Scientific, entrepreneurial, international

Ever since its inception in 1868, the Technische Universität München has borne out what, since the time of Humboldt, has epitomized the idea of the university – education and training as scientific objective – research as fascination, adventure, character building and societal culture.

Eminent figures have studied, taught and conducted research here – Nobel Prize winners, inventors, entrepreneurs, representatives of public life. But we can thank a strong community spirit that knows no boundaries between the generations and nurtures performance for its rise to become a world-class university. The most visible proof of the strength of the TUM family is the rebuilding of our university from the ruins of a world war that had virtually destroyed it.

Today, around 26,000 young people study here – 23 percent of them from abroad – in the 13 faculties of TUM. It is this entrepreneurial spirit that in its liberal and competitive form promotes our three key objectives: academic excellence, entrepreneurship and international performance.

The Technische Universität München sees itself as serving a society that, in the course of progressive globalization, is increasingly facing new and ever greater challenges. To accomplish this, it needs talented young researchers, with an interdisciplinary approach attuned to the issues of this century: health and nutrition · energy, climate and environment · mobility · communication and information · natural resources · infrastructure. These are issues we have embraced and they determine our research program.

The Institutional Strategy “TUM. The Entrepreneurial University” as part of the 2006 Excellence Initiative has paved new ways toward a competitive university of international standing. The TUM Graduate School represents a new format for structured doctoral studies with professional profiling and interdisciplinary horizons. The TUM Institute for Advanced Study provides creative development opportunities for outstanding teams of researchers and scope for interdisciplinary discourse.

The following conveys, in words and pictures, kaleidoscopic insights into the vibrant life of the Technische Universität München. Experience the fascination of TUM for yourself!

Wolfgang A. Herrmann, President
TUM: A global brand

TUM ranks as one of the leading universities in continental Europe and has made its mark with cutting-edge performance in research and teaching, interdisciplinary activities and the promotion of talent. Strong links forged with enterprises and with scientific institutions stand for the TUM global brand. TUM works internationally, and it works entrepreneurially.

TUM has been instrumental in Bavaria’s evolution from an agricultural area to a center of high technology. It was founded in 1868 as a Polytechnic College; today it is synonymous with technological advancement and entrepreneurial spirit. Nobel Prize winners and eminent inventors have studied here, among them Carl von Linde, Rudolf Diesel, Claude Dornier, Oskar von Miller and Willy Messerschmitt.

TUM has around 26,000 students enrolled in 142 courses. Its subject portfolio is unique in Europe with key focus areas including engineering, natural sciences, medicine and life sciences, along with business management. Its scientists teach and conduct research on an interdisciplinary basis. Founded in 2009, the TUM School of Education, as a faculty for teacher training and educational research, takes on an important responsibility for the future of society.

TUM is one of the first Excellence Universities in Germany. In the national competition in 2006, it made a major impact with its “TUM. The Entrepreneurial University” concept of an entrepreneurially thinking and engaging university. Its International Graduate School of Science and Engineering, which brings together engineering and natural sciences under one structured doctoral studies umbrella, was singled out and awarded. The two research clusters Cognition for Technical Systems and Origin and Structure of the Universe document its scientific excellence.

TUM selects its students in most disciplines itself, with key criteria including predisposition and talent. After completing their studies, most alumni retain links with their alma mater, and the international KontakTUM network connects students and alumni, professors and sponsors. TUM is one big family - with no boundaries between the generations.

TUM benefits from the cooperation among its three local sites - Munich, Garching and Weihenstephan. Based in the Munich Metropolitan Region, TUM exerts strong influence on regional scientific development. Examples include the Science Center Straubing for Renewable Resources and the Oskar von Miller Research Institute for Hydraulic Engineering and Water Economy Obernach in the Bavarian mountain area. TUM Asia Pte. Ltd. was founded in 2002 as the first affiliate of a German university abroad. It manages its own teaching programs and conducts research via its TUM CREATE subsidiary (2010) on "Electromobility in Megacities."
TUM was founded and evolved in the heart of Munich, and today the faculties of Civil Engineering and Surveying, Architecture, Medicine, Sport and Health Science, the TUM School of Management, the department of Electrical Engineering and Information Technology, and the TUM School of Education are based there.

Garching is TUM’s rapidly developing science and engineering campus, housing the departments of Chemistry, Mathematics, Informatics, the Physics department, the faculty of Mechanical Engineering, the Institute of Medical Engineering, the Catalysis Research Center, the Institute for Nanoscience and Nanotechnology and the Bionics Center, as well as the Walter Schottky Institute. Around 1.3 billion euros have been invested in the buildings and facilities at Garching since 1995. The Heinz Maier-Leibnitz high-flux neutron source is a 440 million euros investment, famous throughout the world.

The Center of Life and Food Science Weihenstephan is TUM’s largest faculty. Health and sustainability are the main themes of its research, driven by modern biosciences.

TUM has cooperation arrangements in place with scientific facilities throughout the world. Its students complete periods of residency abroad at more than 150 foreign partner universities. There are double degree agreements with more than 20 universities abroad.

In the Munich Metropolitan Region, one of the leading science and economic areas in Europe, TUM cooperates with prominent research institutes, including the Max Planck Society, the Fraunhofer-Gesellschaft and the Helmholtz Center.

The TUM Institute for Advanced Study (TUM-IAS) offers eminent researchers at TUM and leading international scientists generous scope for their research in engineering and natural sciences, life sciences and medicine. The unique work environment is conducive to innovative projects in promising areas of science.

