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## BIOGRAPHICAL SKETCH

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NAME Paulsen, Keith D.	POSITION TITLE Professor		
eRA COMMONS USER NAME (credential, e.g., agency login) KDKPAULSEN			
EDUCATION/TRAINING <i>(Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable.)</i>			
INSTITUTION AND LOCATION	DEGREE <i>(if applicable)</i>	MM/YY	FIELD OF STUDY
Duke University, Durham, NC	B.Sc.	1981	Biomedical Engineering
Dartmouth College, Hanover, NH	M.Sc.	1984	Biomedical Engineering
Dartmouth College, Hanover, NH	Ph.D.	1986	Biomedical Engineering

### A. Personal Statement

I have 25 years of experience successfully competing for and conducting NIH-funded research at Dartmouth. Over this time, we have developed the infrastructure and collaborative partnerships with multiple medical specialties and commercial entities that have allowed us to translate in-house technical developments into early-stage clinical testing on a regular basis. During my academic career, I have served as the primary thesis advisor of almost 30 PhD graduates and mentored more than a dozen post-doctoral fellows and numerous junior faculty including Brian Pogue, Alex Hartov and Paul Meaney, all of whom are now full professors at Thayer with successful careers. I have led program-level NIH-funded research in breast imaging for more than 10 years and serve in multiple leadership positions for infrastructure and programs having the core mission of facilitating and executing NIH-funded research at Dartmouth. I am currently acting as Deputy Director for the Dartmouth Center for Cancer Nanotechnology Excellence (DCCNE) as well. I am very excited to work with my colleague, Sohail Mirza, MD, on the proposed COBRE for the Center for Surgical Innovation. We have an extraordinary opportunity to involve a large number of junior, mid-career and senior clinicians, engineers and scientists in innovative research made possible by the new Advanced Surgical Center. The opportunities to pursue advanced technology that enable new surgical procedures and interventions are only limited by our imagination and creativity. The degree of multi-disciplinary interaction and integration across the spectrum of the research projects we can propose is also extremely rich. Historically, surgical innovation and advancement has started in a single specialty, and its migration to the significant benefit of other specialties has typically been slow, in part because of the time required for the new surgical specialty becomes aware of the advances being made elsewhere. Despite the risk of appearing too diffuse in developing our plans for CSI:Dartmouth, we have purposely chosen research projects and themes which involve many surgical specialties to take full advantage of the significant cross-pollination that we expect to occur and consider this aspect of the proposed COBRE to be a decided strength of the Center.

### B. Positions and Honors

#### Positions and Appointments

1986-1988	Assistant Professor, Dept. of Electrical and Computer Eng., U. of Arizona, Tucson, AZ
1987-1988	Joint Asst. Prof., Dept. of Radiation Oncology, U. of Ariz. Health Sci. Center, Tucson, AZ
1988-1994	Assistant Professor, Thayer School of Engineering, Dartmouth College, Hanover, NH
1993-2007	Co-Director, Radiobiology and Bioengineering Research Program, NCCC, DHMC
1994-2000	Associate Professor, Thayer School of Engineering, Dartmouth College, Hanover, NH
2000-	Professor, Thayer School of Engineering, Dartmouth College, Hanover, NH
2006-	Director, Advanced Imaging Center, Norris Cotton Cancer Center, DHMC
2006-	Professor of Radiology, Dartmouth Medical School, Hanover, NH
2007-	Co-Director, Cancer Imaging and Radiobiology Research Program, NCCC, DHMC
2008-	Robert A. Pritzker Chair in Biomedical Engineering, Thayer School, Hanover NH
2010-	Scientific Director, Advanced Surgical Center, Dartmouth-Hitchcock Medical Center
2010-	Associate Director of Translational Programs for SYNERGY, Dartmouth's Center for Clinical and Translational Science, Dartmouth College, Hanover, NH
2010-	Deputy Director, Dartmouth Center for Cancer Nanotechnology Excellence (DCCNE)

