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## BIOGRAPHICAL SKETCH

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NAME John B. Weaver	POSITION TITLE Professor of Radiology		
eRA COMMONS USER NAME (credential, e.g., agency login) JBWEAVER			
EDUCATION/TRAINING (Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable.)			
INSTITUTION AND LOCATION	DEGREE (if applicable)	MM/YY	FIELD OF STUDY
University of Arizona	B.S.	05/1977	Engineering Physics
University of Virginia	Ph.D.	05/1983	Biophysics
University of Virginia	Postdoctoral	02/1984	Medical Physics

### A. Personal Statement

I am a Medical Physicist specializing in MRI who is a Professor of Radiology at the Dartmouth Medical School and Chief Diagnostic Physicist at the Dartmouth-Hitchcock Medical Center. I am also an adjunct Professor at the Thayer School of Engineering and the Physics Department at Dartmouth College. I have been a practicing medical physicist who has been involved with MRI in both clinical and research efforts since 1985 when I was an MRI Applications Scientist with Siemens. My MRI research has included fast MRI, wavelet encoded MRI and magnetic resonance elastography. I have also been active in image processing: I published the first wavelet transform filter in any discipline. I remain active in MR elastography of brain tissue. But most of my efforts are now devoted to developing methods of bio-sensing and imaging magnetic nanoparticles using a method I introduced, MSB. MSB is able to measure several key features of the microenvironment of magnetic nanoparticles including molecular binding, temperature and rigidity. The current proposal results from the finding that the bound state can be characterized using the magnetic properties of the nanoparticles in an alternating magnetic field. Further, the measurements can be made using very low concentrations of iron *in vivo*. Thus an *in vivo* system to follow the concentration of biomarkers and drugs *in vivo* should be possible.

### B. Positions and Honors

#### Positions and Employment

1982 - 1983 Postdoctoral Research Assistant, University of Virginia  
1983 - 1985 MRI Applications Scientist, Siemens Medical Systems  
1985 - 1991 Assistant Professor, Radiology, Dartmouth Medical School & Thayer School of Engineering  
1991 - 2005 Associate Professor, Radiology, Dartmouth Medical School, Dartmouth-Hitchcock Medical Ctr  
Adjunct Associate Professor, Thayer School of Engineering, Dartmouth College  
2005 - present Professor, Department of Radiology, Dartmouth Medical School,  
Chief of Clinical Physics, Department of Radiology, Dartmouth-Hitchcock Medical Ctr  
Adjunct Professor, Department of Physics, Dartmouth, College, NH  
Adjunct Professor, Thayer School of Engineering, Dartmouth College, Hanover, NH

#### Other Experience and Professional Memberships

1986-present Chief of Diagnostic Physics, Mary Hitchcock Memorial Hospital  
1986-present Member American Association of Physicists in Medicine  
1986-present Member International Society of Magnetic Resonance in Medicine  
1986-present Member Mary Hitchcock Memorial Hospital Radiation Safety Committee  
1996-present Radiobiology and Bioengineering Research Program, Norris Cotton Cancer Center  
1997-2001 Assistant Radiation Safety Officer, Mary Hitchcock Memorial Hospital  
1998-present American Board of Radiology Certification, Diagnostic Physics  
2009-present Conference Chair, SPIE Med. Imaging, Molecular, Structural & Functional Imaging Conference  
2008-present Program Committee, SPIE Med. Imaging, Molecular, Structural, & Functional Imaging Conf.  
*NIH reviewer*: "Clinical and Translational Imaging Applications" 02/15/2012; "Academic-Industrial Partnerships for Development and Validation of In Vivo Imaging Systems And Methods for Cancer Investigations" NCI PAR 07-214 ZRG1 2009-2010; Challenge Grants ZRG1 SBIB-V (58) R-RFA OD-