TUM is an entrepreneurial university and promotes the wide variety of its talents as the greatest source of entrepreneurial success. It has created modern organization and management structures in order to develop into a science-driven enterprise, with the aims of efficient strategic planning, rapid operational decisions and effective control and quality management.

TUM is a founder university. It promotes entrepreneurial spirit and helps young startup companies on their way toward professional independence. UnternehmerTUM GmbH has developed into the largest university-based founder center in Europe.

Right: The development of the TUM faculties from 1868 to 2011
1868 Founding as the Royal Bavarian Polytechnic School of Munich

I. General Department (eight professors of mathematics, physics, national economy and humanities)

II. Engineering Department (four professors of mechanical engineering and surveying)

III. Structural Engineering Department (four professors of architecture)

IV. Mechanical Department (four professors of mechanical engineering)

V. Chemical Department (four professors of chemistry)

1877 Renaming to the Royal Bavarian Technical School of Munich

1918 Renaming to the Technische Hochschule München (THM)

1970 Renaming of the THM to the Technische Universität München (TUM)

1922 Affiliation of the Commercial University of the City of Munich with the THM

1922 Founding of the VIIth Business Administration Department

1934 Reorganization of the eight departments into six faculties:

I. Department of Mathematics

II. Department of Physics

III. Department of Chemistry, Biology and Geosciences

IV. Department of Economics and Social Sciences

V. Department of Civil Engineering and Surveying

VI. Department of Architecture

1930 Splitting of the whole department into

VI. Agricultural Department and VIII. Brewing Department

1928 Integration of the Agricultural Department into the newly founded Agricultural and Brewing Department

(with 2 departments: Agricultural Department of the Technische Universität München and University of Agriculture and Brewing in Weihenstephan)

1922 Affiliation of the Commercial University of the City of Munich with the THM

1918 Renaming to the Technische Hochschule München (THM)

1899 Renaming of

I. General Department

II. Civil Engineering Department

III. Architects Department

IV. Mechanical Engineering Department

V. Chemical Department

VI. Agriculture Department

1870 Renaming of the VIth Agricultural Department

1877 Founding of the VIth Agricultural Department

1971 Renaming of the Faculty of Brewing

to the Faculty of Brewing and Food Technology

1930 Splitting of the whole department into

VI. Agricultural Department and VIII. Brewing Department

1928 Integration of the Agricultural Department into the newly founded Agricultural and Brewing Department

(with 2 departments: Agricultural Department of the Technische Universität München and University of Agriculture and Brewing in Weihenstephan)

1922 Affiliation of the Commercial University of the City of Munich with the THM

1918 Renaming to the Technische Hochschule München (THM)

1860 Founding of the Royal Bavarian Polytechnical School of Munich

I. General Department (eight professors of mathematics, physics, national economy and humanities)

II. Engineering Department (four professors of mechanical engineering and surveying)

III. Structural Engineering Department (four professors of architecture)

IV. Mechanical Department (four professors of mechanical engineering)

V. Chemical Department (four professors of chemistry)

2000 Founding of the Center of Life and Food Sciences Weihenstephan (WZW)

Abolishing and integration of the Faculties of Agriculture and Horticulture and of Brewing, Food Technology and Milk Science into the WZW

Abolishing and integration of the Faculty of Forestry Science from the LMU into the WZW

1979 Reorganization of the Departments to Faculties of the same name

1981 Renaming of the Faculty of Mathematics to the Physics Department

1987 Renaming of the Faculty of Electrical Engineering to the Faculty of Electrical Engineering and Information Technology

1981 Renaming of the Faculty of Mathematics to the Faculty of Mathematics and Informatics

1992 Founding of the Faculty of Informatics; renaming of the Faculty of Mathematics and Informatics to the Faculty of Mathematics

1997 Renaming of the Faculty of Physics to the Physics Department

2002 Founding of the Faculty of Sport Science

Founding of the TUM School of Management

Abolishing of the Faculty of Economics and Social Sciences and integration into the latter

2000 Founding of the Center of Life and Food Sciences Weihenstephan (WZW)

1970 Renaming of the THM to the Technische Universität München (TUM)

1950 Renaming of the Faculty of Mechanical Engineering to the Faculty of Mechanical Engineering and Electrical Engineering

Renaming of the Faculty of Agriculture to the Faculty of Agriculture and Horticulture

1946 Hiving off of the Department of Business Administration from the Faculty of General Sciences and transfer to the LMU

1940 Abolishing of the Faculty of Chemistry

Incorporation of chemistry into the Faculty of General Sciences

1934 Reorganization of the eight departments into six faculties:

I. Faculty of General Sciences (incorporation of biology into the WZW)

Integration of geology and mineralogy into the Faculty of Civil Engineering and Surveying;
Transfer of geography to the LMU

1930 Splitting of the whole department into

VI. Agricultural Department and VIII. Brewing Department

1928 Integration of the Agricultural Department into the newly founded Agricultural and Brewing Department

(with 2 departments: Agricultural Department of the Technische Universität München and University of Agriculture and Brewing in Weihenstephan)

1922 Affiliation of the Commercial University of the City of Munich with the THM

1918 Renaming to the Technische Hochschule München (THM)

1877 Renaming to the Royal Bavarian Technical School of Munich

1868 Founding as the Royal Bavarian Polytechnic School of Munich

I. General Department (eight professors of mathematics, physics, national economy and humanities)

II. Engineering Department (four professors of mechanical engineering and surveying)

III. Structural Engineering Department (four professors of architecture)

IV. Mechanical Department (four professors of mechanical engineering)

V. Chemical Department (four professors of chemistry)
TUM Faculties

Thirteen faculties form the academic basis of TUM. They represent a portfolio of subjects focusing on natural sciences, engineering sciences, life and food sciences and medicine that is virtually unrivaled. Technology-oriented business management and the TUM School of Education complete these focus areas.
Architecture

The architects’ faculty plans, designs and builds - and is associated with renowned names such as Gottfried von Neureuther, Friedrich Thiersch, Robert Vorhoelzer, German Bestelmeyer, Hans Döllgast and Sep Ruf. Comprising 27 teaching and research units, the faculty encompasses both a wide and a diverse portfolio and places the emphasis on an interdisciplinary approach.

