

ERC Starting Grant for Lena Maier-Hein

The European Research Council (ERC) awards “Starting Grants” to support excellent young scientists who are starting an independent science career. Lena Maier-Hein, a computer scientist from the German Cancer Research Center (Deutsches Krebsforschungszentrum, DKFZ) in Heidelberg, has now received the prestigious grant for a multidisciplinary project: She plans to combine computer-navigated minimally invasive surgery with novel, gentle imaging technology based on sound and light. The additional imaging information will help physicians get a clearer picture of diseased tissue.

Minimally invasive surgery is gaining increasing importance in the diagnosis and treatment of cancer and other diseases. When performing minimally invasive surgery, clinicians are faced with two major challenges: First, they need to differentiate between malignant tissue and healthy tissue, which can be difficult even in open surgery. If this differentiation cannot be reliably made, the tumor may recur or the surgery performed may be unnecessarily radical. Second, surgeons need to know precisely how to insert endoscopic instruments into a target region without injuring nearby organs.

Associate Professor (PD) Dr. Lena Maier-Hein addresses these challenges in a multidisciplinary project that is now supported by the European Research Council (ERC). Maier-Hein, a computer scientist, plans to use medical imaging methods based on light and sound signals for the first time to capture important tissue parameters (such as oxygen saturation in the blood) in real time and thus to provide physicians with additional information about tissue characteristics.

So far, physicians have gained special orientation inside the body using an endoscopic camera that uses white light to illuminate the target area. This type of illumination delivers only poor contrasts and little depth of vision, which makes it difficult to handle the instruments precisely. Lena Maier-Hein now plans to combine standard imaging with an emerging technology called multispectral optical and photoacoustic imaging. “This will enable us to visualize not only the three-dimensional surface of tissues, but additionally the details that are hidden beneath, such as the structure of blood vessels, blood supply and oxygen saturation in the target region,” Maier-Hein explains. “This provides physicians with important clues about potential malignant tissue alterations.”

An important component of the project is photoacoustic imaging, a technology that is capable of capturing structural and functional tissue parameters non-invasively and without exposure to radiation. Maier-Hein plans to use this technology in a multispectral mode in order to determine the molecular composition of tissues and to reconstruct important tumor markers such as changes in oxygen saturation or abnormal vessel microstructure.

During surgery, the surgeon has images of the organ and tissue surfaces plus the additional information provided by the imaging technology. The individual patient’s anatomy, which is calculated and visualized in 3D based on prior CT and MRI scans, is superimposed on these images.

Maier-Hein plans to test and evaluate the innovative method in computer-assisted endoscopic examinations of the bowel and stomach. Enhancements in these commonly performed surgical procedures would benefit many people, for example in colorectal cancer screening programs.

Lena Maier-Hein, born in 1980, studied computer sciences at the Karlsruhe Institute of Technology (KIT) and at the Imperial College in London and attained her qualification to give lectures ('Habilitation') at Heidelberg University in 2013. Since 2009, she has been pursuing research as a post-doc at the DKFZ, where she has been leading an independent junior research group since 2012. Maier-Hein, mother of a daughter since 2012, has already been distinguished with several science awards including the Heinz Maier Leibniz Award of the German Research Foundation (DFG).

The ERC Starting Independent Researcher Grants are awarded by the European Research Council (ERC) and are designed to support excellent young researchers at an early stage of their career when they are starting their own independent research team or program in a European country. Starting Grants comprise EUR 1.5 million for a period of five years. The prestigious research grant is awarded in a highly competitive process in which only one in ten proposals is accepted.

The German Cancer Research Center (Deutsches Krebsforschungszentrum, DKFZ) with its more than 3,000 employees is the largest biomedical research institute in Germany. At DKFZ, more than 1,000 scientists investigate how cancer develops, identify cancer risk factors and endeavor to find new strategies to prevent people from getting cancer. They develop novel approaches to make tumor diagnosis more precise and treatment of cancer patients more successful. The staff of the Cancer Information Service (KID) offers information about the widespread disease of cancer for patients, their families, and the general public. Jointly with Heidelberg University Hospital, DKFZ has established the National Center for Tumor Diseases (NCT) Heidelberg, where promising approaches from cancer research are translated into the clinic. In the German Consortium for Translational Cancer Research (DKTK), one of six German Centers for Health Research, DKFZ maintains translational centers at seven university partnering sites. Combining excellent university hospitals with high-profile research at a Helmholtz Center is an important contribution to improving the chances of cancer patients. DKFZ is a member of the Helmholtz Association of National Research Centers, with ninety percent of its funding coming from the German Federal Ministry of Education and Research and the remaining ten percent from the State of Baden-Württemberg.

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