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Innovation through interaction

Striving for breakthroughs in international and interdisciplinary teams

Complex innovations enrich our everyday lives with more and more versatile technologies such as cloud computing, nanomaterials or safety systems in modern motor vehicles. Medicine, too, benefits from new technologies. Imaging processes, for example, use computer tomography, X-ray, ultrasound, nuclear magnetic resonance imaging or biomedical imaging with molecular markers to diagnose diseases or monitor therapeutic progress. The development of both the recording devices and imaging techniques, as well as the processing and analysis of the images is ongoing.

“Already today, in most cases, diagnosis is no longer possible without technology. A basic understanding, both of the medical and of the technical principles, is indispensable if you want to work in this area,” according to Dr Petra Dorfner, Chief Executive Officer of the International Graduate School of Information Science in Health (GSISH) at the Technical University of Munich (TUM). Even within the individual processes, the technologies overlap more and more. “In previous years, technological innovation has generally been seen in imaging processes. In the future, linking different imaging techniques together will be decisive”, agrees Dr Florian Odoj, Head of Marketing and Distribution at RAPID Biomedical GmbH, an equipment manufacturer for preclinical, clinical, and magnetic resonance imaging. “In the area of magnetic resonance imaging, for example, this was the combination of PET and MR. Other combinations, however, can also be considered. Of course, it will then be crucially important that these methods can cover the concrete requirements of the clinicians. At the moment, I see the greatest challenge in the years to come in this dialogue between the developers and the clinical users.” The GSISH Graduate School and RAPID are part of the “German Medical Imaging in Motion” (GMIM)



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research network, a consortium of seven university and industrial partners in the field of medical imaging and processing.

Together with seven other research clusters, the overseas activities of the GMIM network are supported within the framework of the international campaign “Germany – Partner for Medical Technology” by the “Research in Germany – Land of Ideas” initiative of the German Federal Ministry of Education and Research (BMBF).

Internationalization of science

Besides the increasing interdisciplinarity in medical technology, an intensified internationalization of research and development can also be seen. In order to facilitate cooperation across disciplinary and cultural frontiers as early as possible, the TUM GSISH Graduate School is looking for more overseas postgraduate students. CEO Petra Dorfner herself studied molecular biotechnology, an interdisciplinary field, and carried out research overseas for a period: “Together with the purely technical training, we give our postgraduate students international and intercultural skills. They learn, for example, how to collaborate in an international team and how to develop and publish results together with partners from other disciplines.” Modern communications technology accelerates the innovation processes. “Scientific innovations do not emerge in just one country, but in leading teams worldwide. Today, thanks to the globalization of communication, we become aware of what is happening elsewhere in the world much more rapidly. The significant advantage for our postgraduate students is that, during their doctoral studies, they can contact other working groups directly in order to drive their work forward. For example, this is true for developing new algorithms for the improved analysis of medical data.”

The internationalization of science must be actively supervised, so as not to lose the connection worldwide and in our own country. Petra Dorfner makes reference to the positive stimuli that are generated by the support of the BMBF campaign. “The campaign directly affects the demand and visibility abroad,” according to Petra Dorfner. “Thanks to



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the joint overseas tours and conference participation, international up and coming scientists have the opportunity to visualize our work and, as the case may be, to submit an application. In return, we have the chance to get to know the interested parties on site personally. This summer, for example, three exchange students from Johns Hopkins University (JHU) are working with our postgraduate students on highly innovative projects at the TUM-GSISH.”

Kevin Olds, a JHU postgraduate student in Biomedical Engineering, is one of them. During his time at the GSISH, he developed a disposable instrument manipulator using the Rapid Manufacturing technique, for controlling endoscopic instruments for procedures via single access, so-called single port surgery: “I think the work is novel and interesting. I had never seen rapid manufacturing of whole disposable components and robots before.” Above all, the widely varied tasks of the postgraduate students in Germany and at the GSISH impressed the American PhD students: “The scientific approach is not so different, but the way the labs are managed is very different. Young researchers have much more responsibility in Germany than in the USA, mentoring many students, teaching, and running large projects.”

