

# KontakTUM Magazine

For alumni of the Technical University of Munich  
Spring/Summer 2017



## Passionately curious

A magazine about innovation and  
research at TUM

*Photo: Adobe Stock*

# Curiosity and thirst for knowledge are a prerequisite for every discovery.

Bianca Monzer is a student of Engineering at TUM, an ambitious course of studies that inspires and encourages her. She was grateful for support by means of the Deutschlandstipendium. You can promote young talents yourself too! [www.tum-universitaetsstiftung.de](http://www.tum-universitaetsstiftung.de)  
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”

*The best thing was feeling backed up by my sponsor, the support allowing me to strive for new goals.”*

**Bianca Monzer**

Bachelor student of Engineering Sciences

Photo: Andreas Heddergott / TUM

## What drives us as humans

### Humans are curious by nature:

As soon as the senses start functioning, a baby will start to explore the world, getting to know its surroundings very fast. Our KontaktTUM Editor Sabrina Eisele can observe this at the moment, as her first daughter was born in December. Congratulations!

Researchers keep their urge to innovate for the rest of their lives, which drives their work and serves as a basis for innovation. There are a lot of people at TUM who are hungry for knowledge. Every day, our researchers explore and continue to make new discoveries – possibly even groundbreaking inventions. In the past year, there were 145 invention disclosures at TUM, and 103 patents were filed – proving the inventiveness of our university, which will turn 150 next year.

The TUM's alumni are characterized by their constant curiosity and their passion towards everything new, as you can learn, for example, from the interview with the inventor Dr. Franz Lärmer, Vice President of the Robert Bosch GmbH (page 32). Further, Stephan Rohr, doctoral candidate at TUM, conducted and interview with Dr. Michael Steiner, development engineer at Porsche, providing you with information on how to turn ideas into marketable products (page 22).

Stay passionately curious and delve into the stories from the TUM network! Wishing you an exciting and fascinating reading experience ...

Photo: Magdalena Jooss / TUM



**Verena Schmöller** for the editorial team of KontaktTUM



*Children learn through imitation – but what about companies? Join the discussion in the evening event “Innovation durch Imitation” (See page 18 in the enclosed KontaktTUM program).*

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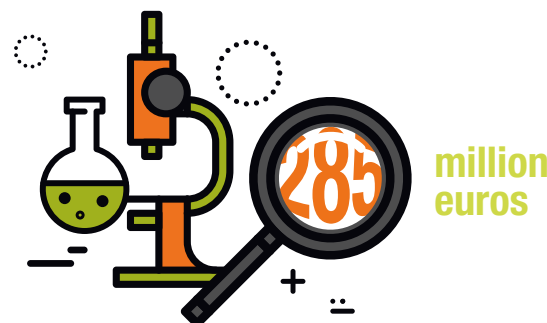
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Photo: Magdalena Jooss / TUM

Dr. Michael Steiner met  
Stephan Rohr in Weissach



million  
euros

16 Create thinking  
spaces



Back to the lecture hall

Photo: Magdalena Jooss / TUM



36  
We belong together

Photo: Magdalena Jooss / TUM

Photo: Astrid Eckert / TUM

06 The President on  
innovation at TUM





# The university as the home of curiosity

**The physicist Albert Einstein is said to have written the following about himself: “I have no special talent. I am only passionately curious.”** Without the scientist’s desire to find out what is behind certain phenomena, or the engineer’s striving to bring a new technical dimension to conventional procedures, there would be no innovation. Therefore curiosity and progress belong together. Carl von Linde, the inventor of the modern refrigerator and professor at the Technische Hochschule München from 1868 onwards, was drawn to the research field of refrigeration by a competition. In his memoirs, he described how he had been struck by curiosity: “I immediately felt there was unidentified potential in this area of mechanical thermodynamics.” Every researcher is a pioneer on unknown terrain. The desire to uncover something new is what drives him or her on.

## The desire to uncover something new

Thanks to my own research experience, however, I am aware that – in addition to the personality of the curious scientist – it is also the work atmosphere that plays a central role in promoting creativity and innovation. In my position as President of one of the leading technical universities in Europe, it is therefore important for me to create an environment in which curiosity can be lived. At TUM, there is a culture that allows risks to be taken – including the risk of failure. At our university, the courage to explore new directions beyond the well-trodden paths is an institutional strategy. This applies to everyone, from the students to the professors. According to our self-image, TUM serves the innovation society and aims to conduct research to sustainably improve living conditions and human coexistence.

True innovation is especially likely to arise where researchers focus on a bigger picture beyond their own horizons. There is unimagined potential in the exchange between different scientific disciplines. MUTE, for example, the TUM’s innovative electric vehicle, was developed and built by researchers

and students of 21 departments in eight faculties, together with numerous industrial partners. The project shows that complex challenges can be addressed successfully through cooperation between the traditional scientific disciplines. Following the motto “Risking Creativity”, we established the TUM Institute for Advanced Study (TUM-IAS) as an international, interdisciplinary research institute. There researchers from science and industry will be given every possible opportunity to develop visionary, sometimes even risky, projects and bring them to fruition. TUM is also involved in five Clusters of Excellence, in which innovative research projects are addressed at world-class level.

## Focusing on the bigger picture

In order to promote innovation at a university, creating an optimal working environment for the researchers is a necessary part of developing an adequate institutional structure, as we have been able to do over the past



**The TUM logo on the steering wheel:**

President Wolfgang A. Herrmann (front) and TUM Chancellor Albert Berger testing TUM’s innovative, electrically operated city run-around MUTE. MUTE stands for “the quiet one”.

Photo: Andreas Heddergott / TUM

## Passionately curious – “Culture of Excellence” for 150 years

Next year, we will be celebrating the 150th anniversary of the Technische Universität München. Our university has been characterized by an innovative spirit since the days of Karl Max von Bauernfeind and Carl von Linde, and “Culture of Excellence” will be our anniversary motto. In the future, we want to continue to match ourselves with the best universities all over the world, and to be in the forefront of setting standards. To achieve this, we need sufficient financial resources in order to make an impact in research – apart from managing the challenging compulsory program of a leading university. For this, we must prove attractive to the world’s leading figures. Many generous alumni contribute to this by providing financial resources through the TUM’s Universitätsstiftung or by sharing their knowledge and experience with the students. This should be an example for everyone. Our founders are helping to shape the future. This is not about reaping what we sow ourselves, but about being obliged, about providing for the next generation. Thus, dear readers, I also expect you to show loyalty towards those who are shaping the future! If we remain “passionately curious” and keep up this attitude as an ongoing, uniting strategy of the “entrepreneurial university”, our countless talents will serve as a solid foundation for securing the TUM’s future.

**By Wolfgang A. Herrmann**  
President of  
the Technical University of Munich

# What is innovative?

**TUM alumni and students on innovations that have had the most significant impact on their lives**

In 1976, the design of the “masterset 113 Tischfernsprecher” was awarded with the “iF Award”. It was designed for Siemens by Herbert Krämer and Tönis Käo. This item is part of the TUM’s Telecommunications Museum, a unique collection of telecommunications devices from the early days of telecommunication until today. Via the internet, you can take a virtual tour through the museum room at the Chair of Communication Networks. The digital mapping was, by the way, the first project of the TUM start-up NavVis GmbH, which is currently preparing to conquer New York (read more on page 43). [www.lkn.ei.tum.de](http://www.lkn.ei.tum.de) > Museum > Virtuelle Tour

## A table-top-phone

40 years ago, green phones like this one were absolutely state-of-the-art, and teenagers used to be on the phone for hours on end, talking to their friends and occupying their family’s only communication medium. Today, we use Skype and WhatsApp – technical developments that have changed our communication behavior. Innovations shape our lives and our everyday routine. Things that might have seemed unthinkable yesterday are reality today and will be only memories tomorrow. For this issue of KontaktTUM, we talked to TUM alumni and students about what innovations have been of particular importance for them personally.



Photo: Astrid Eckert / TUM



*Laura Furst participated in the Paralympics in Rio for the first time, finishing the event with a Silver Medal for her team.*



Photo: MSSP-Sportphoto

## Medical technology

### LAURA FÜRST

“Without the innovations in medical technology, my life would be quite different today. Even 50 years ago, it would have been impossible to be as mobile as I am today, with an incomplete paraplegia following an accident. For example, thanks to a robot-assisted device called Lokomat, which was relatively new on the market in 2008, I was able to do physiological training in rehab to learn to walk again. This therapy also helped me to regain other functions. Also, thanks to the rapid development of wheelchairs, I am agile enough for competitive sports. Wheelchair basketball has been around for a long time – but the ever-improving equipment allows us to play at a very high level.”

**After completing her Bachelor's degree in Energy and Process Engineering at TUM, Laura Furst is now working towards her Master's degree in Mechanical Engineering. In 2008, she had an accident with a snowmobile while she was staying in the US. She successfully plays wheelchair basketball for RBB Munich and is a member of the German women's national team. She and her team won the silver medal at the 2014 World Cup, the gold medal at the European Championships, and the silver medal at the Paralympics in Rio in 2016.**

## Computers

### PROF. SISSI CLOSS

“The development of the computer has had significant impact on my life and my work. When I was studying Computer Science in the 1970's, the computer eventually became more and more visible. At that time, nobody would have expected that this device would become so established, and that just about everyone would possess a computer soon. It was assumed that this would primarily be of interest for companies. After all, the things were monstrous back then. I was fascinated by this topic right from the very beginning, how it would all develop, and what the results would be ... I'm still curious about new developments. That's what drives me. And I want it to stay like that for my entire life, to keep me open-minded and safe from a standstill.”



