Adams MR, *et al.*). "Production of Charged Hadrons by Positive Muons on Deuterium and Xenon at 490 GeV", *Z Phys C* 61; 179: 1994.
- 6) The E665 Collaboration (Adams MR, *et al.*). "Nuclear Shadowing, Diffractive Scattering and Low Momentum Protons in μ Xe Interactions at 490 GeV", *Z Phys C* 65; 225-244: 1995.
- 7) The E665 Collaboration (Adams MR, *et al.*). "Measurement of Nuclear Transparencies from
- 8) Exclusive ρ^0 Meson Production in Muon-Nucleus Scattering at 470 GeV", *Phys Rev Lett* 74; 1525-1529:1995.
- 9) The E665 Collaboration (Adams MR, *et al.*). "Nuclear Decay Following Deep Inelastic Scattering of 470 GeV Muons", *Phys Rev Lett* 74; 5198-5201: 1995.
- 10) The E665 Collaboration (Adams MR, *et al.*). "Extraction of the Ratio F2(N)/F2(P) From Muon-Deuteron and Muon-Proton Scattering at Small x and Q^2 ", *Phys Rev Lett* 75; 1466-1470:1995.
- 11) The E665 Collaboration (Adams MR, *et al.*). "Shadowing in Inelastic Scattering of Muons on Carbon, Calcium and Lead at Low x_{Bj} ", *Z Phys C* 67; 403-410:1995.
- 12) The E665 Collaboration (Adams MR, *et al.*). "Proton and Deuteron Structure Functions in Muon Scattering at 470 GeV", *Phys Rev D* 54; 3006-3056:1996.
- 13) The E665 Collaboration (Adams MR, *et al.*). "Measurement of the Gluon Distribution Function of the Nucleon using Energy-Energy Angular Pattern in Deep-Inelastic Lepton Scattering", *Z Phys C*; 71; 391-404: 1996.
- 14) The E665 Collaboration (Adams MR, *et al.*). "Diffractive production of ρ^0 (770) mesons in muon-proton interactions at 470 GeV". *Z Phys C* 74; 237-261:1997.
- 15) The E665 Collaboration (Adams MR, *et al.*). "Inclusive single-particle distributions and transverse momenta of forward produced charged hadrons in μ -p scattering at 470 GeV". *Z Phys C* 76; 441-463: 1997.
- 16) Mistretta CA, Grist TM, Korosec FR, Frayne R, Peters DC, Mazaheri Y, **Carroll TJ**. "3-D Time resolved contrast-enhanced MR-DSA: Advantages and Tradeoffs". *Magn Reson Med* 40; 571-581: 1998.
- 17) Zhou Y, **Carroll TJ**, Grist TM, Frayne R. "Design and Validation of a motion stage for in vitro MR experiments", *J Magn Reson Imaging* 10; 972-977: 1999.
- 18) The E665 Collaboration (Adams MR, *et al.*) " Λ and Λ polarization from deep inelastic muon scattering." *Eur Phys J* 17; 263-267:2000.
- 19) **Carroll TJ**, Korosec FR, Swan S, Grist TM, Frayne R, Mistretta CA. "A Method for Rapidly Determining and Reconstructing the Peak Arterial Frame From a Time Resolved CE-MRA Exam", *Magn Reson Med* 44; 817-820: 2000.
- 20) **Carroll TJ**, Korosec FR, Swan JS, Hany TF, Grist TM, Mistretta CA. "The Effect of Injection Rate on Contrast Enhanced Peripheral MRA." *J Magn Reson Image* 14; 401-410: 2001.
- 21) **Carroll TJ**, Korosec FR, Petermann GM, Grist TM, Turski PA. "Carotid Bifurcation: Evaluation of Time-resolved Three-dimensional MR Angiography". *Radiology* 220; 525-532: 2001.
- 22) Hany TF, **Carroll TJ**, Omary RA, et al "Aorta and Runoff Vessels: Single-Injection MR Angiography with Automated Table Movement Compared with Multiinjection Time-resolved MR Angiography—Initial Results." *Radiology* 221; 266-272:2001
- 23) Du J, **Carroll TJ**, Wagner HJ, et al "Time-Resolved, Undersampled Projection Reconstruction Imaging for High Resolution CE-MRA of the Distal runoff vessels" *Magn Reson Med* 48;516-22:2002.
- 24) Wieben O, **Carroll TJ**, Swan JS and Frayne R. "Rapid Generation of Preview Images for Real-time 3D MR Angiography", *Phys. Med. Biol.* 47; 17-24: 2002.
- 25) Mazaheri Y, **Carroll TJ**, Du J, et al , "Combined Time-Resolved and High Spatial Resolution 3D MRA using an extended adaptive acquisition." *J Magn Reson Imaging*, 15;291-301: 2002.