The four-year Bachelor’s degree course incorporating a year spent abroad, combined with an extensive visiting professors program, introduces the approximately 1,200 architecture students to international concepts in their field. The Technical Center impresses with first-class studio facilities for building models and prototypes. The TUM Architecture Museum in the Pinakothek der Moderne is one of the best of its kind in the world.

www.ar.tum.de

Civil Engineering and Surveying

Construction · Infrastructure · Environment · Planet Earth: Civil and environmental engineers, geodesists and geologists at the TUM are visibly working together on the design of our civilization’s living space. The teaching and research programs also cover the energy aspects of sustainable planning and building. The European Space Agency’s (ESA) satellite project GOCE, which was largely designed at the TUM, will survey with hitherto unequaled accuracy the Earth’s gravity field in order to draw conclusions on the effects of climate around the globe, for example. Munich’s Oskar von Miller Forum of the Bavarian Construction Association provides an opportunity for interdisciplinary discourse.

www.bv.tum.de
Chemistry

Germany’s number one in chemistry has produced several Nobel Prize winners. The department attracts many international visiting scientists and research cooperation partners from the industrial arena. The globalized labor market values its graduates as experienced, versatile generalists. The faculty’s subject portfolio covers all core and applied areas of modern chemistry, including chemical engineering and construction chemistry, electrochemistry, water chemistry and radiochemistry. In addition to outstanding expertise in biological chemistry, catalysis research based in the TUM Catalysis Research Center is the faculty’s interdisciplinary focus of research.

www.ch.tum.de

Electrical Engineering and Information Technology

The Department of Electrical Engineering and Information Technology is the largest and most research-strong faculty of its kind in Germany. The nation-wide highest percentage of international students and visiting scientists is proof of the excellence for which it is renowned. The faculty’s outstanding reputation is attributable not least to its strong international ties, for example in the fields of energy technology, information and communications technology, and automation and automotive engineering. The Faculty’s professors include numerous IEEE fellows. Siemens AG has acted as one of its major industrial partners for decades.

www.ei.tum.de
Informatics

TUM Informatics is an international brand. Students not only learn how to design operational information systems for large enterprises, set up data networks between banks, develop traffic management systems and simulate technical and administrative processes. At the Cognitive Factory, they also design the production facilities of the future and develop new models for the interaction of people with “intelligent” machines. Modern software engineering has its origins at the TUM where mathematicians and engineers designed and built the first “program-controlled electronic computer Munich” (PERM) in 1956.

www.in.tum.de

Mechanical Engineering

Today, mechanical engineering extends far beyond the traditional core subjects. It is linked closely with virtually all research areas at TUM, such as mechatronics, microsystems and medical engineering, bioprocess engineering, energy technology and power plant technology. Advanced automotive technologies (e.g. drive technology and electromobility) in collaboration with the leading automotive manufacturers form the main focus. BMW and Audi rank as the industrial research partners with the strongest links. Aerospace technology at TUM brings together research and industrial partners in the Munich Metropolitan Region at the Munich Aerospace Center.

www.mw.tum.de
Mathematics

Mathematics forms the scientific basis of TUM, with pioneers such as Walther von Dyck, Felix Klein and Friedrich L. Bauer. Today, the faculty is the paragon of Applied Mathematics in Germany. It has been honored on many occasions and has an outstanding team of internationally renowned professors. Together with informatics, it is frequently the driving force behind scientific progress in the natural, engineering and life sciences and in medicine. TUM’s financial mathematics activities are highly relevant for business and economy.

www.ma.tum.de

Medicine

TUM’s Medicine faculty is one of the leading teaching and research institutions in Germany. The university hospital Klinikum rechts der Isar and the German Heart Centre Munich are much sought after for research-based health care in all fields of modern medicine. The TUM Medicine faculty has created its particular interdisciplinary effectiveness as a result of its links with the natural and engineering sciences. Although the faculty was only founded in 1967, it has repeatedly written medical history, for example with the world’s first double arm transplant in 2009. Future technologies in medical diagnostics are at the center of the research, as exemplified by early stage tumor detection in the “Centre for Advanced Laser Applications” (CALA), for example.

www.dekanat.med.tum.de
Sport and Health Science

The faculty boasts one of the largest sports complexes in Europe, a legacy of the 1972 XXth Summer Olympic Games. The focus is on health science, linked on an interdisciplinary basis with other faculties including Medicine, Life and Food Sciences (Weihenstephan Science Center) and the TUM School of Education. An avant-garde approach is directed at research into preventive medicine and nutritional medicine. At the same time, the faculty acts as a service provider for the training of physical education teachers, and offers recreational sports facilities for students from all Munich universities.