Photo: Adobe Stock

**Prof. Sissi Closs (Diploma in Computer Science 1978) is one of the leading experts in the field of information architecture, documentation, and XML – and she is one of Germany's DITA pioneers. She became Professor for Information and Communication Technology at the university Karlsruhe in 1007, and she is also CEO of the company C-Topic Consulting GmbH and Chairperson of the Supervisory Board of the Fischer Computertechnik FCT AG. As early as in 1987, she founded the first service company for software documentation in Germany, which she sold successfully after 25 years. She has received several awards for her research and for her company management.**



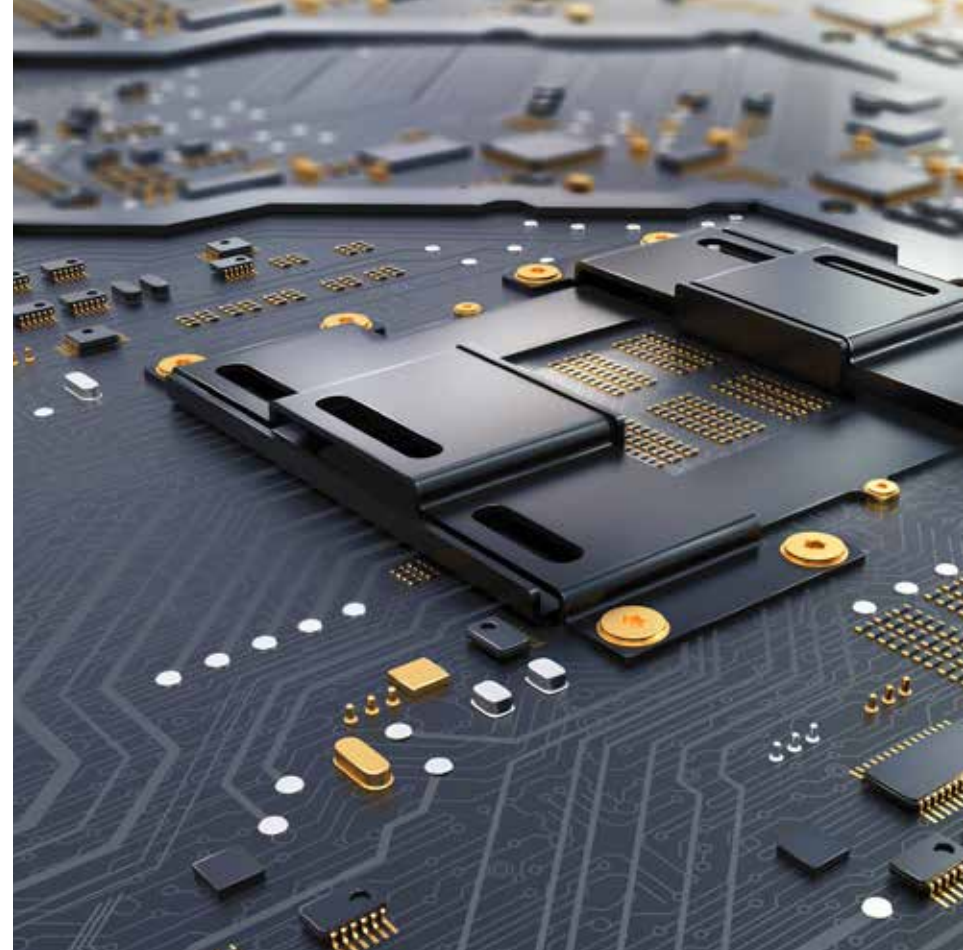
Photo: Uli Benz / TUM

*In 2012, TUM Vice President Prof. Thomas Hofmann appointed Prof. Sissi Closs as a “TUM Entrepreneur of Excellence”*



*Neither computers nor refrigerators, power supplies, or energy saving lamps would work without semiconductors. Their production is quite elaborate. The photo shows a mainboard.*

Photo: Adobe Stock



# Medical imaging

## PROF. SILVIO AIME

“The possibility to look at molecules within a living system is an important innovation in the field of medical imaging. It is a real breakthrough that we can now conduct non-invasive research on the metabolism of cells. This new technology will have significant impact on how we will approach the detection and monitoring of diseases in future. For me, research at its core, is always curiosity-driven. Thinking “outside the box”, trying to find new ways, delving into one’s personal background knowledge to collect puzzle pieces and to put them together – that’s what makes research projects so attractive.”

**Prof. Silvio Aime is Professor of General and Inorganic Chemistry at the Università di Torino in Italy, and he is considered a leading specialist in the field of molecular imaging. As IAS Hans Fischer Senior Fellow, he visited Prof. Markus Schwaiger at the TUM Institute for Advanced Study (TUM-IAS) several times in the period from 2011 and 2014.**

*In December 2016, TUM President Prof. Wolfgang A. Herrmann appointed Prof. Silvio Aime as a “TUM Ambassador” in recognition of his achievements.*



Photo: Astrid Eckert / TUM

# Semiconductors

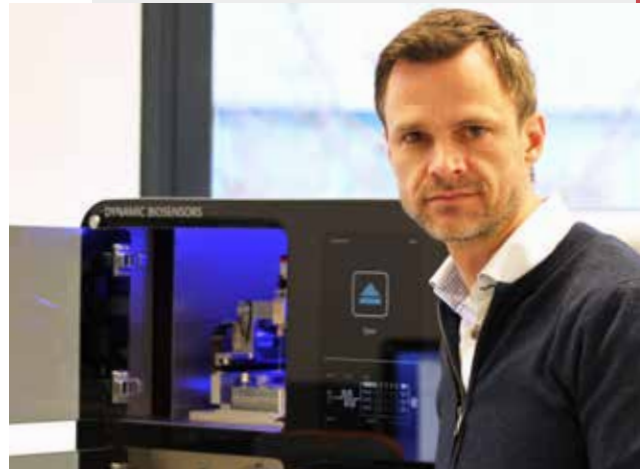
## DR. ULRICH KÜSTHARDT

“The fact that we are now able to produce semiconductors in significantly different and much more favorable processes is an innovation that makes me proud. The process took almost ten years. In the field of chemistry, it is difficult to develop new products and market them successfully within a year. Thus, it is all the more important to create the right environment for innovations. In addition to perseverance, it is necessary to establish open spaces in order to encourage creativity and lateral thinking – and innovation is not only about developing solutions according to a customer’s wishes, but also about active research: What is there to come, where could technological development lead us?”

**Dr. Ulrich Küsthardt studied Chemistry at TUM. After completing his doctorate at TUM in 1986, he started his professional career at an international consulting company before taking positions in controlling, marketing, and distribution at predecessor companies of Evonik. Since 2015, he has been Chief Innovation Officer at Evonik. He took this position with the aim to make Evonik one of the “most innovative companies” in the world.**



Photo: Evonik



## DNA nanolevers

**DR. ULRICH RANT** “The question which innovation has had the most significant impact on my work is easy to answer: the electrically switchable DNA nanolevers, which we conducted research on at TUM, and which we are now using as functional elements for high-performance biosensors in practice. I am particularly fascinated by the various facets of this development, from the technological details to the interface of interpersonal communication and to the practical applications in biomolecular research. For me, there is nothing more exciting than finding ways to put technical innovations into practical use and, thus, to open up new possibilities – in our case, the development of novel medicines.”

**Dr. Ulrich Rant is a founding member and CEO of the Dynamic Biosensors GmbH, which was awarded with the TUM Presidential Entrepreneurship Award in 2014 and the German Innovation Prize (Deutscher Innovationspreis) for its innovative sensor technology in 2015. Dr. Rant completed his doctorate in Physics at TUM in 2005 and was Carl von Linde Junior Fellow at the TUM Institute for Advanced Study.**



## The Internet

**DR. MATTHIAS GÖBEL**

“The Internet has revolutionized both my private life and my professional life. The development of this innovation took place very fast as of the early 1990s – and I was able to experience this first-hand. I think it is really fascinating that the internet has already become important enough to – in the form of the social media – influence the electoral campaigns in the United States. Meanwhile, I use the World Wide Web every day. Almost every patent application that lands on my desk has to do with the Internet in one way or another. Also, the fact that the decisions of the European Patent Office are published online significantly contributes to transparency. For me, the Internet also serves as a quick reference tool. I am very curious about what there is to come.”

**Dr. Matthias Göbel completed his doctorate at TUM in 1994. Before becoming a patent examiner at the European Patent Office in Munich, he conducted research in the field of metal organics as a postdoctoral student at the University of California in Berkeley, United States, for one year.**

## Networking via the internet

*Ten years ago, alumni who wanted to join the TUM Network still had to fill in forms and send them to TUM by post or fax. Today, it is possible to simply register online via the TUM website [www.community.tum.de](http://www.community.tum.de).*

*New graduates will not even have to do that anymore: using their TUM ID and password which they were given during their studies, they can simply continue to benefit from the TUM Community and stay in touch with their alma mater over the Internet – conveniently using their computer at home, of from anywhere else in the world.*



## Carbon

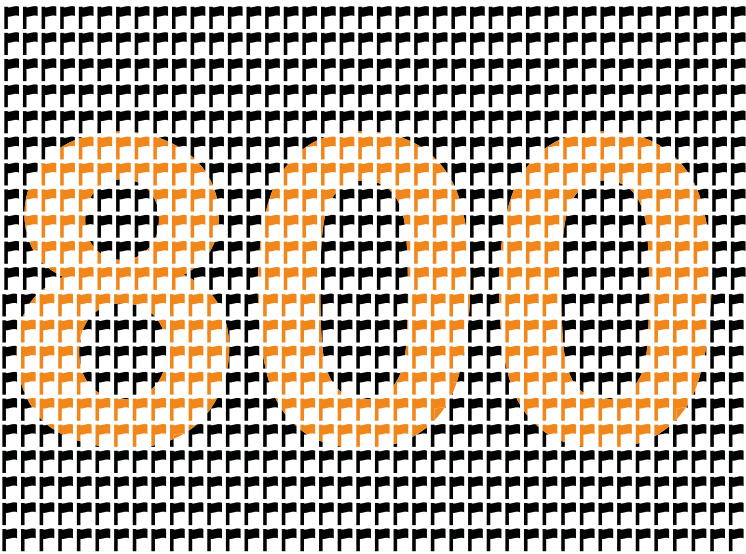
**CHRISTINE SCHÖBER** “In the scope of developing electric vehicles, our student team at TUfast Eco cooperates closely with the industry, and we are often allowed to test innovations. For our highly efficient vehicles, carbon parts are essential. Carbon is much lighter and more robust, and it is easy to shape. It is tremendously efficient. The less the vehicle weighs, the more energy-efficient it is – which is a great advantage for us. Carbon is already being used in the aerospace industry, and I guess other areas will follow. For me, this development is very exciting. It is a real enrichment to be that close to technical innovations.”

**Christine Schöber (TUM-BWL, 5th semester) is part of the organizational department of TUfast Eco, a student group that develops a new highly efficient electric vehicle every year. They take part in international competitions. Last year in July, they were rewarded with a Guinness World Record in the category “most efficient electric vehicle” with their eLi14.**





More than



*new businesses* established at TUM in the period from 1990 to 2016



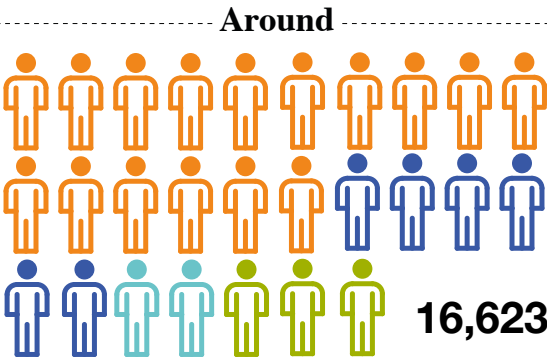
2,040,729,533€

*Estimated revenue of all spin-off companies at TUM*



x145

*invention disclosures at TUM in 2016*



people are working in these companies

👤 = 1000   👤 = 10   👤 = 100   👤 = 1



103

patent applications made at TUM in 2016



Spin-offs are planned for **20%** of the inventions of 2016

Create space to think –

shape the future

Curiosity, the urge to conduct research and the courage to break new ground – that’s what shapes a university. Good ideas thrive in an environment that provides freedom as well as a professional working atmosphere. This leads to solutions that help our society to face the tasks of tomorrow.

