

digest

TUM Asia

January 2012



10 Years
**ENGINEERING
KNOWLEDGE**
in Singapore

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I recall just writing about our 8th Masters Graduation ceremony with the biggest graduating cohort in our last issue of newsletter. Time flies and we're about to say goodbye to 2011. Looking back 2011, it indeed has been a very challenging year for TUM Asia. Despite the difficult moments, the success we managed in our programme expansion brings a great sense of achievement for the organization as a whole. I would like to thank our staffs and partners for their hard work in kick-starting our Executive Education workshops, seeing through our first intake of the Bachelor of Science in Chemical Engineering cohort as well as rolling out the Master of Science in Biomedical Imaging in 2012. Amidst all these, TUM Asia also rendered support in establishing TUM Create here in Singapore. These are amazing feats and it gives me great energy to look forward to the new year ahead.



2012 is an exciting year for TUM Asia. We are 10 years in Singapore and we have lined up a series of events to celebrate our 10 years here, part of which we will do our part to give back to the society and the less fortunate. The cover story in this issue of the newsletter showcases the milestones we achieved in our 10 years. Have a read and take a walk through our student and corporate activities the past quarter as well. As for our upcoming events, we will be featuring them on our new website and Facebook pages so I would like to encourage everyone to stay updated with us through these online platforms.

In the new year ahead, I look forward to the new changes happening in TUM Asia, such as having our operations expanding into Beijing with the growing number of overseas students. I would like to say that TUM Asia is indeed very honoured to have the continuous support from our industry partners, agencies, academic partners and students. We could not have come so far without you and we hope to work even closer next year to continually provide top notch industry relevant graduates to the workforce here.

I wish everyone a fabulous 2012 ahead!

Dr. Markus Wächter
Managing Director, TUM Asia

10 Years ENGINEERING KNOWLEDGE *in Singapore*



2012 marks the 10th year TUM Asia began its operations in Singapore. From its humble beginnings at the German Centre to the current Pixel and Singapore Polytechnic campus, TUM Asia now provides holistic higher education services from undergraduate programmes to PhD and/or applied research programmes to students here in Singapore and from all over the world.

The significant milestones over the years.

In 2002



TUM Asia was founded as the German Institute of Science and Technology (GIST - TUM Asia) in Singapore with the support of Economic Development Board (EDB) under the Global Schoolhouse initiative as well as the German Academic Exchange Service (DAAD) and the German Federal Ministry of Education and Research (BMBF). A subsidiary of Technische Universität München (TUM), TUM Asia offered the first Master of Science programme in Industrial Chemistry jointly with the National University of Singapore (NUS). The programme has successfully graduated almost 150 IC engineers into the market and is still one of the most well received programmes here.

In 2005

TUM Asia launched the second Master of Science programme in Integrated Circuit Design jointly with Nanyang Technological University (NTU).

In 2007

The Master of Science in Microelectronics was appended as the 3rd Master of Science programme under TUM Asia. This programme is offered jointly together with NTU.

In 2009

A ground breaking year for TUM Asia where 2 new post graduate programmes were introduced to the students here in Singapore. The Master of Science in Aerospace Engineering in collaboration with NTU as well as a standalone TUM Master of Science in Transport and Logistics programme was launched.

April 2009, TUM Asia signed a MOU with the Workforce Development Agency (WDA) under the Skills Programme for Upgrading and Resilience (SPUR) providing funding schemes for workers to acquire new skills or to enhance their existing skill sets during the economic downturn under our various programme offerings.

TUM Asia was awarded the Institute of Higher Learning status by the Ministry of Education, Singapore.



In 2010

TUM Asia extends its foray into the research sector. A research contract was signed between TUM Asia and Singapore National Research Foundation (NRF) to look into the

development of electric vehicles. TUM CREATE was set up as the research center for this project.

August 2010, the Bachelor of Science in Electrical Engineering and Information Technology offered in partnership with Singapore Institute of Technology (SIT) saw its first intake of 42 students.



In 2011

TUM Asia was issued a 6 year registration certificate from the Council of Private Education (CPE).

August 2011, TUM Asia and SIT offered a 2nd Bachelor of Science programme in Chemical Engineering and welcomed the first cohort of 18 students.





In 2012

TUM Asia celebrates its 10th year in Singapore.

August 2012, TUM Asia launches a new standalone TUM Master of Science programme in Biomedical Imaging.