www.sp.tum.de

Physics

The Physics Department is one of the major physics centers in Europe, offering a unique combination of basic and applied research. International scientists work at TUM in all areas of modern physics on questions of fundamental high-energy and astro physics, engineering physics, optics and the properties of solid and flexible materials, as well as biophysical challenges. The cooperation with a number of Max Planck institutes and other non-university research institutions is a particular feature. TUM physicists are based at the major transnational research centers, e.g. CERN (European Organization for Nuclear Research) in Geneva and ILL (Institut Laue-Langevin) in Grenoble/France. Garching’s neutron physics is a magnet for top researchers across the globe.

www.ph.tum.de
TUM School of Education

The TUM School of Education (2009) sets the “gold standard” in Germany for forward-looking teacher training. It manages and coordinates teacher training in the STEM subjects (science, technology, engineering and mathematics) across the university. The faculty draws its scientific profile from cross-disciplinary research, also conducting Germany’s International Comparative Studies of Education and Training. With an extensive school network, the faculty represents the University’s “backward integration” into the national school system. The TUM Otto von Taube-Kolleg at Gymnasium Gauting is a forerunner for new education formats at the school/university interface.

www.edu.tum.de

TUM School of Management

This young faculty, founded in 2002, is currently on its way to joining the nation’s leading institutions in this field and ranks as a European bastion of entrepreneurship research. Excellent professors, students selected to an exacting standard, and the TUM-specific management – technology – life science profile characterize its unique position. Research and teaching take place at the interfaces of natural and engineering sciences. Study is demanding in terms of scientific methodology, but has a practical orientation at the same time. It is specifically oriented towards ultimately occupying leading positions in the economic sector while also creating the entrepreneurial environment for spinoff companies arising from TUM.

www.wi.tum.de
Biology is the key science here, while interdisciplinary research on the foremost subjects of this century – nutrition, land use, environment – is conducted at the largest of TUM’s faculties. Scientists work on safeguarding the quality and quantity of nutrition and gaining ecological, economic and social living space. Agricultural, forestry and environmental scientists, biologists, chemists, nutritional and food scientists, engineers and physicists research the entire life cycle of food and raw materials, from the genetic and biological bases to production to processing and consumption.

Center of Life and Food Science Weihenstephan

www.wzw.tum.de
Interdisciplinary horizons

TUM is more than just a conventional technical university. It opens up interdisciplinary horizons and allows its students to engage in an intellectual field of tension that makes them “weatherproof” for life.

Educational horizons
The Carl von Linde Academy encourages sensitivity to the value of interdisciplinary academic education; technical knowledge here is anchored in the humanities and cultural studies. Professional skills are developed that are indispensable in practice, such as knowledge of a language (Chinese, among other languages), and presentation and creativity techniques. The eminent science philosopher Professor Klaus Mainzer is the current Director of the Carl von Linde Academy. www.cvl-a.de

UnternehmerTUM
As a Technical University, TUM promotes an entrepreneurial attitude, and for this reason the entrepreneur Susanne Klatten founded UnternehmerTUM GmbH, which supports students, scientists and professors in seizing entrepreneurial opportunities and implementing them. UnternehmerTUM provides support to more than 50 teams each year for the development and testing of new business concepts. It offers an opportunity for early exchange with experts and potential clients and helps in questions of financing. New technologies from the TUM research laboratories form the starting point for many projects. www.unternehmertum.de

Career planning
TUM graduates are a step ahead of their competitors. The TUM Career Service provides support for students in the application process, in entering the profession, and in all other steps in professional life both at home and abroad. Career experts provide personal advice and organize events and direct contacts with enterprises. Working graduates give students information on their experience via the Alumni Network. www.tum.de/service/career_service
Mentoring
Mentoring is an effective tool in personnel development and support for young researchers at TUM. Experienced individuals act as mentors for young people engaged in their studies and when entering the professional world. The TUM Gender Center provides mentoring for young female students. The TUM mentoring program draws on the experience of alumni; hundreds of TUM alumni act as mentors for graduate students and doctoral candidates. www.tum.de/mentoring

Scholarship system
The TUM: Junge Akademie sponsors outstanding, highly committed students and young alumni. The scholarship holders work in interdisciplinary groups on projects of their choice and are assigned mentors who provide support in the early years of their professional life. www.tum.de/jungeakademie

Student initiatives
TUM students become involved in interests beyond their subject studies. Their initiatives look at converting theory into practice. One example is Akaflieg, a student group of Munich universities that joins forces to design, build and fly gliders and powered aircraft. Students in the TUfast racing team build cars in their free time; their passion is racing cars, with which they have successfully participated in Formula Student competitions since 2004, and emerged victorious on several occasions. IKOM, the largest career forum in southern Germany, is an entrepreneurially organized student initiative of TUM.

Music
TUM promotes its musical talents. Orchestras, choirs and the TUM Big Band offer a wealth of opportunities for the artistically inclined. The TUM Orchestra makes regular guest appearances in major concert halls at home and abroad, including China.
The Technische Universität München has friends and sponsors. They are aware that the university needs them and consequently set up the TUM University Foundation in 2010, which contributes to the international competitiveness of the TUM using income from capital. The Foundation enables the TUM to headhunt the best minds and put the entrepreneurial spirit into practice.

The TUM University Foundation was launched on July 21, 2010, with an original capital of around 17 million euros. Since then, it has attracted major input from sponsors.

The TUM University Foundation is based on the endowment principle. It supplements TUM fundraising, which raised around 180 million euros in the period between 1999 and 2010, mainly for endowed chairs and institutes. The major individual foundations, each of which has around 10 million euros each available to them are the Else Kröner-Fresenius Center of Nutritional Medicine, the Susanne Klatten Chair for Educational Research, the TUM Institute for Advanced Study (BMW) Building and the Carl von Linde Academy.