**One day, tiny nanomachines might travel through our bodies – in the bloodstream, for example – to take medicines exactly to where they are needed.** These nanorobots would, for instance, be complex enough to drill a hole in the wall of a body cell and deliver a specific substance. We are still a long way from this scenario, but Professor Hendrik Dietz is conducting research on the scientific requirements for this at TUM. The biophysicist builds nanomachines from DNA, the huge spiral molecule in which the genotype of every living being is stored, to create devices or machines with specific functions.

*In 2015, TUM received*



**million euros**

*in third party funding for research and teaching*

Dietz is an absolute pioneer in this field, and his work aims to lay the foundations for the development of industrial applications using this technology. In 2015, he was honored with the most important research award in Germany, the Gottfried Wilhelm Leibniz Prize of the Deutsche Forschungsgemeinschaft.

#### **Freedom for research**

At the moment, Dietz benefits from a funding program with which TUM aims to ensure maximum freedom for scientists to focus on their research: As Carl von Linde Senior Fellow at the TUM Institute for Advanced

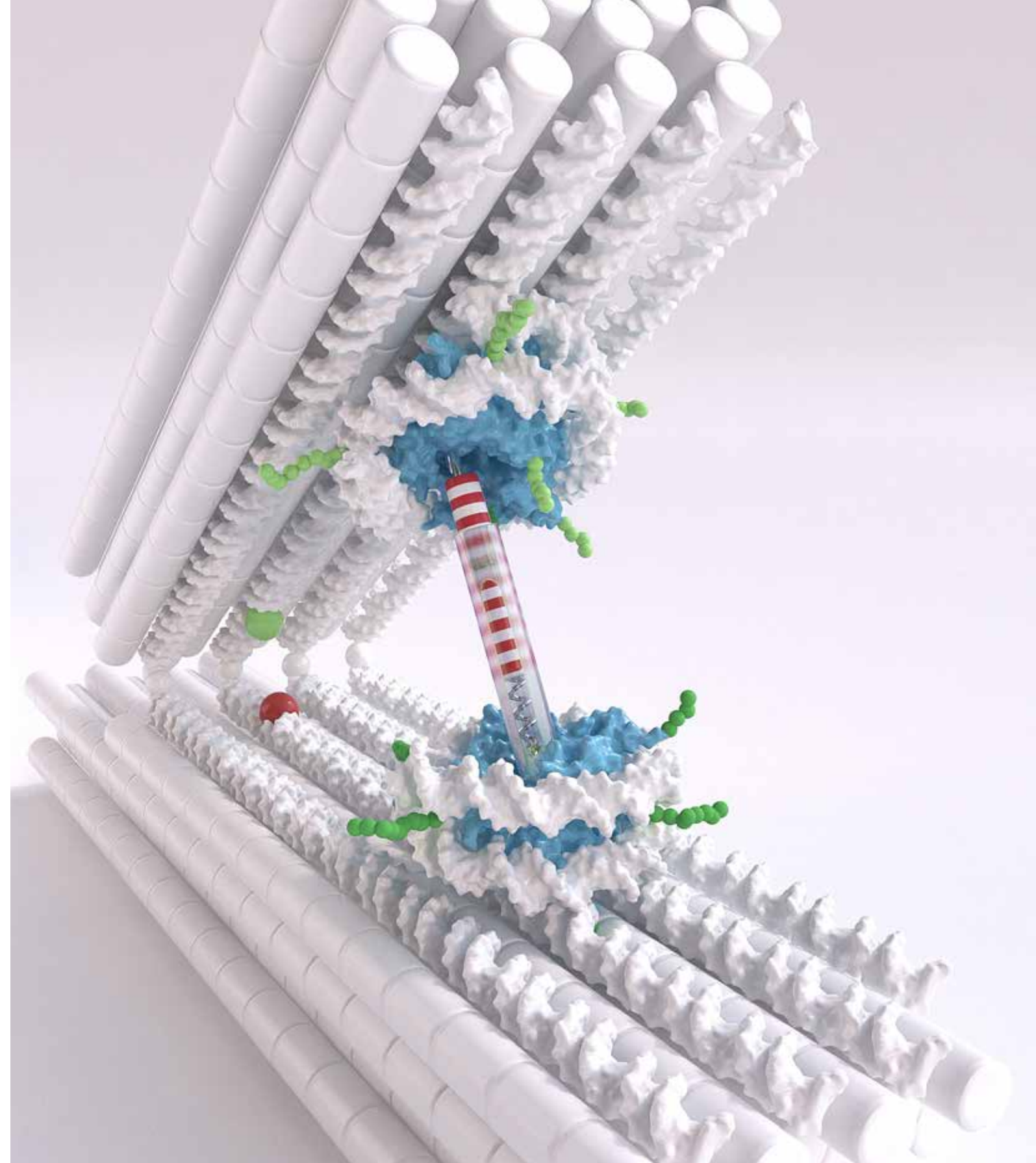
Study (TUM-IAS), he was relieved of all administrative tasks and teaching obligations for three years, allowing him to concentrate on his research.

According to TUM's self-image, the university serves society – committed to promoting innovation and sustainably improving people's lives. TUM-IAS allows outstanding researchers to pursue visionary ideas and even risky projects in new research fields over the course of several years, and TUM encourages researchers to take risks and to venture into new fields of research. It also has its own service departments such as TUMforTe, the Office for Research and Innovation Transfer, which provides help with acquiring third party funding, among other things. Dietz is aware of the importance of the financial aspect too: "If I had to count every penny, I would have to settle for less courageous experiments," he says. "TUM does not have more money for researchers than other universities, but the assistance with raising third party funds has helped me a lot."

Back to Dietz's nanorobots: where do the ideas come from? "I often initiate projects based on a gut feeling – and then I find out that I was right," he says. "Many ideas arise from personal exchanges, at conferences or by talking to colleagues. You have to have time for that. As soon as we start a new project, we are curious as to whether everything will really turn out the way we imagine." Above all, curiosity: Dietz thinks that it is a basic requirement of being a researcher. "If you rest, you rust. And if you start resting on your laurels, you're already corroded."

Munich plays an important role as a location, because several groups – such as research clusters and special research areas in the field of nanotechnology – are located here. "Research cannot be done in isolation. It is necessary to be part of a scene

Photo: Chris Hohmann, NIM /Dietz Lab, TUM



*This nanotechnology tool was developed in Hendrik Dietz's laboratory: a pincer-like structure consisting of two rigid DNA beams connected by a hinge.*



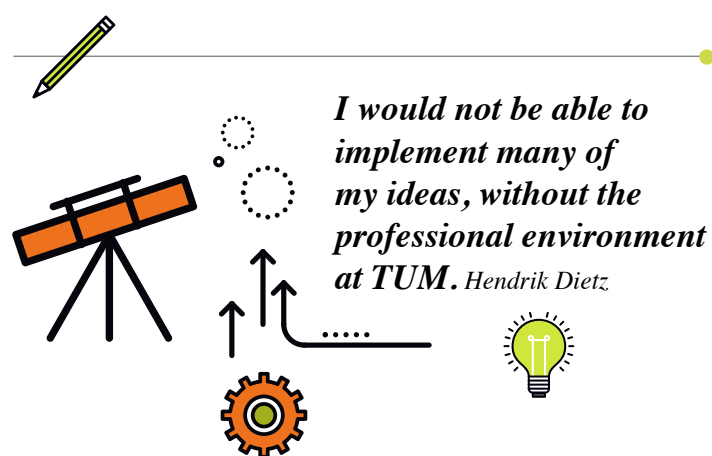
in which there is mutual inspiration.” Even the best ideas are worth nothing without an adequate professional environment, Dietz emphasizes. Such an environment can be found in Munich, and especially at TUM itself. “My colleagues and our students are excellent, as I often notice when I compare my situation to that of colleagues from other institutions. Without them, I could not succeed in what I am doing.”

### Innovation processes must be developed further

One day, nanomachines that are based on Dietz’s work could revolutionize medical technology and other industrial sectors, just as the process of digitalization is now transforming conventional industry. At the Institute for Automation and Information Systems, Professor Birgit Vogel-Heuser is currently conducting research under the motto “Industry 4.0”. Roughly speaking, the focus lies on the “Internet of Things” for industry, based on the assumption that production facilities, products, and commercial systems will someday be self-organizing. The opportunities that are attributed to Industry 4.0 and the digital technologies that are entering the market are presenting a great dynamic challenge for companies.

“As well as traditional mechanical and electrical engineers, I now need software experts. I have to change my business procedures and consider the aspects of cybersecurity and user innovation, to name just a couple of things,” says Professor Vogel-Heuser in explaining the challenges for companies. “Often, however, this can be addressed on a fairly small scale. For instance, many companies have quality control data or data they already use from the production machines to analyze downtimes or failures. They can use these data directly to improve processes systematically, for example

to ensure that machines will be used more effectively. This in turn can give them the freedom to address other difficult issues.”



Vogel-Heuser is the spokesperson for the special research field “Cycle Management of Innovation Processes”, which, put simply, focuses on the development of new strategies and tools for companies to proactively manage their innovation processes. “In order to follow a systematic approach, it is necessary to understand the interrelationships within one’s own enterprise as well as with partners and, above all, in the market – not only in technical terms, but also in relation to sociological aspects, for example,” as Vogel-Heuser summarizes her research goal.

### Three types of innovation

“In our opinion, there are three types of innovation,” she says. “The classic creation of something unprecedented – the iPhone, for example, or the Smart car, which allows you to use the smallest parking gaps. Then, there is the systematic and continuous improvement of products. Last but not least, and this is often forgotten, there is forced innovation – for example if a certain technology is no longer available, or if a certain component is no longer produced.” Nowadays, the market is tight, and companies

that don’t move with the times or that fail to innovate might quickly disappear from the market. Universities can help in the race to provide the best offer, in many ways: conventionally, through new technologies, and also by producing well-educated personnel who are creative and whose creativity is underpinned by a systematic approach. However, and this is new, universities can also support companies directly in the innovation process – by developing new innovation tools, for example, or by providing an environment in which there is more freedom than in a corporate structure.

### Finding new solutions systematically

GE Global Research is located close to Dietz’s laboratory and Vogel-Heuser’s department in Garching. Here, Professor Oliver Mayer (Electrical Engineering and Information Technology 1989), Senior Principal Scientist at GE, is responsible for innovative methods, among other things. He, too, emphasizes the speed of the markets and the need for companies to innovate in response to customers’ needs. “It takes a few years to develop a new turbine,” Mayer explains. “A lot can change in that time. Because of the energy revolution, for example, turbines are no longer as much in demand, since electrical power is no longer produced only thermally. The era of the inventor who buries himself in his laboratory and comes out with a finished product is over.” Despite the need for a systematic approach, curiosity and flashes of genius are still necessary in hunting for new ideas. Even if the basic idea is clear, there are still technical problems to be solved. For Mayer, curiosity in this context also means “curiosity about what is happening around you, whether there are things that could be transferred to other areas. Take 3D printing, for example: What is it about? Can I use it to solve my problem?” And how can a company maintain its curiosity? “This is

only possible by employing lateral thinkers and allowing them the freedom to give their creativity free reign.”

As diverse as the fields of activity of the three researchers might be, they all share a recipe for success: pursuing an idea systematically while, at the same time, thinking freely to find the best solution.

