

Dr. Elizabeth Hillman, Ph.D.

Photon Migration Imaging Lab
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By Sara Rubenstein

Dr. Elizabeth Hillman currently does optical imaging research in the Photon Migration Imaging Laboratory at the Martinos Center for Biomedical Imaging. She is working on techniques that can potentially be used for three-dimensional imaging of organs such as the brain and heart. However, it was a long journey that got Dr. Hillman to where she is today.

After crossing Doctor and Astronaut off her list of career possibilities, entering University College in London, Elizabeth Hillman decided to try her hand in physics. Physics offered her a broad spectrum of fields to study and many options to pursue. However, Dr. Hillman found that she had maintained her interest in medicine. She therefore decided to combine her interests in medicine and physics and studied medical physics. During her undergraduate career she conducted a study using light to monitor activation in the brain's visual cortex. Dr. Hillman was also involved in device building, software writing, data acquisition and signal processing. Dr. Hillman went on to receive her PhD in Medical Physics and Bioengineering, in Time-resolved Diffuse Optical Tomography of the Breast and Brain. Through her research as a graduate student she began to develop a new imaging system and began taking the images of the breast and the neonatal brain.

After receiving her PhD, Dr. Hillman started off her career by moving to the United States and entering industry as a research scientist. She became the manager of in-vivo spectroscopy at Argose Inc. The company developed a non-invasive glucose monitor by using light to measure the glucose level in the skin. Although Dr. Hillman benefited from her time spent in industry and was able to learn many valuable lessons, she decided to return to academia. Dr. Hillman then made her way to the Photon Imaging Laboratory in the Martinos Center for Biomedical Imaging. She began her Post-doc research in the area of developing Laminar Optical Tomography system for high-resolution, depth-resolved, functional imaging of the exposed brain. Dr. Hillman and her research team were able to redesign and combine different areas of study in order to develop high-resolution imaging of the brain.

Dr. Hillman's current research is in Functional Optical imaging. This technique provides information about the function and physiology of living tissue using 2-D and 3-D optical imaging microscopy and spectroscopy. Dr. Hillman currently uses different methods of imaging in her research including DOT (diffuse optical tomography), which measures scattered light and is used to image optical contrast in large tissue volumes. She also uses Laminar Optical Tomography in the optical imaging of the cortex. Dr. Hillman is currently trying to develop a new technique for 3-D imaging of the surface of the brain.

Future applications of optical imaging not only include studies of the brain, but will also be applied to other parts of the body, such as the heart. Optical heart imaging will be able to detect spiral waves of the heart, which are precursors to fatal rhythms such as ventricular fibrillation. Other future applications of optical imaging include non-invasive techniques of looking at the back of the eye, as well as non-invasive techniques of finding skin cancers.

Dr. Hillman will be moving on later next year to her own lab at Columbia University, in the department of biomedical engineering. She will start the lab for Functional Optical Imaging.

Dr. Hillman provided us with an abundance of useful and insightful information. Not only did she enlighten us on the field of optical imaging, which is a growing field within bio-medical research, but she provided us with a valuable example of how we can choose our career paths. She showed us that it is more than ok to try new things and take risks. Through her going back and forth between industry and academia she proved that if something does not work out, it is ok to start over again. And her most valuable piece of advice to all of us: “Follow your heart”.

MIT students can further their involvement and understanding of Optical Imaging through various programs. One example is the Biomedical Optics program at the HST summer institute. This is a 9-week research program in which students are trained in the field of using light in biology and medicine. The participating students are trained, through a series of hands-on research and in-depth lectures, in the study of optics and the future uses of biomedical optics technologies in the biological and medical fields.

Links:

This is the link for the Biomedical Optics program at the HST summer institute.

<http://web.mit.edu/hstsummer/BiomedicalOptics.html>

The Photon Migration Imaging Lab is conducting breakthrough research in different areas of Imaging, including: NIRS/DOT and the Brain, Optical Breast Imaging, and Microscopy.

<http://rabi.nmr.mgh.harvard.edu/DOT/>

Dr. Hillman’s Web page provides information about here current as well as past research.

<http://www.nmr.mgh.harvard.edu/%7Eehillman/>