## National Advisory Committees

1987-1989	Ad Hoc Technical Review Group, National Cancer Institute
1989	Special Review Committee, National Cancer Institute
1991	Computational Engineering Review Panel, National Science Foundation
1993-1995	Member, Special Study Sections, National Institute of Health
1995-1998	Member, Radiological Sciences Review Panel, U.S. Army Breast Cancer Res. Program
1996-2000	Member, Radiation Study Section, National Institutes of Health
2002-2006	Member, Diagnostic Imaging Study Section (now BMIT), National Institutes of Health
2003-2006	Member, National Research PAVEPAWS Low-Level Phased Array RF Energy, National Academy of Sciences
2003-2006	Member, Panel E: Biophysics, Imaging & Radiobiology, National Cancer Institute of Canada
2007	Chair, ZRG1 SBIB-L, Special Emphasis Panel, NIH/CSR
2008	Member, ZRG1 SBIB-S, P41 Special Emphasis Panel, NIH/CSR Chair, ZRG1 SBIB-S, P41 Special Emphasis Panel, NIH/CSR Chair, ZRG1 SBIB-I, P41 Special Emphasis Panel, NIH/CSR Member, ZRG1 SBIB-S, Special Emphasis Panel, NIH/CSR
2009	Member, ZCA SRRB-C, P01 Special Emphasis Panel, NIH/CSR Chair, ZRG1 SBIB-S, P41 Special Emphasis Panel, NIH/CSR Member, ZRG1 SBIB-V, Special Emphasis Panel, NIH/CSR Member, ZEB1 OSR-D, Special Emphasis Panel, NIH/CSR Member, ZRR1 BT-9, Special Emphasis Panel, NIH/CSR Member, ZRG1 F15-L, Special Emphasis Panel, NIH/CSR Chair, ZRG1 SBIB-U, Special Emphasis Panel, NIH/CSR
2010	Member, ZCA1 PCRB-A Clinical, NIH, Rockville MD, (May 15, 2010) Member, ZEB1 OSR-B (O1) 1 NIBIB Special Emphasis Panel, Bethesda MD Member, ZRG1 BCMB-A (51) R RFA RM09-022: Transformative R01 Roadmap Review, NIH/CSR Member, NT, Neurotechnology Study Section, NIH/CSR, Washington DC Member, ZRG1 NT-B (09) F, Neurotechnology 2 Overflow, NIH/CSR, Washington, DC Member, ZRG1 ETTN-B (85) S, ARRA: Neurotechnology-4 Competitive Revisions, NIH/CSR, Member, ZRG1 SBIB-V (56) R PAR-08-147: Quick Trials on Imaging & Image-Guided Intervention, NIH/CSR
2011	Chair, ZRG1 SBIB-S, P41 Special Emphasis Panel, NIH/CSR, January 2011 Member, ZCA1 GRB-P(01), Discovery, Imaging and Therapeutics P01 Review, NIH/CSR Chair, ZRG1 SBIB-S, P41 Special Emphasis Panel, NIH/CSR, September 2011 Member, NCI Subcommittee I—Career Development, NIH/NCI, October 2011 Member, ZCA1 PCRB-A(A1)B Clinical Research-Loan Repayment Program, NIH/NCI
2012-Present	Member, NCI-I Subcommittee I, Career Development Review Group, NIH/NCI Member, ZRG1 SBIB-X(50)5, Special Emphasis Panel, Academic Industrial Partnerships, NIH/CSR Chair, ZRG1 SBIB-X(57)R, Special Emphasis Panel, Academic Industrial Partnerships, NIH/CSR
2013	Chair, ZRG1 SBIB-Z(57), Special Emphasis Panel, Academic Industrial Partnerships, NIH/CSR Chair, ZEB1 OSR-C(M3), P41 BTRC Special Emphasis Panel, NIH/NIBIB Member, 2013-08 NIH-NIBIB Loan Repayment Program, NIH/NIBIB Member, 2013-08 ZCA1 PCRB-A(A1)S Clinical Research-Loan Repayment Program, NIH/NCI