## KontakTUM program

*On May 30, 2017, Professor Birgit Vogel-Heuser will hold an exclusive lecture for TUM alumni, focusing on the basics of Industry 4.0, during which she will present the so-called “Yoghurt-Demonstrator” at the Department of Automation and Information Systems.*

*Check out the new KontakTUM program!*  
**Registration:** [www.together.tum.de/events](http://www.together.tum.de/events)

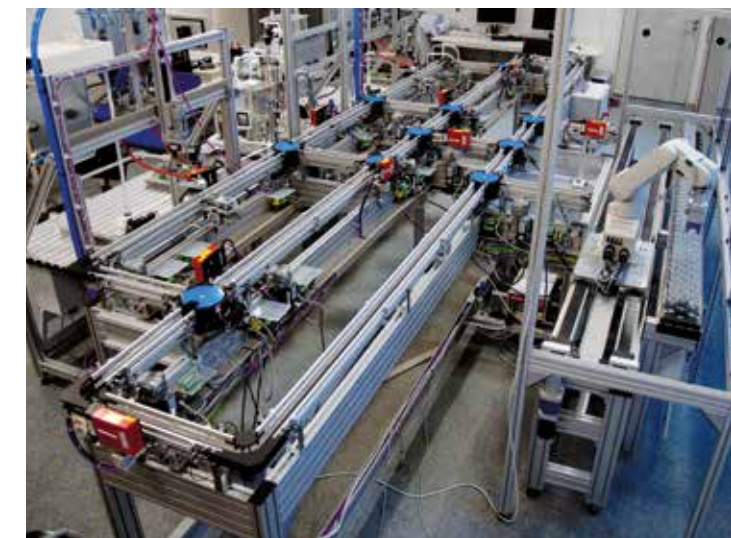


Photo: Sebastian Ulewicz / TUM

Dr Michael Steiner

**Dr Michael Steiner**, who was born in Tübingen, studied and earned his doctorate in Mechanical Engineering at TUM. In 1994, he started his career at Mercedes-Benz AG, which is now called Daimler AG; first in the field of concept development, later as a strategic project manager for the A/B class of car. In 2002, he moved on to Porsche, where he worked in the Development Department for Innovation and Concepts. The development of the Porsche Panamera – which he saw through from the first paper sketch to its market entry – was an important project for him. Since May 2016, Steiner has been Head of Research and Technology Development at Porsche AG.

Photo: Magdalena Jooss / TUM

Letting ideas  
grow **together**

Dr Michael Steiner (doctorate in Mechanical Engineering 1995), Head of Research and Technology Development at Porsche, is interviewed by Stephan Rohr, who is a doctoral student at TUM

Photo: Magdalena Jooss / TUM

INTERVIEWING  
AN ALUMNI

Stephan Rohr

**Stephan Rohr**, who was born in Landshut, started his studies in Mechanical Engineering at TUM in 2008. After completing his Master's degree in 2012, he joined Strategy Engineers – a boutique consulting firm based in Munich – where he supervised projects for automotive customers and suppliers. Following a successful year, he returned to TUM to work on his doctorate. Currently, he is busy analyzing the life cycle of lithium-ion storage, and there are plans to set up a business in this area with colleagues.



Dr Michael Steiner has been Head of Research and Development at Porsche AG since May 2016. He studied and earned his doctorate in Mechanical Engineering at TUM – and memories of that time were reawakened when he met Stephan Rohr, who is currently working on his doctorate at TUM, for an exclusive interview for KontakTUM. The two of them soon found that they not only share the same scientific field, but that they are also both keen on developing pioneering technologies and approaches. Thus they talked about the importance of new ideas regarding digitalization, autonomous driving, and the “Elektro-Porsche”.

**Stephan Rohr: Dr Steiner, being the head developer for a premium sports car manufacturer, you are concerned with two prominent topics for the automotive industry in the future: digitalization and electrification. Digitalization, in particular, is developing rapidly – making it necessary to bring new ideas to the market fast. How does Porsche address this need to act quickly?**

Michael Steiner: On the one hand, acting fast is very important nowadays. On the other hand, there is a risk in entering the market too quickly. As a sports car manufacturer, we have to consider carefully in which areas we want to be pioneers, and in which areas we would rather be so-called “fast followers”. Of course, digitalization is a vital topic for Porsche, but that doesn’t mean that we have to set the trend in the field of highly automated driving. But again, we are aware that we shouldn’t fall too far behind the pioneers. If new technologies turn out to be successful, if the customers see something new as a real improvement, it will soon be taken for granted – and they will expect it from us too. That is why it is important for us to observe developments in the market closely, but to find our own answers and to remain open for new ideas in order to set ourselves apart from others in the future. We always have to keep in mind what our brand is about: sportiness and being a premium product.

**Stephan Rohr: How can you make sure that ideas from within the company will be on the market early enough not to fall behind?**

Michael Steiner: You need the right staff. You have to be convinced that you have the right staff and that you can rely on a competent team. That’s something we can do at Porsche. We could always be proud of our flexibility and – in addition to the development of classic series production pro-

jects – of our ability to work on completely different tasks with the same team. You have to give your employees enough room to develop their own ideas and bring them to life in small-scale prototype projects. However, the company must of course determine the general direction so that employees are able to develop their ideas while bearing the bigger picture in mind.

**Stephan Rohr: Is that what you are responsible for, as the Head of Research and Development?**

Michael Steiner: Yes, exactly. I don’t myself work as an engineer in development any more. I am, however, curious about the suggestions and ideas of our employees regarding a given topic. This is just about the best position you can be in: being responsible for discussing the teams’ views on certain tasks, for evaluating their approaches to solutions, and for improving on these ideas together – always expecting an especially good solution.

**Stephan Rohr: In addition to digitalization, electrification is another important topic for the future of the automotive sector. For my doctorate, I am working on life cycle analyses of lithium-ion storage in electric cars.**

Michael Steiner: That’s an exciting topic. Currently, we don’t have much experience with the life cycle of lithium-ion batteries in practical applications because they haven’t been on the market for very long yet – at least not with the size, energy and power density needed for automobiles. And the technology is still developing quickly. With your subject, it is also interesting of course to present through simulations the findings gained from experiments, so that you don’t have to carry out physical experiments for everything. I’m sure that electric-powered vehicles are on the increase, and will definitely have a place at Porsche.

**Stephan Rohr: Together with a colleague, I am planning to turn my doctoral thesis into a business idea – a TUM startup that focuses on estimating the life cycle of batteries. TUM is providing a lot of support. What was it like for you?**

Michael Steiner: Back when I was working on my doctorate, founding a company was a complete exception. The classic way to start a career was either in industry or in research. Today, the situation at universities for young founders is much better. That’s a good thing. If you see yourself as an entrepreneur, you have to think and act accordingly. A startup is not so much about furthering science as trying to bring products to market.

**Stephan Rohr: We have noticed that as well. As a researcher, you tend to focus on the technology itself and then try to bring it to market in a technology push. Often, it might be better to start by considering a customer’s problem and then develop the technology to solve it ...**

**Michael Steiner (interrupts):**

We need both.

**Stephan Rohr: Yes, we need both.**

Michael Steiner (laughs): Yes, I am absolutely sure of that! On the one hand, we need a good research landscape – and that has always been one of Germany’s strengths. What we need as well, however – and this has so far not exactly been one of Germany’s strong points – is entrepreneurship, the ambition to develop practical applications for research at an early stage. But it won’t work if you focus on only one of these aspects. That is why we at Porsche provide support for scientific research as well as for the young startup scene.

**Stephan Rohr: I went to Berkeley to do research, and I noticed that an important approach was to make knowledge available for business use.**

Michael Steiner: If you make scientific advances, then in my opinion it is reasonable – and maybe even mandatory in an industrial and service-oriented society as we have in Germany – to commercialize innovations.

The interview took place in Dr Michael Steiner’s office at the Porsche Development Center in Weissach (located between Stuttgart and Pforzheim), where the largest sports car manufacturer in the world develops new ideas.



**Stephan Rohr: For scientists, it is sometimes not easy to find a balance between science, making knowledge available to everyone, and ownership, focusing on profit from patents.**

Michael Steiner: Yes, you're certainly right. My experience comes not from scientific research, but from industry. There, it is always sensible to register a patent as soon as possible, because people are often working on similar ideas in several places in the world at the same time. So being a few months ahead can be important.

**"It's important to be able to let go of good ideas."**

**Stephan Rohr: Would you say that the attitude to innovation has changed fundamentally since your time at university?**

Michael Steiner: Absolutely. For engineers, the concept of innovation used to be less broad than it is today. We aimed for patents that were supposed to bring a new functionality into a product. Today, an innovation in the market is mainly about what the customers consider as new or innovative. It is quite possible that the actual technology behind something innovative is no longer based on a new discovery, but that it is the combination of existing systems or functions which is perceived as innovative.

**Stephan Rohr: I would like to go back to the topic of electric-powered vehicles. Porsche stands for a particular driving experience. What impact do new ideas have on the sports car?**

Michael Steiner: That's an exciting question. At the moment, of course, there seems to be a trend towards highly automated driving, combined with digital innovations and modern driving concepts. In a traffic jam, for instance, you wouldn't really want to have to drive yourself – so why not let an assistance system take over? Alongside all the high-tech, however, we can also observe a countertrend towards very purist driving: Some of

our customers are demanding traditional driving machines, cars without assistance systems or navigation devices. And we want to satisfy these customers as well. No matter what kind of cars we might develop in the future, they all have to feel like a Porsche – meaning that they should react precisely to the driver's commands and that they must feature sporty driving dynamics.

**Stephan Rohr: Electric cars allow for entirely new vehicle designs. Will Porsche's classic sports car, the 911, change?**

Michael Steiner: The 911 will still be a 911. At the end of this decade, we will be producing the 'Mission E', our first purely electric Porsche, to present our vision of the sports car of the future. The Mission E will of course also be based on Porsche's design DNA, making it recognizable as a Porsche.

**Stephan Rohr: I will be working on my doctorate for another year. What did you learn from yours, what do you think I should keep in mind?**

Michael Steiner: For me, being able to work on my doctorate at TUM was a unique opportunity, and I still benefit from that a lot today. I was able to immerse myself in a specific topic – a chance that is rarely to be found later on in professional life. You learn how to tackle a topic that you don't know much about at first, to stay focused over the course of several years. And you learn that it is usually impossible to explore or report on a research topic completely. Also, you can learn a lot about yourself – what you're really good at and where you might need support later on in your professional life. You should always be aware that you can't solve complex issues on your own.

**Stephan Rohr: I've noticed that already. I thought I could manage my research topic on my own. But now there's a team of us working on the same topic.**

Michael Steiner: You will also notice that the world carries on, and that others who picked up your topic will have got significantly further ahead in a few years' time. That's all part of it.