An experience also shared by computer scientist Christopher Paxton during his exchange visit to the GSISH: “There seems to be stronger or more rigid organization in labs in Germany. Labs also seem to work together more closely in Germany versus the USA. German PhD students have a role more similar to researchers and employees of the University than that of students.” But even the differences in the scientific work can open up new perspectives: “Seeing different ways of approaching problems, and getting a picture of different possible applications, is always helpful. I think this is one of the big advantages of international exchange,” according to Christopher Paxton.

In Kevin Olds’ point of view, not only the participants themselves benefit from the exchange, but also the institutions involved: “I think the strengths of JHU and TUM complement each other well in the whole area of medical technology. Intensified collaboration would be very helpful to both schools.” Paul Wilkening, too, picked up new impressions and ideas during his time at the GSISH Graduate School in Munich. The



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computer scientist is collaborating on a project in robot-assisted microsurgery in the region of the retina and has written a code for a Raspberry Pi, a small single-board computer: “There are ideas from both projects I’ve worked on that could benefit the other. I’d say these two projects are similar enough that the code I’m working on is applicable to either project and so the exchange is a very beneficial experience.” The programmer could easily conceive of a further research stay in Germany: “I am having a good and productive time so far, and I would be able to do a lot more with more time here.”

Striving together for success: Economics and Science

The model of the affiliated German-American companies, Rapid Biomedical GmbH and Rapid MR International, LLC, also shows how fruitful the interdisciplinary and international exchange between science and industry, research and development in medical technology is. Rapid Biomedical GmbH was founded in 1998 as a spin-off of the University of Würzburg, and, up to the present, has worked together closely with the Physics Institute of the college. “To be successful in the market, you must be aware of the direction in which the market is developing. Particularly in the area of magnetic resonance imaging, the technological trends are set in research. A large number of the significant clinical applications today began as niche applications, 10 - 15 years ago, with a scientific abstract”, according to Florian Odoj, Head of Marketing and Distribution at RAPID Biomedical GmbH.

The networking facilitates new technological developments on several levels, even in the natural and engineering sciences: researchers and developers from different disciplines are working on new technologies in universities and companies in a range of nations. Understanding other areas of study, other cultural perspectives, and the various demands of scientific and economic research is a vital part of the process.



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Graduate School of Information Science in Health Information:

Since 2008, the GSISH Graduate School has been associated with the Technical University of Munich, Information Technology and Medicine, in teaching and research. The postgraduate students of the Graduate School work in four closely interdependent fields of activity, Bioinformatics, Information Technology for Medical Engineering, Medical Informatics and eHealth, as well as Information Technology for Healthcare. The Graduate School cooperates with the Klinikum rechts der Isar, the German Cardiac Centre, Munich, the hospitals of the Ludwig Maximilian University, Munich, and the Helmholtz Centre, Munich, as well as with other institutions. For further information go to: <http://gsish.tum.edu/>

Rapid Biomedical GmbH and Rapid MR International, LLC Information:

Together with its affiliated company, Rapid MR International, LLC, Rapid Biomedical GmbH develops, produces and distributes tailor-made equipment for preclinical and clinical magnetic resonance imaging, in particular, magnetic resonance coils for biomedical and diagnostic applications. Its affiliated company in Columbus, Ohio, supplies the market in the USA, Canada and South America. For further information got to: www.rapidbiomed.com/pages/english/home.php

Campaign, “Germany – Partner for Medical Technology” Information: *As a consequence of its established top-level research and the innovative strength of German companies, Germany occupies a comparatively leading position in Medical Technology. Depending on the subject, between 5 and 20 percent of scientific publications in the field of Medical Technology come from Germany. Within the framework of the current themed campaign, “Germany – Partner for Medical Technology” of the Federal Ministry of Education and Research (BMBF), the German Federal government promotes research and development in the area of so-called key technologies and supports the establishment of*



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international research and development cooperation with important target countries such as the USA and Brazil. For further information got to:

www.research-in-germany.de/dachportal/en/Campaigns-and-Activities/Campaigns/Medical-Technology.html

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