BIOGRAPHICAL SKETCH

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NAME G. Larry Bretthorst	POSITION TITLE Research Associate Professor of Radiology
eRA COMMONS USER NAME (credential, e.g., agency login) LARRYBRETTHORST	

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
Lincoln University, Jefferson City, MO	B. S.	1971	Mathematics
University of Missouri, St. Louis, MO	M. S.	1980	Physics
Washington University, St. Louis, MO	Ph. D.	1987	Physics
Washington University, St. Louis, MO	Post Doc	1987-88	Chemistry

A. Personal Statement

Dr. G. Larry Bretthorst is a recognized expert in Bayesian Probability Theory. Bayesian Probability Theory provides a rigorous theory for the analysis of experimental data. Derived from Cox's theorem, the rules of Bayesian Probability Theory show one how to compute the posterior probability density function for all parameters of interest given all of the available data and prior information. One of the great strengths of Bayesian methods is that probability density functions can be used to obtain both parameter and uncertainties estimates each parameters. For the past twenty years, Bretthorst has developed Bayesian Probability Theory based software for the analysis and modeling of magnetic resonance data. Originally focused on spectroscopy, Bretthorst has extended his programs to include modeling of MR imaging data and kinetic (exponential) data and many other applications. (For a description and download of this powerful software platform, please see the URL given at the end of this personal statement.) Bretthorst has published over 70 manuscripts on Bayesian analysis methods. In the current application, he will develop analysis software to align both FID and Chemical Shift Imaging data in the time domain and then use Bayesian Probability Theory to estimate the number of resonances and their frequencies and decay rate constants. In the CSI data, Bayesian Probability Theory will be used to determine which metabolites are present and in what concentrations. These concentrations will be output in the form of parameter maps (images) of the metabolites as a function of position in the sample. The interested reader is referred to URL http://bayesiananalysis.wustl.edu/index.html for a description and download of Bretthorst's Bayesian toolbox; for reference to additional reading regarding Bayesian methods, see URL http://bayes.wustl.edu/ .

B. Positions and Honors

1968-1974	Systems Analyst/Programmer, Missouri Department of Administration, Jefferson City, MO.
1974-1983	Senior Programmer/Analyst, Regional Justice Information Service, St. Louis, MO.
1988-1999	Research Associate, Department of Chemistry, Washington University, St. Louis, MO.
1999-2002	Research Scientist, Department of Chemistry, Washington University, St. Louis, MO.
2002-2005	Research Associate, Department of Radiology, Washington University, St Louis, MO.
2005-2009	Staff Scientist, Department of Radiology, Washington University, St Louis, MO.
2009-present	Research Associate Professor, Department of Radiology, Washington University.

C. Selected Peer-reviewed Publications

1. **G.L. Bretthorst**, "Bayesian Analysis I, II and III," *J. Magn. Reson.,* **88**:533-595 (1990).

2. **G.L. Bretthorst**, "Nonuniform Sampling: Bandwidth and Aliasing," in *Bayesian Inference and Maximum Entropy Methods in Science and Engineering*, Joshua Rychert, Gary Erickson and C.R Smith *eds., 1-28 (2001).*

3. **G.L. Bretthorst**, "Generalizing The Lomb-Scargle Periodogram," in *Bayesian Inference and Maximum Entropy Methods in Science and Engineering*, Ali Mohammad-Djafari *Ed., 241-245* (2001).

4. **G.L. Bretthorst**, W.C. Hutton, J.R. Garbow, and J.J.H. Ackerman, "Exponential Model Selection (in NMR) using Bayesian Probability Theory," *Concepts Magn. Reson. Part A*, Vol. **27A**:64-72 (2005).

5. C.D. Kroenke, **G.L. Bretthorst**, T.E. Inder, and J.J. Neil, "Diffusion MR Imaging Characteristics of the Developing Primate Brain," *Neuroimage*, **25**:1205-13 (2005).

6. **G.L. Bretthorst**, "How Accurately Can Parameters from Exponential Models be Estimated? A Bayesian View," *Concepts Magn. Reson. Part A*, **27A**:73-83 (2005).

7. C.D. Kroenke, **G.L. Bretthorst**, T.E. Inder, and J.J. Neil, "Modeling Water Diffusion Anisotropy within Fixed Prenatal Primate Brain using Bayesian Probability Theory," *Magn. Reson. Med.*, **55**:187-197 (2006).

8. D.A. d'Avignon, **G.L. Bretthorst**, M.E. Holtzer, K.A. Schwarz, R.H. Angeletti, L. Mints, and A. Holtzer, "Site-specific Experiments on Folding/Unfolding of Jun Coiled-Coils: Thermodynamic and Kinetic Parameters from Spin Inversion Transfer Nuclear Magnetic Resonance at Leucine-18," *Biopolymers,* **83**:255-267 (2006).

9. C.D. Kroenke, D.C. Van Essen, T.E. Inder, S. Rees, **G.L. Bretthorst**, and J.J. Neil, "Microstructural Changes of the Baboon Cerebral Cortex during Gestational Development Reflected in Magnetic Resonance Imaging Diffusion Anisotropy," *J. Neurosci.*, **27**:12506-12515 (2007).

10. A.L. Sukstanskii, **G.L. Bretthorst**, Y.V. Chang, M.S. Conradi, and D.A. Yablonskiy, "How Accurately Can the Parameters from a Model of Anistropic ^{3}He Gas Diffusion in Lung Acinar Airways be Estimated? A Bayesian view," *J. Magn. Reson.,***184**:62-71 (2007).

11. **G.L. Bretthorst**, "Automatic Phasing of MR Images. Part I: Linearly Varying Phase," *J. Magn. Reson.,* **191**:184-192 (2008).

12. **G.L. Bretthorst**, "Automatic Phasing of MR Images. Part II: Voxel-wise Phase Estimation," *J. Magn. Reson.,* **191**:193-201 (2008).

13. **G.L. Bretthorst**, W. C. Hutton, J. R. Garbow, and J. J. H. Ackerman, "High Dynamic Range MRS Time-Domain Signal Analysis," *Magn. Reson. Med.*, **62**, 1026-1035 (2008).

14. A.M. Prantner, **G.L. Bretthorst**, J.R. Garbow, J.J. Neil, and J.J.H. Ackerman, "Magnetization Transfer Induced Biexponential Longitudinal Relaxation," *Magn. Reson. Med*., **60**:555-563 (2008).

15. **G.L. Bretthorst**, "The maximum entropy method of moments and Bayesian probability theory," *AIP Conf. Proc.,* 1553, 3-15 (2013).