

## Bankhead-Coley Cancer Research Program

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*2008 Program  
Bridge (1-year project)*

**Project Title:** Diagnostic Mammography Using a Real Time Co-Registering Novel Hand-Held Optical Imager

**Project Summary:** Optical imaging is emerging as a non-invasive and non-ionizing imaging modality towards breast cancer diagnosis. Most of the currently available optical imaging systems are either bulky and/or not adaptable for different tissue shapes and volumes. Recently, hand-held based optical imagers have been developed, although none to date can contour to different tissue curvatures, nor register their precise location on the breast tissue during real-time imaging. Hence, the objective of our work is to implement an automated co-registration scheme to a novel hand-held optical probe, such that real-time, 3-D optical imaging towards tomography studies is feasible. Our major aims are to:

- 1) Implement a 3-D motion tracker for real-time tracking of the exact position and orientation of the hand-held probe during imaging studies.
- 2) Perform 3-D co-registered tracking on different tissue phantom geometries.

The rationale of the work is that the hand-held imaging concept, although common in ultrasound and nuclear imaging, will be unique in its co-registering capabilities for real-time, 3-D optical imaging using non-ionizing light. Specifically, the target of the research is to positively impact early diagnosis in high-risk, younger women with dense breasts (upon using external contrast agents) and improve the survival rate of women affected by breast cancer (1 in 8 in the United States). The long-term goal of our work is to implement the novel hand-held optical imager as a routine breast imaging tool (at various stages of the disease) in cancer centers nationwide, complimenting the existing and widely used X-ray and nuclear techniques and allowing a cost-effective and a more affordable health care alternative for women of any age group and geographical background.