- 26) **Carroll TJ**, Haughton VM, Rowley HA and Cordes D. "Confounding effect of large vessels on MR Perfusion Images Analyzed with Independent Component Analysis (ICA)." *AJNR Am J Neuroradiol*.23: 1007-1012;2002.
- 27) Swan JS, **Carroll TJ**, Kennell TW, et al. "Time-Resolved 3D Contrast-Enhanced MRA of the Peripheral Vessels", *Radiology* 225;43-52:2002.
- 28) **Carroll TJ**, Jobin M, Treyer V, Hany TF, Burger C, Teneggi V and Buck A. "Absolute Quantification of Cerebral Blood Flow with MR, Reproducibility of the Method and Comparison with H₂¹⁵O PET." *J Cereb Blood Flow Metab* 22;1149-56:2002.
- 29) **Carroll TJ**, HA Rowley and Haughton. "Automating the determination of the arterial input function for assessment of regional cerebral blood flow with MRI". *Radiology*. 227;593-600: 2003.
- 30) Du J, **Carroll TJ**, Block WF, Fain SB, Korosec FR, Grist TM and Mistretta CA. "SNR Improvement for Multiinjection Time-Resolved High-Resolution CE-MRA of the Peripheral Vasculature" *Magn Reson Med* 49;909-917:2003.
- 31) Omary RA, Schirf BE, Green JD, Kanwar YS, Shea SM, **Carroll TJ**, Carr J, Li D. "Catheter-directed MR Angiography and Cross-sectional Imaging for the Assessment of Renal Artery Stenosis. *J Vasc Interv Radiol* 16(2):255-60: 2005.
- 32) Sakaie KE, Shin W, Curtin KR, McCarthy RM, Cashen TA, **Carroll TJ**. "A Method for Improving the Accuracy of Quantitative Cerebral Perfusion Imaging", *J Magn Reson Imaging*, 21(5):512-519: 2005.
- 33) Cashen, TA, Carr JC, Shin W, Walker MT, Futterer S, Shaibani A and **Carroll TJ**, "Intracranial Time-Resolved Contrast-Enhanced MR Angiography at 3T", *AJNR Am Journ Neuroradiol*. 27(4): 822-9: 2006.
- 34) Shaibani A, Khawar S, Shin W, Cashen TA, Schirf B, Rohani M. Kakodkar S and **Carroll TJ**, "First Results in a MRI-Compatible Canine Model of Acute Stroke. *AJNR Am Journ Neuroradiol*. 27(8):1788-93, 2006.
- 35) Koktzoglou I, Chung YC, Mani V, **Carroll TJ**, Morasch MD, Mizsei G, Simonetti OP, Fayad ZA, Li D. Multi-slice Dark-Blood Carotid Artery Wall Imaging: A 1.5 T and 3.0 T Comparison, *J Magn Reson Imaging* 23(5), 699-705, 2006.
- 36) Shin W, Cashen TA, Horowitz SW, Sawlani RN and **Carroll TJ**. "Quantitative CBV Measurement from Static T1 Changes in Tissue and Correction for Intravascular Water Exchange. *Magn Reson Med*. 56;138-145, 2006.
- 37) Koktzoglou I, Harris KR, Tang R, Kane BJ, Misselsitz B, Weinmann HJ, Lu B, Nagaraj A, Roth SI, **Carroll TJ**, McPherson DD and Li D. Gadoflourine-Enhanced Magnetic Resonance Imaging of Carotid Atherosclerosis in Yucatan Miniswine. *Investigative Radiology*, 41 (3) 299-304, 2006.
- 38) Groves EM, Bireley W, Dill K, **Carroll TJ**, Carr JC. Quantitative Analysis of ECG-gated High-Resolution Contrast-Enhanced MR Angiography of the Thoracic Aorta. *AJR*, 2006 (in press).
- 39) Rhee TK, Park JK, Cashen TA, Shin W, Schirf BE, Gehl JA, Larson AC, Carr JC, Li D, **Carroll TJ**, Omary RA. Comparison of Intraarterial MR Angiography at 3.0T with X-ray Digital Subtraction Angiography for Detection of Renal Artery Stenosis in Swine. *J Vasc Interv Radiol* 17;1131-7, 2006.
- 40) Yang J, Motlagh D, Allen J, Webb A, Kibbe M, Aalami O, Kapadia M, **Carroll TJ**, Ameer GA. Modulating ePTFE vascular graft host response via citric acid-based biodegradable elastomers. *Advanced Materials* 18; 1493-1498.
- 41) Sawlani R, Shin W, Horowitz S, Chandler J, **Carroll TJ**. Determining Tumor Grade Non-invasively Using Quantification of Cerebral Blood Volume Through Contrast Enhance MRI. *NURJ, Northwestern Undergraduate Research Journal* 3; 16-22, 2006.
- 42) Pinto C, Hickey R, **Carroll TJ**, Sato K, Dill K, Omary RA, Kroeker R, Simonetti O, Carr JC. Time-resolved MR Angiography with Generalized Autocalibrating Partially Parallel Acquisition and Time-resolved Echo-sharing Angiographic Technique for Hemodialysis Arteriovenous Fistula Grafts. *J Vasc Interv Radiol* 17; 1003-1009: 2006.
- 43) MRI Assessment of Renal Function During Percutaneous Transluminal Angioplasty of Renal Artery Stenosis in Swine. Park JK, Cashen TA, Shin W, Rhee TK, Schirf BE, Gehl JA, Larson AC, Li D, **Carroll TJ**, Omary RA. *Radiology* (Submitted).

