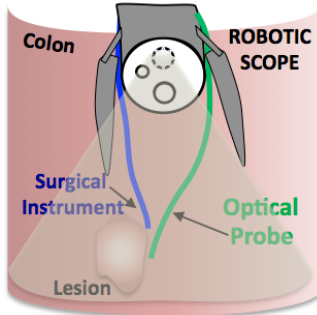


## PhD scholarship in development of a novel method using optical coherence tomography (OCT) for guidance of robotized interventional endoscopy

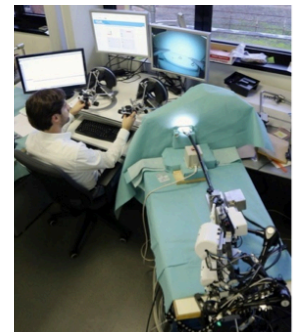


**Thesis location :** ICube Laboratory - Strasbourg University - CNRS

**Thesis supervisors :** Paul Montgomery  
Michel de Mathelin  
Michalina Gora

**Duration :** 3 years, starting on September 2016

The main goal of this thesis proposal is to address clinical needs of minimally invasive treatment of early cancer in luminal organs (e.g. esophagus, intestine). Such treatment is very complex and requires operating the endoscope and resection instruments in a confined space of the colon lumen. A promising solution is being developed by the AVR team at the ICube laboratory, in which the flexible interventional endoscope is completely robotized, so allowing a single operator to telemanipulate the device<sup>1</sup>. However, this solution is subject to the same diagnostic limitations of standard endoscopy that impairs the clinical decision-making process. In this thesis we propose to address this problem by developing a novel method that combines optical coherence tomography, an emerging optical diagnostic method<sup>2</sup>, with the robotized interventional endoscope prototype to enhance real-time diagnostic capabilities and provide real-time and in-situ tissue characterization. The opto-mechatronic OCT imaging system design and integration of both devices will be optimized and validated in pre-clinical experiments (including in vivo animal studies) in collaboration with surgeons from the Institut Hospitalo-Universitaire (IHU) on minimally invasive image-guided surgery and the Institut de Recherche Contre les Cancers de l'Appareil Digestif (IRCAD).



This highly interdisciplinary project will be directed in a collaborative manner between two teams: the Photonics Instrumentation and Processes team (IPP) led by Dr. Paul Montgomery, director of the thesis, who has over 20 years of experience in interference microscopy, and the Control, Vision and Robotics (AVR) team (Prof. Michel de Mathelin, thesis co-director) specializing in robotized interventional endoscopes. Dr. Michalina Gora (AVR/IPP) will be directly involved in supervising the doctoral student and providing the necessary guidance, especially in the development of the endoscopic OCT. The student will have an opportunity for short visits in the laboratory of Prof. Guillermo Tearney at Harvard Medical School and Massachusetts General Hospital in Boston, USA.

**Eligibility:** The applicants must have a master's degree from a foreign university or to have enrolled in a MASTER program at the University of Strasbourg in order to register in doctoral studies, after completion of a complete bachelor's degree course in a university abroad.

**Scientific interests:** Biomedical engineering, medical imaging, clinical translation, mechatronics, optical systems, visual servoing, control application programming (e.g. C/C++, LabVIEW), image/signal processing (e.g. MATLAB), and CAD (e.g. Solid Edge).

**Skills:** Advanced English (both written and spoken), French optional, enthusiasm for interdisciplinary teamwork, aptitude for practical experimentation, abilities of setting priorities and meeting deadlines.

**Contact:** To apply, please send a 1 page cover letter and a curriculum vitae to [michalina.gora@icube.unistra.fr](mailto:michalina.gora@icube.unistra.fr)

<sup>1</sup> A. De Donno, L. Zorn, P. Zanne, F. Nageotte, M. de Mathelin, *Introducing STRAS: a new flexible robotic system for minimally invasive surgery*. *Robotics and Automation (ICRA)*, 2013 IEEE International Conference, 2013.

<sup>2</sup> M. Gora, J. Sauk, R. Carruth, K. A. Gallagher, M. J. Suter, N. S. Nishioka, L. Kava, M. Rosenberg, B. E. Bouma, G. J. Tearney, *Tethered capsule endomicroscopy enables less invasive imaging of gastrointestinal tract microstructure*, *Nature Medicine* 19, 2013.