We couldn't have done it without all the support of our academic partners, agency partners, industry partners, students and staffs.

Moving forward as we welcome the New Year, there are plans in place for TUM Asia to extend its operations into countries such as China and India. Follow us at www.tum-asia.edu.sg or our Facebook fan page - TUM Asia to stay updated with an exciting series of 10th year anniversary events.

TÜV SÜD PSB's Annual Conference

The TÜV SÜD PSB's Annual Conference on Sustainability of E-Mobility took place on 24 November 2011 at the Grand Hyatt Hotel. The panel of speakers include representatives from TÜV SÜD, Land Transport Authority (LTA), the National University of Singapore (NUS), Nanyang Technological University (NTU), Robert Bosch SEA Pte Ltd and ST Electronics Pte Ltd to name a few. Dr. Markus Wächter, Managing Director from TUM Asia and Professor Harry Hoster, Scientific Director from TUM Create are honoured to be invited as two of the speakers, offering their perspectives on E-Mobility in Megacities and the Trends in E-Mobility.

Aside from providing insights into the Electric Vehicle adoption developments in countries such as Singapore, China, Germany, France and the United States of America, the speakers also touched on the energy sustainability of these projects. With terms like 'Green' and 'Sustainability' becoming keywords in businesses during the last decade, the intensive research and testing in E-Mobility have results indicating that Electric Vehicles can offer significant benefits such as energy efficiency and CO2 reduction. Incentives and government policies will play a part in the implementation to obtain such benefits as concluded by Mr. Thomas Schmidt from Robert Bosch SEA.

The attendees were further given insights into TÜV SÜD's functional safety processes and standards that are in place to ensure that Electric Vehicle technology does not become an environmental hazard and the conference moved on to explore the technical aspects of the Electric Vehicle battery system as well. All in all, attendees were provided a multi facet view into E-Mobility through this conference. It was an excellent platform to understand how far Singapore has come as a possible Electric Vehicle hub.



TUM ASIA STUDENT ACTIVITIES OVER THE PAST QUARTER

Clariant Industry session with our Master of Science Industrial Chemistry students.

Dr. Martin Vollmer, Head of Group Technology Services, Clariant and Mr. Walter Mohr, Region Head of SEA and Pacific Clariant, came by the Pixel campus to spend some time with our Industrial Chemistry students and also presented the Clariant scholarship awards to 2 of our Industrial Chemistry students Fan Wei and Gao Shengling.



Mid-Autumn Festival Party organized by the Integrated Circuit Design Chinese Master students.



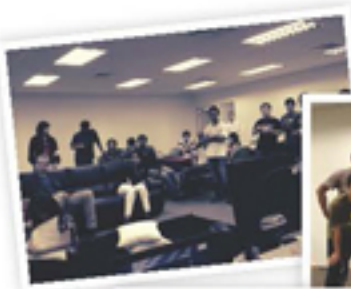
Students from the Transport and Logistics Master programme making industry visits to Port of Singapore Authority and Land Transport Authority.



The students attended a talk by Dr. Andreas Kopp who is a World Bank Economist working in the Department for Energy, Transport and Water. Dr. Kopp touched on the topic of "Transport and climate change: why we need a broad reform agenda"



Not forgetting some leisure whilst hard at work, the students went on a cycling trip at Pulau Ubin as well.



Student year-end event. The classrooms were converted into a living hall theme with console games, movies and music for our students to have a relaxing evening after their examinations.

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Founded in 1868, Technische Universität München (TUM) has produced 13 Nobel Laureates and is Germany's number 1 university*. TUM Asia was set up in Singapore in 2002 as a subsidiary. Today, we offer standalone and joint Master programmes as well as Bachelor programmes together with our partner universities such as the National University of Singapore (NUS), Nanyang Technological University (NTU) and Singapore Institute of Technology (SIT). Join us at our Open House to find out how we can help you engineer a super cool degree.

*Academic Ranking of World Universities (National Rank) 2011

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TUM ASIA ENSURES GRADUATES ARE WELL PREPARED FOR THEIR CAREERS UPON GRADUATION

TUM Asia Master of Science programmes are designed to provide students with industry relevant skills and knowledge. A 2 month internship and 6 month dissertation module is built into the curriculum and students are required to be attached to an industry relevant company to complete it. In this issue of our newsletter, we look into how this internship experience benefits our students, particularly in their job placements upon graduation.



