

## PhD position in super-resolution fluorescence microscopy: *"3D-colocalization in optical nanoscopy."*

Location:	Quantitative Imaging Group, Fac. Appl. Sci., Technical University Delft
Function type:	PhD student
Scientific fields:	Applied physics or a related subject
Hours:	38.0 hours per week (for 4 years)
Education:	Master degree
Salary:	€2086 to €2673 per month gross

### **"Nanoscopy: From sharp images to molecular interaction"**

The STW-Perspectief programme: "Nanoscopy: From sharp images to molecular interaction" is a large national programme on the development of super-resolution microscopy or "nanoscopy" and its applications in biomedical sciences. In the last decade new technologies have been developed that enable achieving resolutions down to 10-50 nm (in contrast of the limited resolution (~250 nm) in classical microscopy). This is a spectacular development, however, the potential of nanoscopy is much higher; it will allow the direct observation of the molecular machines that make up the cell and enable extraction of functional data such as molecular interactions and dynamics. It is our ambition to lift existing nanoscopy techniques to a level that enables extraction of information on biomolecular action and interaction in intact cells.

To achieve this, we will tackle various aspects of experimental nanoscopy in seven projects, all with the same ultimate goal: adding nanoscopy integrally to the toolbox for biomedical research. We have assembled a strong, interdisciplinary and enthusiastic team of scientists from seven Dutch universities, each with broad experience in advanced microscopy. Seven companies are committed to this program and are enthusiastic to work together with this consortium towards our common goal. This collaboration between scientific and commercial partners will result in high impact scientific papers, new hardware, software, new fluorescent molecules and methodology. For this programme we search for 12 enthusiastic and talented PhD students and post-doctoral fellows who would like to contribute to the next step in advanced microscopy: "biomedical nanoscopy"

### **Research group**

The Faculty of Applied Sciences is the largest faculty of TU Delft, with around 550 scientists, a support staff of 250 and 1,400 students. The faculty conducts fundamental, application-oriented research and offers scientific education at the bachelor, master and doctoral levels. The faculty is active in the fields of Life and Health Science & Technology, Nanoscience, Chemical Engineering, Radiation Science & Technology, and Applied Physics. **The Department of Imaging Science and Technology (IST)** is a physics department which specialises in imaging physics and image-based measurement science. Our mission is performing cutting-edge research in imaging science to advance the fundamental understanding of physical phenomena, leading to new, innovative imaging principles and revolutionary imaging instruments. We offer a stimulating academic climate for collaborative research and for educating students in the modern aspects of engineering physics and imaging sciences. From optical images of

colliding galaxies taken by the Hubble telescope to acoustic images of geological structures in the subsurface, from magnetic resonance images of the human brain to optical and electron nanoscopy data for studying biomolecules, the acquisition, processing and analysis of images presents intellectual, scientific and technical challenges. We tackle the development of new image acquisition and processing systems and the quantitative analysis of the 2D, 3D and 4D images obtained through such systems. **The Quantitative Imaging Group** is part of the Department of Imaging Science and Technology. Our ambition is to invent new, image-based measurement principles through a combination of imaging physics and digital imaging. We develop novel algorithms for image processing, image reconstruction, image analysis, and image recognition and apply them in medical imaging for computer-assisted diagnosis and in quantitative bio-molecular imaging (including microscopy and lab-on-a-chip). The programmes are conducted in close collaboration with partners in academia (including several university medical centres), industry, and governmental research institutes. We have access to excellent computing facilities and are the authors of DIPimage ([www.DIPlib.org](http://www.DIPlib.org)), a scientific MATLAB toolbox for 2D and 3D image processing.

## Job description

We are looking for a PhD student to develop tools for 3D colocalization in optical nanoscopy. The interaction between biologically relevant molecules on the nanoscale can be analyzed by measuring the emitter positions in 3D of multiple fluorescent labeling the biomolecules, the fluorescent labels are distinguished by different colours. The goal of the project is to investigate existing schemes and novel, diffractive optics based schemes for measuring “z+ $\Delta$ ” in addition to “x+y”. This involves a combination of accurate optical modeling and design, implementation on parallel computing platforms (GPUs) and precise experimentation. In addition we will endeavour to find suitable measures for species colocalization tailored to the context of optical nanoscopy by single emitter localization.

## Requirements

We are looking for a talented and enthusiastic candidate with an MSc degree in (applied) physics or a related subject. He/she must have an excellent knowledge of written and spoken English and a top 20% ranking during his/her BSc and MSc. Experience in optical engineering and design is helpful. Good programming skills in MATLAB and Labview are a necessity.

## Conditions of employment

The successful candidate will be employed full-time by TU Delft for a fixed period of four years within which he or she is expected to write a dissertation leading to a doctoral degree (PhD thesis). The starting salary for a PhD is €2042 gross per month increasing to a maximum of €2612 gross per month in the fourth year. TU Delft offers an attractive benefits package, including a flexible work week, free high-speed Internet access from home, and the option of assembling a customised compensation and benefits package. Salary and benefits are in accordance with the Collective Labour Agreement for Dutch Universities. Delft University of Technology strives to increase the number of women in higher academic positions; women are therefore especially encouraged to apply.

## Application and information

For more information about this position, please contact Dr. Sjoerd Stallinga, phone: +31 (0)15-2783538, e-mail: [s.stallinga@tudelft.nl](mailto:s.stallinga@tudelft.nl). The closing date for this application is **September 7, 2011**.