09-003 Panel # 23, 2009; NIBIB "Enabling Technologies for Tissue Engineering and Regenerative Medicine" 2008; ZRG1 "Development of Methods for In Vivo Imaging and Bioengineering Research" 2006; "Microscopic Imaging Study Section" 2004; "ZRG1-SRB(53) Image Guide Intervention Study Section" 2003; "Lung Imaging Database Resource for Imaging Research" 2000; "Small Animal Imaging Resource Programs" 1999; ad hoc Program Project Grants 1999&7;  
*DoD*: CDMRP - LC 110593 Early Diagnosis of Lung Cancer SRA, 2011-2012.  
NSF; Canadian Institutes of Health Research; Kentucky Small Grant Program 2003.  
Special Associate Editor for Medical Physics, 2005, 2007, 2008; Faculty of ISMRM Workshop on Minimum MR Data Acquisition Methods, 2001; Program Committee for SPIE Wavelets IX (AM308), 2001; Workshop Chair: Elastography Directions & Applications for Ultrasound and MR Palpation, 2009.  
Chaired Sessions: ISMRM 1994 "Image Processing"; ISMRM 1999 "Image Processing"; ISMRM 2001 "Magnetic Resonance Elastography"; ISMRM Workshop on Minimum MR Data Acquisition Methods 2001 "Non-Fourier Encoding Methods"; Fourth International Conference on the Ultrasonic Measurement and Imaging of Tissue Elasticity "Inverse Methods for Shear Stiffness Imaging"; SPIE Medical Imaging 2006 "MRI and MRE Methods"; SPIE Medical Imaging 2009 "MRI and MRE Methods"; SPIE Medical Imaging 2009 "Elastography Workshop".

**Honors** 1976, Tau Beta Pi; 1983, Sigma Xi; 1982, Bronze Metal Poster the Radiological Society of North America; 1983, Honorable Mention Citation from the Radiological Society of North America.

### **C. Selected Peer-reviewed Publications** (selected from 75 peer-reviewed publications)

1. JB Weaver, Yansun Xu, DM Healy, Jr., LD Cromwell: "Filtering Noise From Images With Wavelet Transforms" Magnetic Resonance in Medicine, 21:288-295 (1991).
2. JB Weaver, Yansun Xu, DM Healy, JR Driscoll: "Wavelet Encoded MR Imaging" Magnetic Resonance in Medicine, 24(2):275-287 (1992).
3. Jian Lu, DM Healy, Jr., JB Weaver: "Contrast Enhancement of Medical Images Using Multiscale Edge Representation." Optical Engineering, 33(7), 2151-61 (1994).
4. JB Weaver, DM Healy, Jr.: "Signal to Noise Ratios and Effective Repetition Times for Wavelet Encoding and Encoding with Wavelet Packet Bases," Journal of Magnetic Resonance Series A 113, 1-10 (1995).
5. DM Healy, JB Weaver: "Adapted Waveform Encoding for Magnetic Resonance Imaging" IEEE Engineering in Medicine and Biology 14(5) 621-638 (1995).
6. JB Weaver, EEW Van Houten, MI Miga, FE Kennedy, KD Paulsen: "MR Elastography Using 3D Gradient Echo Measurements of Steady State Motion," Medical Physics, 28(8):1620-1628 (2001).
7. Q Zeng, I Baker, JA Loudis, Y Liao, PJ Hoopes, JB Weaver. "Fe/Fe oxide nanocomposite particles with large specific absorption rate for hyperthermia." Applied Physics Letters 90, 233112 (2007).
8. JB Weaver, AM Rauwerdink, C Sullivan, I Baker. "Frequency distribution of the nanoparticle magnetization in the presence of a static as well as a harmonic magnetic field," Medical Physics 35,1988-94 (2008).
9. JB Weaver, AM Rauwerdink, EW Hansen, "Magnetic Nanoparticle Temperature Estimation", Medical Physics 36(5):1822-1829 (2009).
10. A.M. Rauwerdink, J.B. Weaver, "Measurement of Molecular Binding Using The Brownian Motion of Magnetic Nanoparticle Probes" Applied Physics Letters 96, 033702 (2010).
11. J.B. Weaver, "Hot Nanoparticles Light Up Cancer" Nature Nanotechnology 5:630-631 (2010).
12. J.B. Weaver, "The Use of Magnetic Nanoparticles in Thermal Therapy Monitoring and Screening: Localization and Imaging", Journal of Applied Physics 111, 07B317 pp1-3 (2012).
13. J.B. Weaver, E. Kuehlert, "Measurements of Magnetic Nanoparticle Relaxation Times" Medical Physics 39(5):2765-2770 May (2012).
14. A.J. Giustini, I.M. Perreard, A.M. Rauwerdink, P.J. Hoopes, J.B. Weaver, "Noninvasive assessment of magnetic nanoparticle-cancer cell interactions" Integrative Biology 4:1283-8 (2012).
15. D.B. Reeves, J.B. Weaver, "Simulations of magnetic nanoparticle Brownian motion" Journal of Applied Physics JR12-8177R1 (2012).