“In short, an internship to me is like a preview of what your job may be like. It may also be a stepping stone for far bigger opportunities that you would have never imagined.”

Ms. Amylia Ghani

Master of Science in Industrial Chemistry
(2009 Intake)

Although I did not manage to secure an internship with a company, I managed, however, to secure an internship-cum-masters thesis position with Professor Kühn, one of our lecture-giving professors at TUM Asia. I was assigned to a collaborative project between the TUM and KAUST (King Abdullah University of Science and Technology) in Saudi Arabia. My internship was in the Garching campus of TUM, where I worked in Professor Kühn's laboratories. I learnt many skills relevant to an inorganic chemist and also developed an aptitude for research.

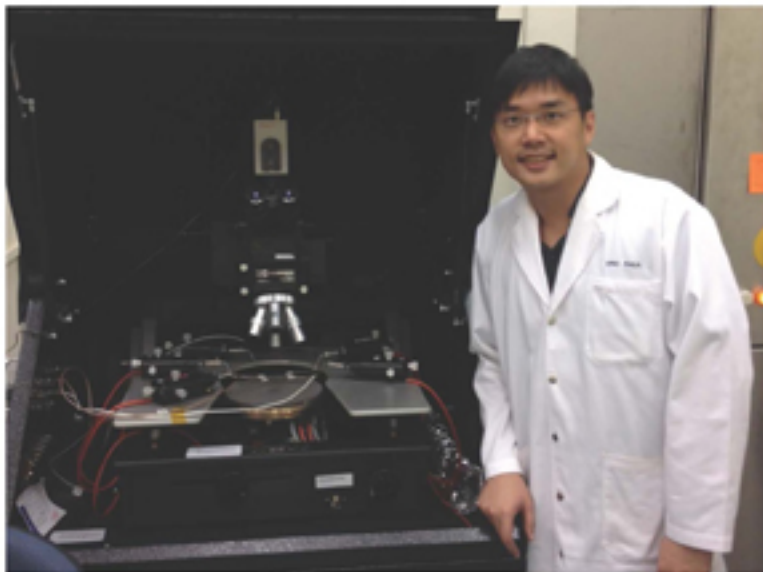
My internship-masters thesis experience in Garching gave me my current job placement as a PhD student here (in Germany a PhD student is not considered as a student but as a working individual). The skills that I have acquired during the internship have definitely prepped me for being an independent PhD student. I am also more confident in approaching tasks. Chemistry aside, I do feel that the relationships forged here during my internship period were important as well. It enabled me to integrate into the group with ease as I was

familiar with how things were being done, which labs I should go for analysis techniques, which colleague I could talk to for different areas of chemistry etc.

The benefits of the internship are far and many. I thank God that the cards fell nicely in my favour as I am still working in a KAUST collaborative project at TUM for my PhD and I am currently on an exchange in KAUST in Saudi Arabia right now. As Steve Jobs once said, *You can't connect the dots*

> continue p12

looking forwards; you can only connect them looking backwards’. Had I not interned with Professor Kühn, I would not be blessed with such an amazing opportunity to work in one of the newest and technologically advanced universities in the world.



“What your books can’t teach you, your internship will.”

Mr. Eric Phua

Master of Science in Microelectronics (2009 Intake)

I had a great internship experience at the Institute of Microelectronics (IME), Singapore. Back there, I was attached as part of a team in researching on a new biomedical device. My mentors and fellow research students were great companions and they offered great help and advice whenever needed. The institute prides itself on its inventions and the high quality researches being done, many advance equipment exist which are made available to research students. As such, there are always new things to learn each day.

Coming from a research institute helps to prepare me for my current research position. Technically, I become better as I get more accustomed to the different characterization techniques and technologies which are used for various analyses. There are also many opportunities to hone your soft skills as research is being carried out in a multicultural platform; many researchers in IME came from different parts of the globe.

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For students who anticipated to work after going through their masters, I strongly encouraged them to apply to relevant companies. Reason being that most of the experience gained would help get them a step closer to their future job applications. There is also an opportunity where the internship company would take the interns back as a full time hire.



Mr. Joash Tan

Master of Science in Integrated Circuit Design
(2009 Intake)

My internship was with Silicon Laboratories International in 2010. My role as a digital designer was to design and verify a memory interface for an embedded system. For me, I have been doing IC design for a number of years so what this course provided were both practical skill upgrade as well as a higher education certification.