The logo of the TUM University Foundation symbolizes the tree of life, representing the sequence of generations with their constantly renewing talents. The aim of the Foundation is to promote these particular talents; it invests in people and in what strengthens their links.
“Not a rationally acting Homo oeconomicus, but people make economic decisions – with joy, fear, euphoria or sympathy. This means research faces tremendous challenges that can only be tackled on an interdisciplinary basis. I conduct research and teach at the TUM because here we work to a large degree on an interdisciplinary basis. Innovations arise at the interfaces of the disciplines.”

Prof. Dr. Isabell M. Welpe

TUM’s youngest female chair professor represents one of the most state-of-the-art subject areas in economic research: psychological behavioral economics.
Prof. Dr. Claudia Eckert

Professor Eckert gives the Department of Informatics an internationally acknowledged voice in IT security – be it with scientists, economic associations, enterprises or in politics. Her research has set standards in the development of security solutions and is a major contribution to the leading role of TUM Informatics in the subject.

“At the TUM, I have found the ideal environment for my research. The proximity to scientific partners is unique and also offers me the optimum framework for setting up project groups at my Fraunhofer Institute.”

Prof. Dr. Klaus Mainzer

The well-known philosopher and science theorist explores the broad basic questions for all engineering and natural sciences: Where do the boundaries and open routes of their cognitive and progress possibilities lie – and what demands arise from this for research and teaching?

“I work at the TUM because here cutting-edge research has to be measured regarding its significance for future generations if we are to pass it on to the teachers and researchers of the future. At the same time, the TUM is an ideal thinktank and platform interacting between basic scientific problems and the practical needs of the markets and society.”
Prof. Dr. Vasilis Ntziachristos

Professor Ntziachristos is the pioneer of the development of optoacoustic imaging tools in medicine. He came from Harvard University to the TUM, where he occupies the Chair of Biological Imaging and heads the Institute for Biological and Medical Imaging (IBMI) at the Helmholtz Center in Munich.

“The TUM offers an exciting environment for cutting-edge research in the field of medical engineering. The integration of medicine and engineering studies is a particular advantage.”

Prof. Regine Keller

The Faculty of Architecture appointed the successful landscape architect as its Dean, and soon later she became TUM’s Senior Vice President for Academic Affairs. The former actor also has an excellent reputation in the moderation of university policy processes.

“The TUM creates comprehensive links between engineering and natural sciences with cultural insights. This opportunity makes the work here so unique. Only against this background will the responsibility for our environment that we as scientists bear be fulfilled.”
Prof. Dr.-Ing. Liqiu Meng

The work of the renowned chair professor for cartography has been of fundamental importance for a vast digital world and for global navigation systems. As Senior Vice President for International Alliances and Alumni, she brings the world to TUM. She was born and grew up in China, obtained her doctorate in Germany and was a professor in Sweden (KTH Stockholm) until she was discovered by TUM.

“Advances in free science should not be hampered by cultural, national or ideological boundaries. This is exactly what the TUM stands for – also in its commitment to the principle of an entrepreneurial university. With this philosophy, the TUM is for me as a researcher and university manager a virtually unrivaled place to work.”
Prof. Dr. Hendrik Dietz

The youngest professor in the Physics Department gained an outstanding reputation in the scientific community at an early stage with his unconventional ideas. The shooting star of biophysics found ways of using strands of genetic material to form miniaturized “machine parts” that can be used to examine and possibly rebuild proteins one day. He received strong support from the TUM Institute for Advanced Study (TUM-IAS).

“The TUM gives scientists with good ideas exceptionally generous scope. They benefit from open exchange with leading researchers from all over the world and find orientation and support as they tread entirely new paths.”
Prof. Dr.-Ing. Martin Faulstich

The founding director of the Straubing Science Center and Chair of Raw Materials and Energy Technology is a renowned researcher and political adviser on the major questions concerning the future of modern energy production.

“As an entrepreneurial university, I regard the TUM as an ideal link between the intellectual scope of university research and the demands of the markets and society. As a mediator between two worlds, I have the ideal basis for my mission at the TUM.”

Prof. Dr. Wolfgang M. Heckl

The physicist and highly distinguished science communicator holds the Oskar von Miller Chair for Science Communication at the TUM and manages the Deutsches Museum. A strategic cooperation contract joins the two bastions of technology.

“One of the most important tasks today is to provide technology and the natural sciences with the status in school and general education that they have due to their significance for society and the economy in Germany. Knowledge is the prime resource of our country.”
Prof. Dr. Burkhard Rost

The co-founder and standard-bearer of bioinformatics left Columbia University, New York, and accepted an appointment as Humboldt professor. His work established the growing understanding of the human code based on genes and proteins – and ensures the peerless positioning of the TUM together with its environment in bioinformatics throughout Europe.

“The TUM offers me ideal working conditions. As the number of unanswered questions increases with the amount of biological data, the researcher network of which my team is part has to be creative, versatile and capable of growth.”

Prof. Dr. Chris-Carolin Schön

Chris-Carolin Schön addresses one of the most pressing global challenges in agricultural sciences: How can crop plants feed the exponentially growing world population? Highly experienced in the scientific and economic issues of her subject, the initiator of the national interdisciplinary center for genome-based breeding research (Synbreed) drives pioneering breeding methods forward.

