Researchers shedding new light on neural imaging research

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Neural imaging—maps of brain functions—is a primary tool used by researchers hoping to transform the lives of people living with chronic neurological conditions such as epilepsy. At present, researchers often require several different imaging techniques to fully map brain functions, making research and treatment of these conditions expensive and inefficient.

Using cutting-edge illumination technology, Professor Ofer Levi and his research students from the Institute of Biomaterials & Biomedical Engineering (IBBME) and The Edward S. Rogers Sr. Department of Electrical & Computer Engineering (ECE) has developed a new cost-effective neural imaging system. It allows researchers to make much more complex maps of the brain with just one camera and one imaging system. The team's initial findings, released this week in *Biomedical Optics Express*, demonstrate that this new technology may one day transform the way researchers view the human brain

Developed from the same technology that lights up our cell phones and computers, this unique system uses Vertical Cavity Surface Emitting Lasers (VCSEL): low-cost, easily-tested, miniature microchip lasers mounted on an extremely fast, sensitive camera, which allows the operator to switch the lasers on and off with extraordinary speed and precision. This rapid light manipulation (at a rate of approximately 1x/millisecond) means that the brain can be mapped with greater sophistication and precision—much more quickly. Results published in Professor Levi's article, for instance, demonstrate that this imaging

technology is able to classify both veins and arteries simultaneously—something never before accomplished.

Hart Levy, co-author of the article and recent graduate from the ECE and IBBME, looks forward to seeing the results of further testing. "It's amazing to develop something that's going to be used to help people," he said.

Professor Levi asserts that this new, "agile system" is only the beginning; he plans to adapt the technology into a portable model, which would enable researchers to conduct studies with "freely behaving," or non-anesthetized, animals. While other portable neural mapping systems already exist, Professor Levi's multi-modality technology mean that blood flow, oxygenation and florescence—the three components of the human brain that researchers look at, which currently requires three different imaging systems—can be mapped simultaneously.

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