**Stephan Rohr: It's not that easy to watch your own ideas being developed further by others**

**who have just picked them up ...**

Michael Steiner: Right. But ideally, you'll be able to distance yourself from the basic idea enough to be glad about its development – especially if others manage to improve on it. This is important anyway, because innovations are often based on interdisciplinary cooperation. Often the person who had the initial idea is not able to turn it into an actual innovation without the help of others. It

is absolutely essential to have good ideas and to work on them, but also to present them to your colleagues – to let go, to encourage others to develop them further. If you can't do that, you aren't really suited to teamwork. Teamwork, however, is the basis for innovation, more than ever before.

**What innovation was the most inspiring for you?**

**Stephan Rohr:**

For me, the smartphone is an innovation that has changed my life significantly, because I can now do so many things from just about anywhere. It gives me an enormous amount of freedom, although perhaps it also limits my freedom in other ways, as I can always be contacted. However, it has most certainly had a lot of influence on my life since 2007. 11.15 Uhr ✓



Photo: Magdalena Jooss / TUM

**Michael Steiner:**

Back when I was a student, I still made sketches in pen and ink. So the innovation I was most enthusiastic about was the CAD system that took the place of ink and pencils. Towards the end of my studies, it was great to be able to simply alter designs and manage them using the computer.



Photo: Adobe Stock





# How TUM promotes innovation and research

*The self-image of the Technische Universität München is to serve our society in addressing the ever new and increasing challenges of a globalized world. So we need a professional and competent scientific community that focuses on the “hot topics” of the century: health & nutrition – energy, climate, environment – natural resources – mobility & infrastructure – communication & information. In this, providing an innovative research environment is just as important as an active entrepreneurial spirit and a sense of community that supports talent as well as performance – and in which there are no boundaries between different generations.*

## Interdisciplinary research

TUM is one of Europe's most active technical universities, and it focuses on a unique combination of subject areas: engineering and the natural sciences, the life sciences, medicine, economics and the social sciences. The only way to solve the important questions of the future and to develop new research topics is to rely on cooperation between the different subject areas. Therefore, TUM creates opportunities for interdisciplinary

research – for example by means of its integrative research centers: the TUM Institute for Advanced Study, the Munich School of Engineering, and the Munich Center for Technology in Society. Here, researchers of different scientific disciplines can work with leading international scientists.

## Technology transfer and patent policy

Ideas and inventions that originated at TUM are at the forefront of technological and

societal progress. The utilization of new technologies developed at TUM is part of this – a task that is managed by TUM ForTe, the body that is responsible for negotiating contracts with partners who want to put the TUM's inventions to use. In order to treat the intellectual property of the researchers professionally and with special care, TUM has worked out its own patent policy. Industry for its part can receive support through cooperation with our researchers.

Photo: Andreas Heddergott / TUM



**TUM offers self-organizing research groups to support students who are keen to develop their ideas and talents.** In January 2017, the research group WARR Hyperloop was awarded a first place in the Hyperloop Pod Competition final at SpaceX in Los Angeles for their concept of a transport capsule for a high-speed train – the so-called “Pod”.

## TUMentrepreneurship

With its strategy concept TUMentrepreneurship, TUM aims to increase the number of growth-oriented technology companies and to motivate scientists to establish startups. Every faculty has its own Founding Ambassadors who represent this particular goal of the university, and the TUM Entrepreneurship Center offers a range of support for all phases of establishing a business – such as management training, support with applications for funding, or the Executive MBA qualification. The annual TUMIdeAward serves to promote ideas with market potential, and the winners

receive up to €15,000 as well as coaching. In cooperation with the associated institute UnternehmerTUM GmbH, TUM also supports promising startups.

## MakerSpace

In addition, UnternehmerTUM offers its MakerSpace. This high-tech workshop open to the public is available to ambitious startups, the do-it-yourself-community and other creative people – bringing together the local network of the city, the universities, the startups, the companies, and the local creative scene – thus strengthening Munich's position as a high-tech center.

## International networking

Together with its excellent partners the European EuroTech Alliance and the Global-Tech Alliance, TUM is working on research strategies for important issues of the future. There is also cooperation with the European Institute of Technology (EIT), which the European Parliament launched in 2007 and which focuses on innovations of significant societal relevance. Finally, via TUM Asia, the TUM's campus in Singapore, we are in close contact with the most important universities and companies there.

## 3

questions  
for ...

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**TUM is one of the most important research centers in Europe. How did we manage to reach this top position, and what is being done to ensure that TUM will maintain this position in the future?**

The success of a university depends on how many creative people there are, on an active culture of mutual appreciation, on an environment that supports the discoverers and inventors among of the students, that helps scientists to reach their full potential development, and that provides perspective for the future. In the center of TUM's strategy development, there is a successful calls policy that is tailored towards internationally experienced and ingenious personalities. Their prominence within the respective scientific discipline attracts talents of the next generation – and it is their pioneering spirit, their wealth of ideas that, in turn, attracts the best professors: mutual attraction on the highest level! The introduction of the TUM Faculty Tenure Track has given this spiral of success fresh impetus. Since 2012, we managed to recruit more than 80 professors from first-class schools – with international experience and bestowed with scientific awards – thanks to our calls and career system. It is these creative personalities who continue to push the boundaries of the natural sciences and engineering, of the life sciences and Medicine. Further, they allow us to be even more innovative in interdisciplinary research areas

such as sustainable energy innovations (Munich School of Engineering) or to apply the principles of engineering to biological systems (Munich School of Bioengineering). It is the courage to engage in constant innovation thanks to which TUM is fit for the future.

**Your position has to do with both research and innovation. Innovation is often mentioned in connection with new products. What is your opinion on the importance of innovation for research – and how should transition from research to the industry take place?**

Germany's innovative capacity as a science and technology location is not least dependent on how well we will manage to turn discoveries, inventions, and new developments into innovative technologies, into marketable products and services. In volatile times, and especially with regard to the digital revolution, we need innovators who are prepared to take risks in order to maintain our top position in the field of high-tech. This puts us, the universities, at the beginning of the value chain: we are extremely important as a launching pad for entrepreneurs! With an entrepreneurial overall strategy, we can help students and researchers to bring their ideas to light and to develop breakthrough technologies. At the new Entrepreneurship Center in Garching,

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**Prof. Dr. Thomas Hofmann** is TUM Vice President for Research and Innovation. After completing his doctorate and his habilitation at TUM, he first became Vice Director of the Leibniz Institute "Deutsche Forschungsanstalt für Lebensmittelchemie" in Garching, then Professor and Director of the Department of Food Chemistry at the University of Münster. Then, he returned to TUM to become a Professor at the TUM's Department of Food Chemistry and Molecular Sensors. He has been TUM Vice President since 2009, and Co-Director of the Bavarian Center for Biomolecular Mass Spectrometry since 2015.



Photo: Andreas Heddergott / TUM

the startups can rely on support from a single source – from the basic idea to the growth phase of a company. Here, we investigate what framework conditions are beneficial for spin-offs. We provide advice and support together with UnternehmerTUM, and we provide help in trying to find investors. Embedded in the powerful economic region of Munich, founders can rely on ideal conditions as well as on a network of strong partners, providing them with fresh impetus and easy access to private risk capital, to domestic industrial partners, to customers and international markets. Based on this holistic approach, we provide support for the young pioneers who can, thus, do what they are supposed to do – to shape the future! And successfully, as more than 800 technology-based businesses started off at TUM over the course of the past 25 years, 130 of them during the last two years alone.

**The idea of innovation is the most important one of TUM's guiding principles. How is it possible to promote curiosity and an enthusiasm for research among the students already?**

The desire to discover new things instead of just making oneself feel comfortable – that's what makes our students so special. And that's what we try to promote throughout all

our courses and training programs. The students are trained in the scope of up-to-date research topics. The TUM: Junge Akademie supports exceptionally talented students who are keen on interdisciplinary teamwork – and we encourage them to conduct research beyond the boundaries of their scientific discipline. Other students can benefit from the experience of international exchange. Thus, we recently signed an agreement with the National University of Singapore (NIS) that allows students to visit Singapore for one semester in order to take part in an entrepreneurship seminar and to do an internship in a local startup. This is an opportunity for students who aim to acquire entrepreneurial as well as intercultural skills. The European Venture program of the EuroTech universities TUM, EPFL/Lausanne, DTU/Copenhagen, and TU/e Eindhoven follows the same goal. Students are able to gather experience in the context of international markets and legal systems before actually being involved in founding a business themselves. Others might want to discover their passion for research and innovation in the scope of student competitions by joining, for example, the TU-Fast team, which regularly wins prizes for its Formula Student race cars, or the TUM team that recently won the first prize in the Hyperloop-competition in the United States – notably being ahead of the renowned universities MIT and CalTech in the US. The young peoples' enthusiasm is contagious!!



# Inventors among themselves

*Today, Dr Franz Lärmer (doctorate in Physics 1989) is an inventor who has received several awards, but back when he was working on his doctorate at TUM, patents and start-ups were not an issue at his Chair. The doctoral student Martin Brand – one generation younger – already filed his second patent application last spring, and he is now building a start-up based on his invention. The two met up at TUM, their alma mater, to exchange views.*



Photo: Magdalena Jooss / TUM

**“Yes, I remember this,” Franz Lärmer smiles as he enters the TUM main building at downtown campus.**

When he was a student of Physics, however, he was in Garching most of the time – and there wasn’t a direct subway connection yet. After graduating, Lärmer took a position at the Bosch Research Center in Stuttgart, where he developed a process that laid the basis for microsensors that are now used in automobile safety systems, for example. This was the beginning of his career as an inventor. Today, the physicist holds about 200 patents, and the European Patent Office appointed him Inventor of the Year 2007 in the industrial area – one of the most important awards for innovation in Europe. Lärmer is still at the Robert Bosch GmbH, now as Vice President in the company’s research center.

Martin Brand has no idea about what successes he might be able to look back on in 30 years, but he already started his career as an inventor while still working on his doctorate in Electrical Engineering at TUM. Together with four fellow students, the 33-year-old developed a technique that allows to test batteries for electric vehicles faster, easier, and more precisely than before. Their start-up Li.plus already exists, and they have received positive feedback from potential partners in the industry. Now, they have to get their product ready for the market. Brand’s motivation to start his own business was not least encouraged by the numerous offers with which TUM aims to accompany and support young entrepreneurs. “Also, my supervisor Dr. Jossen, who is an entrepreneur himself, encouraged us to consider whether our results might be suitable for an interesting patent application.”