“The TUM offers me a perfect field for increasing and disseminating this knowledge. At the Science Center at Weihenstephan, the intensive exchange with many disciplines guarantees me the optimum conditions for forward-looking research and a broad opportunity for teaching.”
“I took the decision to return to the TUM in view of the excellent research conditions offered here. Along with first-class facilities, these include for me the varied stimuli you receive as a research clinician through exchange with medical care that comprises patients of all ages presenting the full range of cardiovascular problems. This integration creates unique work opportunities.”
Nobel Prize winners

Heinrich Otto Wieland  
(1877 – 1957)  
Professor  
Nobel Prize in Chemistry  
(1927) for his research on the composition of the bile acids and related substances

Hans Fischer  
(1881 – 1945)  
Professor  
Nobel Prize in Chemistry  
(1930) for his work on the structural composition of the blood and plant pigments and for the synthesis of hemin

Ernst Otto Fischer  
(1918 – 2007)  
Student, Doctoral Student, Professor  
Nobel Prize in Chemistry  
(1973) in recognition of his groundbreaking and forward-looking work on the metalorganic “sandwich compounds”

Rudolf Mößbauer  
(* 1929)  
Student, Doctoral Student, Professor  
Nobel Prize in Physics  
(1961) for his investigations on the resonance absorption of gamma radiation and the discovery of the Mößbauer effect

Robert Huber  
(* 1937)  
Student, Doctoral Student, Post-Doctoral Student, Professor  
Nobel Prize in Chemistry  
(1988) for research into the three-dimensional structure of the photosynthesis reaction center

Klaus von Klitzing  
(* 1943)  
Professor  
Nobel Prize in Physics  
(1985) for the discovery of the “quantized Hall effect”

Nobel Prize winners educated at the TUM:  
Ernst Ruska  
(1906 – 1988)  
· Engineering Studies 1925 – 1927 · Nobel Prize in Physics 1986 | Konrad Bloch  
(1912 – 2000)  
· Study of Chemical and Engineering Sciences 1930 – 1934 · Nobel Prize in Physiology or Medicine 1964 | Wolfgang Paul  
(1913 – 1993)  
· Physics and Engineering Studies 1932 – 1934 · Nobel Prize in Physics 1989 | Gerhard Erler  
(* 1936)  
· Doctorate 1965 with Professor H. Gerischer · Habilitation 1967 · until 1968 assistant and lecturer at the TUM Physical-Chemistry Institute · Nobel Prize in Chemistry 2007 | Johann Deisenhofer  
(* 1943)  
· Physics Studies 1965 – 1971 · Habilitation 1987 · Nobel Prize in Chemistry 1988 | Erwin Neher  
(* 1944)  
· Physics Studies 1963 – 1966 · Doctorate 1970 with Professor H. Gerischer · Nobel Prize in Physiology or Medicine 1991 | Wolfgang Ketterle  
(* 1957)  
· Physics Studies 1978 – 1982 · Nobel Prize in Physics 2001
Inventors and discoverers

Emil Erlenmeyer
(1825–1909)
Pioneer of the modern structural theory of organic compounds
With Carl von Linde, was one of the founding professors of today’s TUM

Oskar von Miller
(1855–1934)
Founder of the Deutsches Museum, first run-of-river power station in the world
Graduate of the TH Munich (Civil Engineering)

Wilhelm Emil Messerschmitt
(1898–1978)
Aircraft engineer and entrepreneur, inventor of the jet engine drive
Graduate of the TH Munich (Mechanical Engineering)

Carl von Linde
(1842–1934)
Inventor, entrepreneur and scientist
Professor of Theoretical Mechanical Engineering and founder of today’s Linde AG

Rudolf Diesel
(1858–1913)
Inventor of the diesel engine
Graduate of the TH Munich (Mechanical Engineering)

Heinz Maier-Leibnitz
(1911–2000)
Pioneer of neutron physics
Professor of Engineering Physics

Arne Skerra (*1961)
Ground breaking work in the field of molecular biotechnology and protein design
Professor of Biological Chemistry and founder of several enterprises (e.g., Pieris AG)

Thomas Scheibel (*1969)
Development of bioinspired materials based on structural proteins (e.g. spider silks)
Currently professor at the University of Bayreuth, co-founder of Amsilk GmbH
TUM fosters careers at all levels. It selects the best high-school graduates, headhunts internationally renowned scientists and invests in child care to attract female high-performers and families, while at the same time appreciating maturity and life experience – as evidenced by the TUM Emeriti of Excellence, for example.

**International headhunting**
TUM seeks out the best doctoral students, postdocs and professors worldwide. It not only looks for subject expertise, but also factors in the personality that shapes the students. This international recruiting strategy has enabled TUM to make many top-level appointments, among them a number of scientists who have relocated from universities abroad thanks to TUM’s brilliant reputation.

**εducaTUM**
The εducaTUM initiative provides support in the search for the best-qualified high-school-graduates. A network with over 150 secondary schools helps to make the transition from school to university easier. εducaTUM also improves teaching quality. Teachers are involved in both the university and research, and trainee teachers gain practical experience in everyday school life right from the start of their studies.

**Munich Dual Career Office**
When TUM recruits top scientists, it is able to make them very attractive offers. The Munich Dual Career Office looks after the professional prospects of partners and helps them find a job. This service is all part of the appointment negotiations. The work of the Dual Career Office is invaluable for professors and endows TUM with genuine advantages over its competitors.

www.tum.de/dualcareer
The family-friendly university
The aim of TUM is to be the most attractive technical university in Germany for female students and faculty, and one of the ways it accomplishes this is by providing family-friendly conditions and flexible working hours. There are Kindergarten and pre-Kindergarten facilities, day-care centers and after-school care at all TUM sites – thanks to generous donors. The above-average high level of young female researchers in technical subjects at the TUM demonstrates that this concept is bearing fruit. At the International Graduate School of Science and Engineering, 27 percent of the doctoral candidates are women.