## **C. Selected Peer-reviewed Publications (Most recent 15, selected from 330+ peer-reviewed papers)**

1. Michaelsen K, Krishnaswamy V, Pogue BW, Brooks K, Defreitas K, Shaw I, Poplack SP, **Paulsen KD**. Characterization of materials for optimal near-infrared and x-ray imaging of the breast." *Biomed Opt Express*. 2012 Sep 1;3(9):2078-86. Epub 2012 Aug 10. PMID: 23024902
2. Mastanduno MA, Jiang S, Diflorio-Alexander R, Pogue BW, **Paulsen KD**. "Automatic and robust calibration of optical detector arrays for biomedical diffuse optical spectroscopy." *Biomed Opt Express*. 2012 Oct 1;3(10):2339-52. Epub 2012 Aug 31. PMID: 23082277
3. Weaver, J. Pattison, A., McGarry, M., Perreard, I., Swienckowski, J., Eskey, C., Lollis, S.S., **Paulsen, K.D.**, "Brain Mechanical Property Measurement Using MRE with Intrinsic Activation", *Physics in Medicine and Biology*, 57, 22, 7275-7287, 2012

4. Valdes PA, Leblond F, Jacobs VL, Wilson BC, **Paulsen KD**, Roberts DW. "Quantitative, spectrally-resolved intraoperative fluorescence imaging". *Sci Rep*. 2012;2:798. Epub 2012 Nov 12. PMID: 23152935
5. Roberts DW, Valdés PA, Harris BT, Hartov A, Fan X, Ji S, Pogue BW, Leblond F, Tosteson TD, Wilson BC, **Paulsen KD**. *Adjuncts for Maximizing Resection: 5-ALA*. (Clin Neurosurg. 2012;59:75-8). PMID: 22960516
6. Valdés PA, Moses ZB, Kim A, Belden CJ, Wilson BC, **Paulsen KD**, Roberts DW, Harris BT. Gadolinium- and 5-aminolevulinic acid-induced protoporphyrin IX levels in human gliomas: an ex vivo quantitative study to correlate protoporphyrin IX levels and blood-brain barrier breakdown. *J Neuropathol Exp Neurol*. 2012 Sep;71(9):806-13. doi: 10.1097/NEN.0b013e31826775a1. PMID: 22878664
7. McGarry MD, Van Houten EE, Johnson CL, Georgiadis JG, Sutton BP, Weaver JB, **Paulsen KD**. "Multiresolution MR elastography using nonlinear inversion" *Med Phys*. Oct; 39(10):6388-96, 2012.
8. Johnson CL, McGarry MD, Van Houten EE, Weaver JB, **Paulsen KD**, Sutton BP, Georgiadis JG., "Magnetic resonance elastography of the brain using multishot spiral readouts with self-navigated motion correction". *Magn Reson Med*. 2012 Sep 21. doi: 10.1002/mrm.24473. [Epub ahead of print]
9. Golnabi AH, Meaney PM, **Paulsen KD**, "Tomographic microwave imaging with incorporated prior spatial information," *IEEE Transaction on Microwave Theory and Techniques*, vol. 61, pp. 2129-2136, 2012.
10. Jensen PD, Meaney PM, Epstein N, **Paulsen KD**, "Cole-Cole parameter characterization of urea and potassium for improving dialysis treatment," *IEEE Antennas and Wireless Propagation Letters*, vol. 11, pp. 1598-1601, 2012.
11. Meaney PM, Goodwin D, Zhou T, Golnabi A, Pallone M, Geimer SD, Burke G, **Paulsen KD**, "Clinical microwave tomographic imaging of the calcaneus: pilot study," *IEEE Transactions on Biomedical Engineering*, vol. 59, pp. 3304-3313, 2012.
12. Krishnaswamy V, Laughney AM, Wells WA, **Paulsen KD**, Pogue BW. Scanning in situ spectroscopy platform for imaging surgical breast tissue specimens. *Opt Express*. 2013 Jan 28;21(2):2185-94. doi: 10.1364/OE.21.002185. PMID: 23389199
13. Johnson CL, McGarry MD, Gharibans AA, Weaver JB, **Paulsen KD**, Wang H, Olivero WC, Sutton BP, Georgiadis JG. Local mechanical properties of white matter structures in the human brain. *Neuroimage*. 2013 May 1. pii: S1053-8119(13)00448-5. doi: 10.1016/j.neuroimage.2013.04.089. [Epub ahead of print]
14. Laughney AM, Krishnaswamy V, Rice TB, Cuccia DJ, Barth RJ, Tromberg BJ, **Paulsen KD**, Pogue BW, Wells WA. System analysis of spatial frequency domain imaging for quantitative mapping of surgically resected breast tissues. *J Biomed Opt*. 2013 Mar;18(3):036012. doi: 10.1117/1.JBO.18.3.036012. PMID: 23525360
15. Meaney PM, Kaufman PA, Muffly LS, Click M, Poplack SP, Wells WA, Schwartz GN, di Florio-Alexander RM, Tosteson TD, Li Z, Geimer SD, Fanning MW, Zhou T, Epstein NR, **Paulsen KD**, Microwave imaging for neoadjuvant chemotherapy monitoring: initial clinical experience. *Breast Cancer Res*. 2013 Apr 24;15(2):R35. [Epub ahead of print]