## **D. Research Support**

### **Ongoing Research Support**

“Frequency Domain Optical Imaging of Breast Cancer Detection” PI: K. D. Paulsen, Period 09/22/08 - 07/31/13.  
NIH/NCI

This project develops an MR-compatible NIR imaging system for simultaneous MR and NIR breast imaging.  
Role: Co-Investigator (6% Salary)

1U54CA151662-01 PI: Ian Baker

Period: 09/16/2010 – 08/31/2015

“Dartmouth Center for Cancer Nanotechnology Excellence”

NCI - Centers of Cancer Nanotechnology Excellence

Project 2: “Spectroscopic Quantification of Ligand Binding in Vivo”

The aim of this project is to develop magnetic hyperthermia treatment for cancer. Project 2 will develop magnetic and optical methods of measuring the bound fraction in vivo.

Role: Principal Investigator Project 2 (10% Salary).

“Specific Drug Release from Mesoporous Silica Supported Lipid Bilayer Nanoparticles via Alternating Magnetic Fields” PI: J.B. Weaver. Period: 5/1/11 - 11/30/12

NCI – Centers of Cancer Nanotechnology Excellence

The aim of this joint effort with the University of New Mexico is to develop nanoscale structures that can be ruptured to release drugs selectively. Only bound structures will rupture while free structures remain intact.

Role: Principal Investigator

PI J.B. Weaver

Period: 2/01/12 - 1/31/13

“Sensing the local concentration of biomarkers in vivo using implantable microscopic constructs”

Source: Hopeman Fund Grant: Norris Cotton Cancer Center

The aim of this joint effort is to develop a method of monitoring specific target molecules in vivo at selected sites for cancer diagnosis and treatment monitoring.

### **Recently Completed Research Support**

“Early Detection of Ovarian Cancer”, PI: J.B. Weaver.

Period: 2009 - 2011

Norris Cotton Cancer Center

This pilot project develops a novel method of screening for ovarian cancer using phagocytosis of magnetic nanoparticles in the peritoneal cavity and the migration of those phagocytes to the malignancy.

Role: Principal Investigator.

P01 CA080139-06A2, PI: KD Paulsen

Period: 2005 – 2010

NIH/NCI “Alternative Breast Cancer Imaging Modalities”: Project I; Cores A, C

Role: Project I Principal Investigator; Magnetic Resonance Elastography.

RO1 EB004632, PI: KD Paulsen

Period: 2005 – 2009

National Institutes of Health – NIBIB

“Advanced Magnetic Resonance Elastography”

Role: Co-Investigator

R21 CA102938, PI: KD Paulsen

Period: 2005 – 2009

National Institutes of Health - NCI

“MR Microwave Absorption and Tomography Imaging”

Role: Co-Investigator

R01 DK063013, PI: JB Weaver

Period: 2004 – 2008

National Institutes of Health – NIDDK “Mapping the Mechanical Properties of the Diabetic Foot”

Role: Principal Investigator

Philips Medical Systems, PI: JB Weaver

Period: 2005-2009

“Evaluation of Pulse Sequences for MR Elastography at 3T”

Role: Principal Investigator