TUM Emeriti of Excellence
TUM promotes talent, but it also knows how to use it. Not only the talents of youth, but also the more mature and senior talents. The TUM Emeriti of Excellence play a part in the diverse range of tasks of modern university management, taking the pressure off their younger colleagues by involvement in a variety of initiatives and programs. They draw on the reservoir of their lifelong experience in nurturing students and young researchers. They use their national and international connections to advance “their TUM”. They are “roving ambassadors” for the TUM in supporting our links and the TUM alumni clubs abroad. The TUM Emeriti of Excellence, currently numbering around 40, also represent the TUM’s modern diversity ethos: not just variety of nationalities and genders, but also teams with a range of ages and experience in a variety of organizations and functions. The TUM Emeriti of Excellence are independent, experienced advisers to the President. They identify with the TUM that they have already served outstandingly in their active working years.

www.tum.de/forschung/oe
TUM Alumni

TUM has an international alumni network consisting of around 35,000 members. This is a strong community. The TUM alumni clubs span the globe.

“As a teacher and researcher, I am advancing computer-supported engineering sciences, as Vice-President I was part of the 2006 Excellence Initiative; as Director of the TUM Graduate School I stand for a modern, structured doctoral education. I am involved beyond my own subject area because my TUM fascinates me as a ‘land of unlimited opportunities’.”

Prof. Dr. Ernst Rank

Director of the TUM Graduate School
TUM Alumnus 1985 (Civil Engineering)
Dr. Evelyn Ehrenberger
CEO, TUM International GmbH
The University Company
TUM Alumna 1994 (Chemistry)

“I gained professional experience in university science management, at the Ministry of Economics and in the free economy to now market science from the center of research for my alma mater. TUM is a powerful brand.”

Dr.-Ing. Norbert Reithofer
CEO, BMW Group
TUM Alumnus 1983 (Mechanical Engineering)

“They are my academic home. What attracts me to it today? Entrepreneurial thinking!”
Karl Max von Bauernfeind  
Founding director 1868

This is what he might say today:  
“It was beyond my imagination that the Polytechnic School of 1868 would become an international university. As founding director, I simply wanted the spark of science to spread to the industrial world! This spark has spread since then, and to something new every day.”

Yasmine Aguib  
TUM Executive Staff - Scientific Advisor  
TUM Alumna 2007 (Biotechnology, Medicine)

“When I went to school in Cairo, I dreamt of Munich. Studying molecular biotechnology at Weihenstephan and Garching and then obtaining a doctorate in medicine has awakened my fascination with science. My sister Heba also studied and earned her doctorate at the TUM, and my husband is part of the international ‘Sustainable Resource Management’ master’s program. The TUM is one big family!”
**Anneliese Eichberg (°1910)**  
TUM Alumna 1934 (Architecture)  

“I am alive for over a hundred years. In 1930, I was the first woman to begin studying architecture at the TUM. I would never have thought how attractive my TUM would become in the 21st century as a woman-friendly university!”

**Chirag Tejuja**  
BASF SE, TUM Alumnus 2005 (GIST TUM Asia)  

“Studying in a class comprising just 15 students assured that each one of us had a chance to personally interact with the lecturers. But the small size did not mean that we missed out on the diversity. Nationality-wise we were five Chinese, four Indians, three Indonesians, two Malaysians, one French. Discipline-wise we were eight engineers, six chemists, one pharmacist. This assured a fluidity of knowledge across nationality and discipline-related boundaries in an environment akin to most multinationals operating in Asia today.”
TUM Research Centers

The TUM brings together the relevant professional expertise from several faculties in subject-oriented Research Centers. It concentrates on fields of the future in science, technology and medicine. The Research Centers make major contributions to the organic change in structure of the university.
In the belief that the free development of creativity provides the most efficient contribution to the advancement of science, TUM creates generous scope for its elite. The TUM Institute for Advanced Study founded in 2005 embodies the “university of scientific opportunities” and is specifically designed and laid out as a haven and forum for top-level science. Selected on the basis of the best international science standards, this is the launch pad for high achievers from the TUM, from industry and from abroad, free from the burdens of typical daily university life to achieve new research goals. Young talents of the future benefit here from an inspiring environment, in the spirit of the “Humboldt education.” This creates a “knowledge exchange platform” in critical interdisciplinary discourse at the heart of the TUM.

Scientists with an interest in getting together and learning from one another meet at the Faculty Club above the Garching high-tech campus. There are no boundaries here between the faculties; the common interest is “science from next door,” and this is where the “emerging fields” of science are discussed. The building, opened in 2010, was donated by one of TUM’s great donors, the BMW Group, and has already proven to be the most sought-after location for interdisciplinary dialog, as well as a venue for science to meet the public.

www.ias.tum.de
Neutron research has a great tradition at the TUM. The Heinz Maier-Leibnitz Neutron Research Facility (FRM II) ranks as a unique differentiator internationally. It is the world’s most versatile high-flux neutron source and has also set new standards for inherent nuclear safety. The nuclear fuel element is an innovative development by Garching’s neutron physicists, combining high neutron flux with unsurpassed flux homogeneity close to the core. Since the research reactor was started up in 2005, interest by scientists throughout the world has exceeded capacities more than twice over. Neutrons provide insights into sub-microscopic structures and molecular dynamic processes; neutron research attempts to answer questions on the origin and structure of matter. Practical application centers on the development of new materials and the improvement of products in everyday life. Neutrons can be used to produce not only semiconductor materials for the chip industry, but also radiopharmaceuticals for medical diagnostics and treatment. These manifold applications have led to great interest in the TUM Garching Neutron Research Facility from the natural sciences, technology and medicine.

www.frm2.tum.de
Walter Schottky Institute for Semiconductor Physics

The Walter Schottky Institute is a leader in the production and characterization of semiconductor systems and nanostructures with extreme material quality. The Institute was founded in 1988 jointly by TUM and Siemens with the aim of strengthening the interaction of fundamental research with module development for semiconductors. Numerous leading figures in the semiconductor industry were educated here.