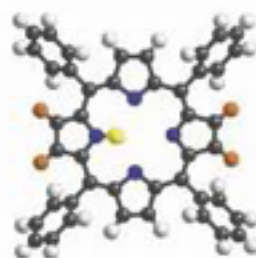
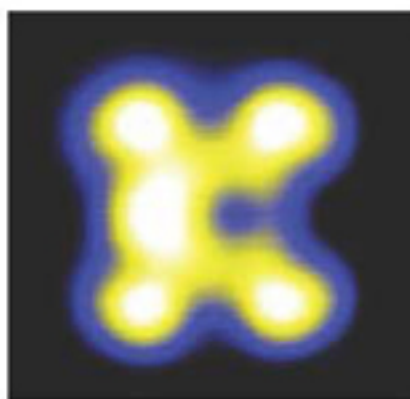
The internship is a very important part of this specialization course. Doing it with an industry relevant company is vital, as it provides students with an opportunity to

put their knowledge learnt in the classroom to practical use. At the same time, you can also learn from fellow colleagues their best practice in design and use of the CAD tools. What you can learn in the classroom is practical but limited due time constrain. So during the internship talk to the seasoned engineers, as they can teach you some scripts setup to run CAD tools and other handy applications to get things done faster. This makes your job less mundane and gives you more time to think about design and have fun.

“....an opportunity to put their knowledge learnt in the classroom to practical use.”



Targeted proton transfer within a molecule: The smallest conceivable switch



For a long time miniaturization has been the magic word in electronics. Dr. Willi Auwaerter and Professor Johannes Barth, together with their team of physicists at the Technische Universität München (TUM), have now presented a novel molecular switch in the journal "Nature Nanotechnology." Decisive for the functionality of the switch is the position of a single proton in a porphyrin ring with an inside diameter of less than half a nanometer. The physicists can set four distinct states on demand.

Porphyrins are ring-shaped molecules that can flexibly change their structure, making them useful for a wide array of applications. Tetraphenylporphyrin is no exception: It likes to take on a saddle shape and is not limited in its functionality when it is anchored to a metal surface. The molecule holds a pair of hydrogen atoms that can change their positions between two configurations each. At room temperature this process takes place continuously at an extremely rapid rate.

In their experiment, the scientists suppressed this spontaneous movement by cooling the sample. This allowed them to induce and observe the entire process in a single molecule using a scanning tunneling microscope. This kind of microscope is particularly well suited for the task since – in contrast to other methods – it can be used not only to determine the initial and final states, but also allows the physicists to control the hydrogen atoms directly. In a further step they removed one of the two protons from the inside of the porphyrin ring. The remaining proton could now take on any one of four positions. A tiny current that flows through the fine tip of the microscope stimulates the proton transfer, setting a specific configuration in the process.

Although the respective positions of the hydrogen atoms influence neither the basic structure of the molecule nor its bond to the metallic surface, the states are not identical. This small but significant difference, taken together with the fact that the process can be arbitrarily repeated, forms the basis of a switch whose state can be changed up to 500 times per second. A single tunneled electron initiates the proton transfer.

The molecular switch has a surface area of only one square nanometer, making it the smallest switch implemented to date. The physicists are thrilled by their demonstration and are also very happy about new insights into the mechanism behind the proton transfer resulting from their study. Knud Seufert played a key role with his experiments: "To operate a four-

state switch by moving a single proton within a molecule is really fascinating and represents a true step forward in nano-scale technologies.”

This research was funded by the European Research Council (ERC Advanced Grant MolArt, No. 247299), the Excellence Cluster Munich-Centre for Advanced Photonics (MAP) and the Institute for Advanced Study of the TU Muenchen.

Original publication:

Willi Auwaerter, Knud Seufert, Felix Bischoff, David Eciija, Saranyan Vijayaraghavan, Sushobhan Joshi, Florian Klappenberger, Niveditha Samudrala, and Johannes V. Barth
A surface-anchored molecular four-level conductance switch based on single proton transfer Nature Nanotechnology, Advance Online Publication, 11 December 2011 DOI: <http://dx.doi.org/10.1038/NNANO.2011.211>

Physicists at the Technische Universitaet Muenchen have created a nano switch based on a single porphyrin ring. If one of two

protons from the inside of the ring is removed, the remaining proton can take on any one of four positions, initiated by a single tunnel electron from the tip of a scanning tunneling microscope. (Credit: Knud Seufert / Technische Universitaet Muenchen)



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