“That was different when I was still a student,” says Lärmer. “After completing our studies, we aimed to either start a career in science or to gain a foothold in a company. Business start-ups were rare – and it was almost frowned on to file a patent application for something you worked out at the university. We primarily saw ourselves as re-

searchers who publish.” In Lärmer’s opinion, it is a good thing that universities are now promoting the exploitation of knowledge. If you aim for scientific work at a university, publications are still more important than patents, says Martin Brand. But there is also often the desire to put knowledge to economic use. “With regard to my doctorate, I was keen on publishing new research results in journals. Scientific prestige, of course, is one thing – but now, I also want to turn ideas into products.” “For me, this was the reason why I wanted to start a career in the industry,” Lärmer recalls. “I want to see what happens to my idea. It wasn’t enough for me to publish something that lands in a drawer or that



**Dr Franz Lärmer, 55** is a physicist. He completed his doctoral studies at TUM in 1989 and has been working at Bosch since 1990. He is one of the inventors of a method to produce the microscopic structures of so-called MEMS sensors – for which he and his colleague Andrea Urban were awarded with the European Inventors Award in the “Industry”-category in 2007. In 2014, he was awarded the “2014 IEEE Jun-ichi Nishizawa Gold Medal Award” by the American Institute of Electrical and Electronics Engineers (IEEE). Lärmer currently holds about 200 patents. He is not quite sure about the exact number.

is used by other scientists. Only once you are able to execute an idea – bring it to life – that’s when things get interesting.” Back when he graduated, the chances for a career in a renowned company were much better for creative people like him – especially if it was all about developing high-tech technologies that require a lot of resources. According to Brand, the big corporations are still very attractive, but programs such as EXIST or the TUM IdeAward motivate students to consider establishing a start-up. “Right after graduation, most people don’t have a very expensive standard of living yet; a good opportunity to try something,” he says. “Currently, our aim is to push the idea along to make it economically profitable.” – “That’s an im-



**Dipl.-Ing. Martin Brand, 33** studied Electrical Engineering and Information Technology at TUM (with a focus on Energy Technology and Mechatronics) and is currently working on his doctorate at the Chair for Electrical Energy Storage, with Prof. Dr.-Ing. Andreas Jossen as supervisor. In October of last year, he and four of his fellow students founded Li.plus GmbH, based on the development of a quick battery tester. With this invention, the team won the TUM IdeAwards in February 2016.

Photos: Magdalena Jooss / TUM

portant aspect,” Lärmer comments. “It’s not a real innovation until you have a product that generates earnings. Before that, it’s all about hard work, about turning an idea into an invention. An idea – no matter how great it may be – will not become a successful product just by itself, without effort.” But how is it done, the actual inventing? Lärmer: “It doesn’t work out the way Gyro Gearloose does it – just having ideas out of nowhere.” First of all, there must be a specific problem that needs to be

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## “Turning an idea into an innovation means hard work”

solved. And then ... “... don’t let go! You have to keep the problem in the back of your mind all the time, whether you’re wallpapering or relaxing in the pool.” So is he often absent-minded? “Sometimes,” he laughs. “My wife always asks me what I am inventing again.” Martin Brand smiles in agreement: “My wife has to put up with me being absent sometimes as well.” Ultimately, this shows that – although the two of them are one generation apart – there’s more that connects them than separates them.

Photo: Magdalena Jooss / TUM



*“It’s personal acknowledgement to be asked for advice.” Lars Hoffmann, Founder and Managing Director of fos4X GmbH, mentor for the founding team Vectoflow.*

## Start-up mentoring

### Building a high-tech start-up ...

... is extremely exciting  
... is largely dependent on the experience of others

Have you establish a company already?

Are you curious about current scientific innovations?

Would you like to share your experience and your know-how with TUM scientists who want to build a start-up?

### Become part of an active network of science and economy!

The start-up mentoring at TUM and UnternehmerTUM support TUM start-ups specifically in the phase of their market entry.

The founders can rely on the many years of experience of the entrepreneurs.

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*Interested?*  
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## WANTED

Are you connected to family members of friends via TUM as well? We are looking forward to your message: [alumniundcareer@tum.de](mailto:alumniundcareer@tum.de)



Photo: Magdalena Jooss / TUM

Back at TUM: Stefan Michael Fiegler (back, left), Dr. Christoph Rapp (back, right), Dr. Stephanie Rapp and Prof. Dr. Robert Rapp.

# TUM in the genes

*A whole family of passionate construction engineers: Prof. Dr. Robert Rapp (diploma 1969), his daughter Dr. Stephanie Rapp (diploma 2000), and his son Dr. Christoph Rapp (diploma 2002) all studied at TUM – and all of them Civil Engineering. This is not very surprising, as father Robert started to take his children along to the construction sites of his large-scale projects at an early age – even to Saudi Arabia for a period of two years. “This really is a great, exciting, and diverse profession,” Robert Rapp says today. Thus, it seems natural that he passed on his enthusiasm in the family.*

Stephanie Rapp also got to know her husband at TUM. Stefan Michael Fiegler (Diploma 1999) is – how could it be otherwise – a civil engineer as well: “What I like about the profession is that it is sustainable. When you finished your work, you can actually see what you achieved.” But that’s not the end of the family’s impressive TUM genealogy: in the early twenties, grandfather Dr. Erich Espermüller was a student in Munich as well, when TUM was still the “Technische Hochschule” – however in a different course of studies: Electrical Engineering. Nevertheless, the grandchildren were curious about his research: “In the first semester, I even borrowed my grandfather’s doctoral thesis from the library. His research was about semiconductors, which was quite an innovative thing back then,” says Stephanie Rapp.

### Prof. Dr.-Ing. Robert Rapp

(diploma in Civil Engineering 1969) completed his doctoral studies at the Bochum Ruhr University and started a career as an advisory engineer in the fields of civil engineering and hydraulic engineering. In 2000, he was appointed honorary professor at the Bundeswehr University in Munich. After retirement, in 2001, he founded his own engineering office. Now, he provides advice in the area of constructive water engineering.

### Dr.-Ing. Stephanie Rapp-Fiegler

(diploma in Civil Engineering 2000) also obtained a diploma in Industrial Engineering at TUM. In 2006, she then completed her doctorate at the Bundeswehr University in Munich. She worked at the TUM’s Chair for Urban Water Management and is now working for a water and wastewater association.

### Dr.-Ing. Christoph Rapp

(diploma in Civil Engineering 2002) completed his doctorate at TUM and was a laboratory manager in the field of Hydromechanics at TUM for several years. For his doctoral thesis, he was awarded with the Johannes B. Ortner Prize in 2009, and he received the Ernst Otto Fischer Award in 2011. Since 2012, he has been working for the municipal works in Munich – as Managing Director of the Praterkraftwerk, among other things.

### Dipl.-Ing. Dipl. Wirtsch.-Ing. Stefan Michael Fiegler

(diploma in Civil Engineering 1999) also obtained a diploma as an Industrial Engineer, in 2005, just like his wife. After three years as an employee of the TUM’s contact point Science and Commerce at TUM-ForTe, he joined BayWa AG in 2013, where he is now Head of Portfolio Management.



# Noticeboard

Photo: Jürgen Wößmann



The World Champion in the 4-man bob with his World Cup team.

## CONGRATULATIONS

At the World Cup 2017 in Königssee, Johannes Lochner (front position in the picture) and his team won the 4-man bob run. After earning his Bachelor's degree, the world champion has now enrolled for a Master's course in Electrical Engineering.

**"If you go down the bobsled run once, you won't want to stop."**  
Johannes Lochner

## NEW BOOKS BY ALUMNI

Photo: Springer Verlag



### Excursions to yesterday and tomorrow

**"Zeitreisen und Zeitmaschinen" is the title of a book by Dr. Andreas Müller.** You might think it's a Science Fiction novel, but it is actually a non-fiction book. The astrophysicist vividly describes the physical basis for time travel and addresses the technical feasibility of time machines. "I thought it would be very exciting to take a look at the idea of time travel – which is incredibly popular in Science Fiction – and the hard-hitting physical principles, to find out what might be possible and what is not," explains Müller, Vice Managing Director of the Excellence Cluster "Origin and Structure of the Universe" at TUM. In the chapter "Vision 2100", he speculates about the social and technological development of humanity, introduces visions of the future, and offers critical views on the topic of climate change.

### Building for space

**How must we plan and build so that living space in space is possible?** The book "Space Architecture Education for Engineers and Architects" by Dr.-Ing. Sandra Häuplik-Meusburger (doctorate in Architecture and Construction Technology 2010) is a study manual on the future-oriented topic of space architecture. "The conditions under which people live in space and in other extreme environments – and which architects in these areas have to consider – are significantly different from those on earth. This can lead to a rethinking of conventional design requirements," says Häuplik-Meusburger. "Studying the extreme and the unusual can lead to new input concerning current issues such as, for example, living in the smallest space and spatial expansion, managing resources, or improving the quality of life" – or the question of how to integrate technical systems so that they are easy to operate. Häuplik-Meusburger had already devoted herself to this topic in her dissertation "Architecture for Astronauts". In her opinion, space architecture is "one of the hot topics for Architecture of the future, and perhaps for all of humanity."



Photo: Springer Verlag

Photo: Springer Verlag



Photo: Peter Hammer Verlag



Photo: KOSMOS

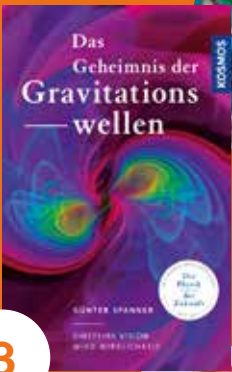


Photo: Humboldt Verlag



- 1** Dr.-Ing. Thomas Tille (doctorate in Electrical Engineering 2001)  
Automobil-Sensorik: Ausgewählte Sensorprinzipien und deren automobiler Anwendung Springer-Verlag 2016
- 2** Prof. Dr. Einhard Schmidt-Kallert (diploma in Geography 1972)  
Magnet Stadt: Urbanisierung im Globalen Süden Peter Hammer Verlag 2016
- 3** Dr. Günter Spanner (doctorate in Physics 1995)  
Das Geheimnis der Gravitationswellen: Einsteins Vision wird Wirklichkeit Franck Kosmos Verlag 2016
- 4** Dr. Andrea Flemmer (doctorate in Food Chemistry 1991)  
Cholesterin natürlich senken Schlütersche Verlagsgesellschaft 2016





The founding team of Landpack: Dr. Thomas Maier-Eschenlohr and his wife, Patricia Eschenlohr.

## STRAW INSTEAD OF STYROFOAM

Landpack’s packaging solutions are extremely environmentally friendly and just as suitable for insulating purposes as Styrofoam.

The founders Dr. Thomas Maier-Eschenlohr (doctorate in Mechanical Engineering 2013) and his wife Patricia Eschenlohr managed to develop compostable shipping solutions made of hemp and straw: “Any product that had to be shipped in Styrofoam boxes or using packaging materials consisting of plastic or corrugated cardboard could also be shipped – safely and environmentally friendly – in our ‘Landboxes’: from food-stuffs and medicines that have to be kept cool to furniture, machine parts, plants, or electronics,” the founders explain. Apart from the packaging concept, Landpack also developed a fully automated production line. Landpack won a number of founder awards, including the Next Economy Award.