#### **D. Research Support.**

#### **D. Research Support.**

#### **Ongoing Research Support**

R01 CA69544-10 (Paulsen)

09/22/2008 - 07/31/2014

NIH/NCI

Frequency Domain Optical Imaging of Breast Cancer

This project is developing an MR-compatible NIR imaging system for simultaneous MR and NIR breast examination.

Role: PI

R01 CA139449-01 (Paulsen)

04/01/2009 – 03/31/2014

NIH/NCI

Optical Imaging Fused with Tomosynthesis for Improved Breast Cancer Detection

This project is an academic-industrial partnership proposal under PAR-07-214 to develop and validate optical imaging fused with breast tomosynthesis for improved breast cancer detection and diagnosis

Role: PI

1R01NS052274-01A2 (Roberts)

09/01/2007 – 08/31/2013

NIH/NINDS

Coregistered Fluorescence-Enhanced Resection of Malignant Glioma

The goal of this project is to develop and evaluate coregistered fluorescence guided resection of malignant glioma.

Role: Co-PI

R01CA159324 (Paulsen)

04/04/2011 – 03/31/2016

NIH/NCI

Preoperative Image Updating for Guidance During Brain Tumor Resection

This academic-industrial partnership will develop and evaluate a system for updating preoperative images in the operating room during brain tumor resection.

5 P30 CA023108-31 Israel (PI)

12/01/2008 - 11/30/2013

NIH/NCI

Cancer Center Support (CORE) Grant

This grant provides for the continuation of NCI recognition of comprehensive status and of Cancer Center Support Grant funding for the Norris Cotton Cancer Center (NCCC) at Dartmouth-Hitchcock Medical Center (DHMC). Dr. Paulsen is the Co Director of the Cancer Imaging and Radiobiology Research Program for the Cancer Center.

Role: Investigator

**Completed Research Support**

5 P01 CA080139-08 (Paulsen)

05/01/2006 - 04/30/2012

NIH/NCI

Alternative Breast Cancer Imaging Modalities

This is a program which is aimed at developing and evaluating four alternative breast imaging modalities.

Role: PI

4 R33 CA102938-04 (Paulsen)

05/05/2005 - 07/31/2010

NIH/NCI

MR Microwave Absorption and Tomography Imaging

This project is evaluating the feasibility of microwave absorption and tomography imaging using MR.

Role: PI

5 R01 EB004632-04 (Paulsen)

09/22/2005 - 07/31/2010

NIH/NIBIB

Advanced Magnetic Resonance Elastography

This project is developing and evaluating advanced methods for imaging viscoelasticity and poroelasticity with MR.

Role: PI

5 R01 EB002082-13 (Paulsen)

08/25/2005 - 06/30/2010

NIH/NIBIB

Modeling of Brain Deformation during Surgery

This is the competing continuation of a project which is developing modeling methods for compensation of brain deformation during image-guided neurosurgery.

Role: PI