C. Research Support

Ongoing

Engineering Research Grant RG-03-006 **Carroll** (PI) 9/1/03 – 12/31/06

Source: The Whitaker Foundation

Determination of Pulmonary Blood Volume with Contrast-Enhanced Magnetic Resonance Imaging

The major goal of this project is technical development of MR imaging of the pulmonary vasculature.

Role: P.I.

Innovation Fund Awards **Carroll**, Morasch (PI's) 4/1/04 – 3/31/05

Source: Northwestern Memorial Foundation

Atherosclerotic Plaque Characterization Using High-field MRI.

The purpose of this study is to develop and evaluate high field MR imaging capabilities for atherosclerotic plaque at the carotid bifurcation.

Role: Co P.I.

Innovation Fund Awards **Carroll**, Shaibani (PI's) 1/1/05 – 12/31/05

Source: Northwestern Memorial Foundation

Quantification of Cerebral Blood Flow Using MRI

The purpose of this study is to develop and evaluate a novel MRI pulse sequence and post processing package for quantification of cerebral blood flow in stroke patients.

Role: Co P.I.

1 RO1 NS049395-01A1 **Carroll** (PI) 1/1/05 - 12/31/09

Source: NIH/NINDS

Improved Measurement of Cerebral Perfusion with MRI

The purpose of this study is to develop and validate a technique for quantification of cerebral blood flow (CBF) using dynamic susceptibility contrast MRI. This project will evaluate these imaging technique in acute and chronically ischemic stroke patients.

Role: P.I.

AHA 0655758Z **Carroll** (PI) 7/1/06-6/30/08

Source: American Heart Association

Dynamic MR Angiography of the Vascular Architecture of Cerebral Arteriovenous Malformations

The purpose of this study is to determine the perfusion and vascular architecture changes associated with staged embolization of cerebral arteriovenous malformations.

Role: P.I.

Pending

1 RO1 HL088437-01A1 **Carroll** (PI) 7/1/2007 - 6/30/2012

Source: NIH/NINDS

MRI Based Angiography of Intracranial Arteriovenous Malformations

The purpose of this study is to develop and validate a technique for dynamic MR angiography of intracerebral arteriovenous malformations.

Role: P.I.

Completed

Imaging Technology IMG100754 **Carroll** (PI) 10/1/01-10/31/03

Source: Susan G. Komen Foundation

Non-invasive Diagnosis of breast tumors using high-resolution dynamic contrast-enhanced MRI

The major goal of this project is to reduce the rate of false positive diagnoses in contrast enhanced MRI of breast tumors.

Role: P.I.

1RO1HL66488-01A1 Mistretta (PI)

7/01/01 - 7/31/04

Source: NIH

3D-CE-MR with High Resolution Extended Acquisition

The purpose of this study is to develop a robust method for peripheral MRA using high-resolution time-resolved acquisition and vein suppression to permit extended scanning; to apply the optimal acquisition/processing strategy developed in a pig model using intravascular contrast material and intra-arterial DSA validation.

Role: Co-investigator

RO1 HL62425 Mistretta (PI)

4/1/99 – 7/31/02

Source: NIH

High-Resolution Time-Resolved Contrast-Enhanced 3-D MRA

The goal of this project was to develop a fast, integrated procedure for 3-D MR DSA and techniques for projection reconstruction MRA.

Role: Co-investigator