Photo: Landpack

# Alumni start-ups

## Power from thermal discharge

Orcan Energy focuses on using the energy potential of thermal discharge, which – in practice – is still a fairly rare concept. Dr. Andreas Sichert (doctorate in Physics 2010), Dr.-Ing. Andreas Schuster (doctorate in Mechanical Engineering 2011) and Richard Aumann (diploma in Mechanical Engineering 2007) started as a TUM spin-off in 2008. They develop and produce so-called ePacks that, based on the ORC-technology, turn waste heat from industrial and production processes into electricity. The ePack can be seen as a small power station. “A typical application is to make use of the waste heat of a cogeneration plant engine at a biogas plant. The electric current is either used on-site or fed into the power grid,” Dr.-Ing. Andreas Schuster explains. In addition to biogas plants and industrial facilities, Orcan Energy is now also working on solutions for ships and other mobile appli-



Vice President Thomas Hofmann congratulates the founders of Orcan Energy: Richard Aumann, Andreas Sichert and Andreas Schuster (from left to right) for being awarded with the TUM Presidential Entrepreneurship Award.

cations, for example devices that use the waste heat of truck engines, or mobile power units that are called “Rental Power”. Being an innovative company that aims to put a novel and CO2-neutral energy source to use, Orcan Energy AG was awarded with the TUM Presidential Entrepreneurship Award in 2016.



Making successful running training more fun: the evalu team with Maximilian Gloël (bottom row, second from the left) and Romano Wolf (upper row, center).

Photo: evalu

## A running-coach inside a training shoe

Thanks to a sensor that is integrated in a shoe, runners can benefit from individual training tips using their smartphone, helping them to reach their goal with healthy and effective training. TUM alumni Romano Wolf (Master of Mechanical Engineering 2014) and Maximilian Gloël (Master TUM-BWL 2016) founded the Munich-based start-up evalu together with their colleagues Raphael Blistein and Benedikt Seitz in 2016. What is new about the textile sensors in the shoe is that they can measure the forces transmitted to the ground precisely and in a highly dynamic manner. The data are transferred directly to the smartphone. “Two smart force sensors in the shoes keep track of each of the runner’s steps, and a training-app analyzes the data in order to provide the runners with training tips – live, via the headphones,” Wolf explains. In January 2016, the young founders presented the first prototypes at the ISPO in Munich, the world’s largest sports fair. In September 2016, they were among the winners of the founding initiative WECONOMY, in which Unternehmer-TUM is involved as well. The “mobile running coach” evalu.run will be introduced to the market at the beginning of April.

## TUM IS GREAT FOR FOUNDERS

In the “Gründungsradar 2016” – an initiative by the “Stifterverband für die Deutsche Wissenschaft” – TUM took first place from among the major universities. The result shows that students and researchers can rely on optimal support if they decide to start their own business. The “Gründungsradar” aims to find out whether a university is able to

raise awareness for the topic of entrepreneurship among the students, whether there is support for founders, and whether the university’s institutions address this topic enough. At TUM, the students are introduced to the idea of founding a company at an early stage, and the TUM’s researchers are encouraged to develop marketable products as well: every faculty has Founding Ambassadors, and promising business ideas are supported by means of the TUM IdeAward. According to the “Gründungsradar”, initiatives such as the TUM’s Entrepreneurship Center or the associated institute EntrepreneurTUM, which provide support for start-ups, show that entrepreneurship is deeply rooted in TUM’s university culture. The TUM Presidential Entrepreneurship Award for outstanding TUM spin-offs (see the photo on the left) can be seen as an example for several other incentives.



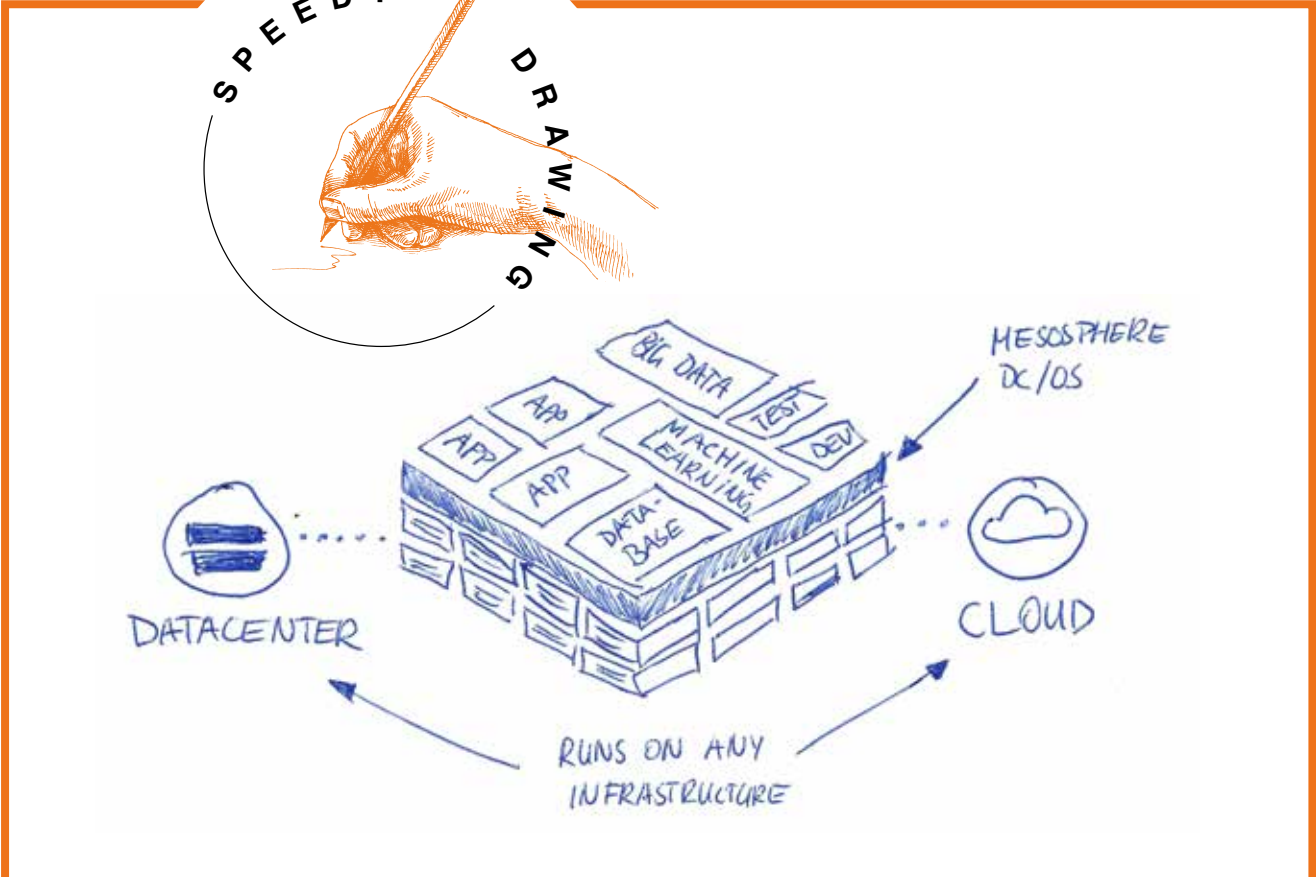


Photo: Mesosphere

COMPANY FOUNDERS  
SKETCH THEIR IDEA!



The Mesosphere founders Tobias Knaup, Benjamin Hindman and Florian Leibert (from left to right).

A software developed by Tobias Knaup (diploma in Electrical Engineering and Information Technology 2009), Florian Leibert, and Benjamin Hindman takes care of the servers of large data centers, significantly reducing the administrators' maintenance work.

The basic idea could be described as an operating system for servers in the "cloud age". "It's a modern cloud-native platform on which the two building blocks of modern software applications – containers and data services – can be operated at the same time," Tobias Knaup explains.

The three of them were convinced enough that they quit their jobs at Airbnb and Twitter to found Mesosphere, which is based in San Francisco. Apple, Twitter, Verizon, and Bloomberg are among their customers. Meanwhile, investors such as the well-known venture capitalist Marc Andreessen are eager to invest in the company, which is now worth several millions. Knaup, who was born in Schweinfurt, was sure that he would be living in the US one day. "I have always been fascinated by the internet – and since Silicon Valley is, so to speak, the capital of the Internet, my fate was more or less predetermined."



Photo: NavVis

Evan McPhee manages the NavVis office in New York.

THE NAVVIS-STORY  
CONTINUES

In the last issue, KontaktTUM reported about the start-up NavVis and its digital map of the Munich Airport. In the meantime, the TUM alumni have made it across the pond – by plane: at the end of 2016, they opened their first foreign branch office in New York. NavVis maps and digitizes interior spaces, which – similar to the mapping of exterior spaces with Google Street View – serves as a basis for navigation and visualization, for example in the form of digital tours. The company was founded by the three TUM alumni Sebastian Hilsenbeck

(diploma in Electrical Engineering and Information Technology 2011), Dr. Georg Schroth (doctorate in Electrical Engineering 2013), and Robert Huitl (diploma in Information Technology 2010), together with Dr. Felix Reinshagen. Now, the entrepreneurs from Munich want to conquer Big Apple: "The city of New York is known for its innovative and spectacular buildings. We are looking forward to be able to create digital images of these building icons in the future," says Sebastian Hilsenbeck.

Farewell to a strong woman

Dipl.-Ing. Anneliese Eichberg, the TUM's oldest graduate, died on February 10, 2017.

Back when Anneliese Eichberg completed her "Abitur" in 1929, she had quite unusual career plans – at least for a woman: she wanted to study Architecture. From 1930 to 1934, she was the only woman among 80 fellow students in the lecture halls of the "Technische Hochschule München" (THM). After graduating, she worked as a private assistant for Prof. Adolf Abel at the Department for City Planning.

There, she got to know Abel's assistant Werner Eichberg, her later husband. The couple did not support National Socialism – and neither did Abel, who was hardly able to find any work under the Nazi regime. When her husband had to serve in the Second World War, Anneliese Eichberg took over his position at the department. In 1945, she managed the huge task of rebuilding the largely destroyed THM.

At the same time, she managed to keep up her teaching at the Faculty of Architecture. In 1952, Anneliese Eichberg left the THM and established an architectural office together with her husband. The couple designed several buildings of the THM, including the new building of Electrical Engineering at the northern side of Main Campus. The largest project was the Klinikum Großhadern. Until her death, she was interested in what was going on at TUM and stayed in contact with her alma mater.

