Personal Statement

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I have had the unique academic opportunity to have an appointment in two departments within Emory University. My primary appointment is in Radiology, a clinical department within the Emory University School of Medicine, and my secondary appointment is in Biomedical Engineering, a joint Emory/Georgia Tech Department. This supportive setting is closely aligned with my underlying academic philosophy. *I have been committed throughout my career to applying engineering principles and technical problem-solving techniques to current clinical problems in the imaging, diagnosis, and treatment of neuropsychiatric disease*. I have sought to maintain a balance between research, teaching, and service, as I believe all of these are important functions of a faculty member within the academic community.

Over the past 8 years, I have established a strong, independent, and nationally-recognized research program focused on the development and clinical application of functional brain imaging. My teaching activities follow the same academic philosophy; I am committed to training students to apply advanced imaging principles to meet current clinical needs. My service contributions closely parallel my teaching and research interests. I have directed the Emory Center for Brain Imaging, a School of Medicine core lab that is dedicated to using multimodality imaging tools to help researchers answer complex questions about disease processes and treatment efficacy. I have also worked on developing educational infrastructure at the institutional and national level.

As I continue my academic career at Emory, I plan to build my research program by expanding my independent research pursuits and my collaborations, while concurrently maintaining my interest in teaching and service.

Service Contributions

My service contributions at the institutional level have concentrated in two related areas. In the first, I developed and grew a clinical service for using functional MRI to localize speech and other critical brain functions prior to neurosurgery in brain tumor patients. My other major service role is my administration of the Emory Center for Brain Imaging, which provides researchers within the School of Medicine access to applied imaging research expertise. My role as Director is administrative and budgetary, as well as one of providing guidance on developing the group by

mentoring members and leading recruitment.

On the national level, I have been active in the major MRI society (ISMRM), serving on the annual meeting organizing committee and leading one of the study groups. I have been an ad hoc grant reviewer for the National Institutes of Health (NIH) and the American Heart Association (AHA). Lastly, I have been co-organizer of two national meetings sponsored by NIH on the role of high-field MRI for neurovascular disease.

Research Program

The broad scope of my research has been the development of clinical applications of functional brain imaging. I have worked with both magnetic resonance imaging (MRI) and positron emission tomography (PET). My research has concentrated on developing new applications that directly impact disease diagnosis and patient care, as well as using imaging to better understand basic physiology and disease mechanisms, particularly in neurodegenerative and mood disorders.

PET Methods Development

A major focus of my research has been the development and validation of MRI-guided partial volume correction methods for PET. This technical challenge is crucial for the accurate interpretation of PET studies involving elderly populations. Our laboratory provided national leadership in this area (Imager et al. *Radiology* 2003 and Imager et al. *NeuroImage* 2004), throwing into question older published studies of aging or neurodegeneration using PET in which partial volume correction had not been performed. This work was supported by award of a Radiological Society of North America (RSNA) Scholar's Award, which afforded me 50% protected research time. Preliminary data gathered from this early study permitted me to apply for and successfully achieve award of an NIH Mentored Career Development (K23) Award. My colleagues and I have since further validated and refined our partial volume correction method (Smith and Imager, *Radiology* 2006), which has currently been adopted in several laboratories worldwide.

Functional MRI: Applications

A second major focus of my research is optimizing and applying functional MRI techniques, including blood oxygenation level dependent (BOLD) imaging and diffusion tensor imaging, to assess the effects of age and neurodegeneration on neural connectivity. We have developed a new approach

to assessing the relationship between the temporal resolution of the BOLD response and regional cerebral blood flow measures (Jones et al. *Journal of Cerebral Blood Flow and Metabolism* 2005; King et al. *American Journal of Roentgenology* 2006). I was honored when my presentation of this work at the annual American Society of Neuroradiology meeting in May of 2006 was recognized by a Bayer Award of Excellence. The application of our functional MRI techniques to a cohort of individuals with mild cognitive impairment (MCI), shows promise in terms of identifying those MCI subjects at greatest risk to develop Alzheimer's disease. This work is supported by an NIH R21 grant of which I serve as Principal Investigator.

Teaching Contributions

My teaching philosophy closely parallels my research philosophy. *I wish to train students to apply advanced engineering principles and methodologies to real world clinical problems and become "translational scientists"*. I have applied this philosophy to students under my mentorship. All such students have projects that have a definite link to a current problem in clinical medicine, but the methodologies they employ are grounded in engineering and/or methodological principles. I strive to bring this marriage of clinical medicine and scientific principles into the classroom as well. In formal didactic lectures I teach for the Medical Students, Radiology Residents, and Neuroradiology Fellows, I strive to bring real-world examples of how imaging physics affect diagnoses.

On the national level, I am a regular educational speaker at the Radiologic Society of North America (RSNA) and ISMRM meetings. As I move forward with my career, I plan to continue this development of training translational scientists in medical imaging and take on a greater role in developing educational infrastructure at the university and national level.

In summary, I have maintained a balance between research, teaching, and service. I have strived, and will continue, to develop research projects that area balanced between a "team science" approach in which my MRI methodologies can be used in multiple collaborative efforts and the building of an independent research program. The overarching philosophy of my academic career has been applying engineering to current issues in clinical neuroimaging.