2009 Bullock-Wellman Fellowship Award

Malte Gather, PhD
Research Fellow

Malte Gather, Ph.D., was recently selected as this year's recipient of the Bullock-Wellman Fellowship Award for his project "Biocompatible and Bioabsorbable Optical Devices for Photomedicine."

Malte is working with his mentors Dr. Seok-Hyun (Andy) Yun and Dr. Robert Redmond to develop a new class of optical devices for light-based therapy, surgery and diagnosis.

Biocompatible and Bioabsorbable Optical Devices for Photomedicine

The long-term goal of this project is to develop a new class of optical devices for light-based therapy, surgery and diagnosis. A variety of optical techniques, such photochemical tissue bonding and photodynamic therapy, require efficient delivery of light deep into tissues, but the limited penetration of light in tissue constitutes a serious constraint in clinical use. Fiber-optic devices or catheters have been useful in bringing a light source close to the target tissue in the body. However, delivering the light further into the tissue has remained a challenge. In this project, a new approach based on bioabsorbable and implantable light-delivering devices is proposed. The first specific aim of the proposed research is to develop thin flexible optical fibers and waveguides using biocompatible polymers, such as photo-crosslinkable hydrogels and lactic-acid based polymers. This contrasts with conventional optical fibers made of glass or plastic that are not biocompatible and thus must be removed from the body soon after use. The second specific aim is to develop biodegradable light-guiding meshes for photochemical tissue bonding (PTB). Such biodegradable devices will be inserted between the interfaces of tissue to be bonded and will induce photochemical bonding in regions into which light can otherwise not penetrate. They will be eventually absorbed thus eliminating the need for removal that would most likely damage the tissue bond. The safeness and effectiveness of this approach will be evaluated in animal models of skin wound closure. While the initial focus of the project is on light delivering devices for PTB, a variety of other bioabsorbable and implantable optical functional devices is envisioned, e.g. for continuous-monitoring chemical sensing ("wearable hospitals"), simplified management of long-term photo-dynamic therapy (PDT) cancer treatment, light delivery inside internal organs, as well as implanted endoscopy after surgery for repeated imaging and monitoring of the healing process. The project is therefore expected to have high impact and might well herald a new paradigm in photomedicine.