Photo: Astrid Eckert / TUM





## Alumni-Ticker

■ **Dr. Aldo Ammendola (doctorate in Biology 1999)** is now a member of the management board of Weleda AG, where he is responsible for research and development. ■ **Georgios Ampatzis (Medicine 2001)**, a specialist in the fields of neurology, psychiatry, and psychotherapy, was appointed the second chief physician in the neurological department of the Fachklinik Herzogenaurach. ■ The German Agricultural Society honored **Isabelle Bernklau (Food Chemistry 2013)** with the innovation award “Young Ideas” for her work on novel imaging techniques that serves to quantitatively characterize the protein structure of wheat dough. ■ For his work in the field of immunology, **Dr. Veit Buchholz (doctorate in Medicine 2015)** was awarded the Otto-Westphal Doctorate Prize, which is endowed with € 1,500. ■ **Sabrina Behrendt and Sandra Pschonny (Landscape Architecture and Planning 2016)** were awarded with the Quarry Life Award 2016 (endowed with € 5,000) for a practical project that focuses on creating a habitat for reptiles. ■ The ADAC Foundation has appointed **Dr. Andrea David (doctorate in Civil Engineering 2002)** as the new Managing Director. David (46) has been working for the ADAC since 2002, and her last area of responsibility was the Transport Division. ■ Undersecretary **Monika Deubzer (Home Economics 1985)** will be the new Head of the Department of Nutrition, Agriculture, and Forestry in Landau. In 2012, she was appointed to the Ministry of State in Munich – and she was responsible for the department “Landfrauen, Haushaltsleistungen und Einkommensverteilung” since 2016. ■ **Dr. Laura Dobusch (doctorate in Sports Science 2015)** has won the ConSozial Wissenschaftspreis 2016 in the category “Science” with her dissertation on “Diversity Limited – Inclusion, Exclusion and Strategies of Frontiering through Diversity Management Practices”. ■ For her outstanding scientific research on cancer therapy, **Dr. Dr. med. Ruth Eichner (Medicine 2010)** was awarded with the Research Prize 2016 of the Walter Schulz Foundation. The 33-year-old scientist and her working group managed to activate the immune system with a modification of the active substance Thalidomide (Contergan). ■ In early May 2017, **Dr. Sophie Ertl (Mechanical Engineering 2003)** was appointed a partner of the Maiwald Patentanwalts GmbH. She worked for BMW for several years – in the Department of Drive Production – before joining the agency Bardehle Pagenberg in 2006. In 2013, she joined Maiwald. ■ The Fachhochschule Lübeck has appointed **Prof. Sebastian Fiedler (Architecture 2004)** to the Faculty of Construction, starting from the winter semester 2016/17. He teaches the subjects of Construction Physics and Technical Building Services. ■ **Markus Fleischmann (Agricultural Science 1998)** is taking over the area Management LandProfi of the Maschinenringe Deutschland GmbH at the company’s headquarters in Neuburg an der Donau. ■ **Dr. Florian Geistmann (doctorate in Chemistry 2002)** has been the new Head of Shimadzu Germany’s Technical Office in Munich since October 2016. ■ **Prof. Dr. Franz Gießibl (Physics 1988)** from the Institute for Experimental and Applied Physics at the University of Regensburg is the winner of the Feynman Prize 2016, with which the Foresight Institute honored his trend-setting work in the field of raster probe microscopy. ■ The Cemex Advancement Award Cement 2016, which is endowed with € 10,000, goes to **Dr. Stefanie Marilies von Greve-Dierfeld (Civil Engineering 2003)** for her contribution “Bemessungsregeln zur Sicherstellung der Dauerhaftigkeit XC-exponierter Stahlbetonbauteile”. ■ **Michael Metzger (Physics 2012)** was awarded with the Evonik Research Prize 2016 for his innovative battery test cell. ■ Roche Diagnostics GmbH has a new CFO: **Claus Haberda (Agricultural Science 1990)** has been with Roche since 1992. Until recently, he was Head of the factory in Penzberg, with around 5,600 employees. ■ **Prof. Dr. Alois Heißenhuber (doctorate in Agricultural Science 1982)** is Head of the newly elected Agriculture Commission at the Federal Environment Agency, which advises the Umweltbundesamt.

## Alumni-Ticker

Georg Henig (management-oriented postgraduate studies of Business Administration 2005) is a new partner of the Oliver Wyman GmbH in Munich. ■ **Dr. Bernadett Hilbert (doctorate in Medicine 2015)** and **Dr. Magdalena Wübken (doctorate in Medicine 2015)** were honored with the Bavarian Doctorate Award for General Medicine 2016 for their dissertations. ■ In December 2016, **Georgios Kabitoglou (Electrical Engineering & Information Technology 1996)** was appointed Chief Business Officer for the Oras Group. Most recently, he was Chief Sales Officer and member of the management team of Bartec Group. ■ In 2016, the European Federation of Geosciences honored **Prof. Dr. Heike Knicker (habilitation in Pedology 2000)** with the Philippe Duchaufour Medal, which is also known as “the Nobel Prize of Pedology”. She has been working at the Institute for Natural Resources and Agrobiology in Seville since 2008. ■ In January 2017, **Prof. Dr. Hubert Kübler (habilitation in Medicine 2011)** was appointed Director of the Clinic and Polyclinic for Urology and Children’s Urology at the Uniklinikum Würzburg. Most recently, he was Deputy Clinical Director of the Urologic Clinic and Polyclinic at the Klinikum rechts der Isar. ■ The presidium of the German Brewers Association has nominated **Dr. Jörg Lehmann (doctorate in Brewing and Beverage Technology 1997)** as a candidate for the election to the presidency of the association in 2017. ■ In September 2016, **Prof. Dr. Martin Leitner (doctorate Mathematics 1989)** took the position of the President of the Munich University of Applied Sciences, where he served as Professor at the Faculty of Computer Science and Mathematics. ■ **Prof. Dr. Thomas Mücke (habilitation in Medicine 2013)** is the new Chief Physician at the Department of Mouth, Jaw, and Facial Surgery at the St. Josefs Hospital in Krefeld, Germany. Most recently, he was a senior physician at the TUM’s Clinic and Policlinic for Oral and Maxillofacial Surgery. ■ The PhD Award 2016 of the Cluster of Excellence Universe in the category “Experiment” goes to **Dr. Alexander Neumeier (doctorate in Physics 2015)**. His doctoral thesis is about a novel particle detector. ■ For her final thesis, **Anja Nieratschker (Mechanical Engineering 2016)** was awarded with the 2016 Study Prize of the Carbon Composites e.V. ■ On September 15, 2016, building contractor **Franz Xaver Peteranderl (Civil Engineering 1982)** was elected as the new President of the Chamber of Crafts for Munich and Upper Bavaria. ■ **Eva Ritter (Forestry and Wood Science 2014)** is the new Head of the Forestry Administration of the City of Augsburg. ■ In January 2017, **Dr. Anke Sax (doctorate in Business Economics 2010)** took over the IT division of the Deutsche WertpapierService Bank AG as the new CIO. Before, she was CIO at Daimler Financial Services AG. ■ **Dr. Christian Schunk (doctorate in Forestry 2016)** was awarded with the Thurn und Taxis Award for Forestry Science for his doctorate in the field of Ecoclimatology. ■ **Dr. Willie Stiehler (doctorate in Business Administrations 2015)** was appointed Managing Director of the newly founded Energieagentur Südostbayern in October 2016. ■ Among others, **Dr. Andreas Vogelsang (doctorate in Computer Science 2015)** was honored with the Kamm-Jante-Medal 2016 of the “Wissenschaftliche Gesellschaft für Automobilfahrzeug- und Motorentchnik” for his outstanding dissertation. ■ **Florian Vogel (Forestry 2003)** was appointed as the new Head of State Forestry Rothenbuch in March 2017. ■ The “DLG-Kommission Mischfutter” has a new chairman: **Prof. Dr. Wilhelm Windisch (habilitation in Animal Nutrition and Performance Physiology 1995)** was elected to take over the position from **Prof. Dr. Hans Schenkel**. In addition to his position at the Chair of Animal Nutrition, he has been the Managing Director of the Hans-Eisenmann Center for Agricultural Science at the TUM School of Life Sciences Weihenstephan since 2013. ■ **Dorian Zank (Architecture 2016)** won first place in the competition “Auf IT gebaut” in the category “Architecture”.



Have a look at the new  
KontakTUM Program!

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## Palo Alto

*In the course of my apprenticeship in carpentry, I decided that I wanted to study restoration at TUM. There, I could develop freely – and I eventually completed a doctoral thesis about a technical artifact at the Deutsches Museum. I would have loved to stay at the museum forever, spending day after day discovering things without ever having to take the same route twice. My husband, however, who is also a TUM alumnus, had already been living in Los Angeles for a while, so I followed him there. Now, two years later, we are living in Silicon Valley with our two children, about 50 kilometers south of San Francisco. It took us a while to feel at home. The region is like an endless suburb – with wide streets, flat buildings, huge parking lots, and extensive shopping centers. Some of the flat buildings belong to companies such as Google, Facebook, or Apple. It is those companies – and others, such as Tesla, Uber, Twitter, and LinkedIn – that make the region unique and exciting. The people who live and work here come from all over the world. It is not uncommon to see driverless cars on the streets. Due to the variety of startups, you could work on exciting new projects with a new team every day. You feel you are experiencing the future. As a restorer with a great interest in technology, I found a new field of work at the Computer History Museum in Mountain View, which has one of the largest computer collections of the world. I have been working recently on a new research project that focuses on the question of how the artifacts that are currently shaping our everyday life can be preserved for future generations. Silicon Valley is unique. If we ever leave again, we will take with us the area's spontaneity, internationality, curiosity, and openness towards everything new.*



**Following her diploma in Restoration, Art Technology and Conservation Science, Dr Nora Eibisch completed her doctorate with Professor Erwin Emmerling as her supervisor.** For her doctorate, she restored and reconstructed the "Montagestraße SRS 72" by Konrad Zuse, for which she was honored with the 2016 Doctoral Thesis Award of the association Friends of TUM. As her supervisor stated in his laudatory speech, her work is to be seen as "a great example of what can be achieved by dedicated restoration work". She lives in Palo Alto with her husband Christoph Lippert (Bioinformatics 2008) and their two children.

**May 25, 2017 // Palo Alto/Silicon Valley**

"Experience computer history with me – live – in Palo Alto!"

**Dr Nora Eibisch** would like to invite you to spend half a day exploring the founding myths of Silicon Valley – on Sunday, May 25, 2017. Following a guided tour through the Computer History Museum in Mountain View, a bus trip through the valley will take you to the famous Buck's Restaurant for lunch.



**May 25, 2017 // Graz**

**Karthik Bhat**

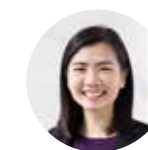
"Join me for an evening visit to the Schloßberg in Graz!"



**June 17, 2017 // Koper**

**Prof. Dusanka Janezic**

"I'm looking forward to showing you my university – the University of Koper near Ljubljana!"



**August 27 to 29, 2017 // Singapur**

**Wai Ching Chan**

"We would like to invite the research alumni to take part in the first Research Alumni Conference in Asia!"

*Photo: Magdalena Jooss / TUM*



**October 17, 2017 // Cairo**

**Prof. Ghada Bassioni**

"Let's meet up for a debate in Cairo!"  
*Photo: Astrid Eckert / TUM*



**May 6, 2017 // Shanghai**

**Prof. Ying Zhang**

"Let's take a walk along the banks of the Huangpu River in Shanghai!"



**October 17, 2017 // Salvador**

**Raphael Dantas**

"Let's found a networking group: come to the first Alumni Meeting in Salvador!"



# Much more than just a number

**In 2018, we will be celebrating the 150th anniversary of the Technical University of Munich. 150 years packed with history and stories about science and research, ideas and innovations, curiosity and passion. 150 years of striving for excellence.**

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Tell us your personal TUM story! Inform us about your encounters with people at TUM who had significant influence on your career. Tell us more about the special moments you experienced at TUM. We are curious. Contact us: [alumniundcareer@tum.de](mailto:alumniundcareer@tum.de)