The Institute is a much sought-after partner for national and international cooperation in research. The Nanosystems Initiative Munich (NIM) Cluster of Excellence, which is funded under the 2006 Excellence Initiative, has been in existence since 2006. Around 200 scientists from different disciplines at ten institutions are involved in these activities. An extension with the most up-to-date clean room technology (2010) is home to the new Research Center for Nanotechnology and Nanomaterials.

www.wsi.tum.de
Leonardo da Vinci Center for Bionics

Technical progress begins with observing nature. A great deal can be learned from structural and functional principles in nature when technology develops sustainable solutions. Biology is therefore being increasingly incorporated into the engineering sciences at TUM. Bionics is keen to learn from nature, which has found practicable solutions to complex problems in the course of evolution.

The TUM Leonardo da Vinci Center for Bionics, founded in 2007, is based on a strategic development concept that places emphasis on the research focuses

- energy production and utilization
- attention and decision-making
- biomaterials – technical materials – construction

One of the most visible examples of its success is the metal “metaklett fastener,” which can resist temperatures of over 800 degrees Celsius and has a holding force of up to 35 tons. The inventors are engineers of the TUM Mechanical Engineering Department.

www.bionik.tum.de
Catalysis is the perfect example of what is called “Green Technologies”. Catalysts are the key components for saving energy and resources in chemical reactions. Without catalysis, industrial chemistry would not be economical.

Consequently, TUM set up the TUM Catalysis Research Center, which focuses on the conventional areas in catalytic chemistry, research into new reaction and synthesis routes, as well as the detailed understanding of reaction mechanisms. New approaches in research require expertise in interdisciplinary cooperation (e.g. physics, microbiology, process technology). Synthetic biocatalysts or those that can be obtained from microorganisms are a major contributory factor in “white biotechnology” (Industrial Biotechnology) for the reorganization of industrial chemical processes.

The Center draws on an international network of renowned partners in science and industry. TUM’s catalysis research developed from the work of Ernst Otto Fischer (Nobel Prize 1973). Clariant Süd-Chemie is the Center’s most important strategic industrial partner.

www.crc.tum.de
Research Center for Nutrition and Food Sciences

TUM has achieved groundbreaking advances in food technology. The Weihenstephan brewing technology has set world standards, and today the TUM site at Weihenstephan is the world’s leading time-honored brand for food and beverage research. The Research Center for Nutrition and Food Sciences (ZIEL) has emerged from this tradition, combining food science with nutrition and health sciences. The research approach includes the safety and quality of food, centering on the holistic examination of the food chain, from obtaining raw materials to the processing and packaging of food to physiology and nutritional medicine.

The Center interacts closely with the authorities and industry. It develops prevention programs and is involved in the development of safe and healthy food. With its continuing education program, the ZIEL-TUM Academy, founded in 2007, draws on current knowledge in nutrition and food research and promotes the dialog between the scientific, public, and economic sectors.

www.ziel.tum.de
Medical engineering combines medicine with engineering and natural sciences. TUM's versatile portfolio is ideal for these activities. The Integrative Research Center of Medical Engineering (IMETUM) brings together the broad platform of skills in medicine, mechanical engineering, materials sciences, sensory analysis, informatics and information technology, chemistry, biology and related disciplines, with the emphasis on age-related problems because of their increasing significance in society.

Key issues are:
- biocompatible materials
- medical device technology/mechatronics
- cell technology/tissue engineering
- medical imaging
- medical electronics

These include navigational aids for complex surgical procedures, medical image processing, intelligent sensors and implants, and minimally invasive surgical procedures.

The TUM focuses on the early detection of tumors using advanced, leading-edge methods in optoacoustics and X-ray and laser medicine. One outstanding example is the Center for Advanced Laser Applications (CALA) located on TUM’s High-tech Campus Garching.

www.imetum.tum.de
The Munich School of Engineering (MSE) follows a new direction toward the German Engineering of tomorrow: It focuses on elite study courses, with a specific emphasis on the embracing natural sciences. MSE plays a major role in TUM’s institutional strategy to foster high-level interdisciplinary research and teaching in the engineering sciences. The teaching programs and research projects are interdisciplinary. The research domains of the MSE are dedicated to Energy - Green Technologies, with special emphasis on:

- power plant technologies
- eCar electromobility
- alternative energies
- energy efficiency

The MSE runs the new interdisciplinary elite study course of Engineering Sciences, which opens up the professional perspectives in the conventional engineering subjects, above all in interdisciplinary fields (e.g. mechatronics, medical engineering, software engineering, synthetic biotechnology).

www.mse.tum.de
Straubing Science Center for Biogenic Resources

Five Bavarian universities and the Fraunhofer-Gesellschaft join forces and cooperate at the Straubing Science Center. Their research includes the material and energetic use of biogenic, plant-based raw materials. Natural sciences, engineering, ecology and business management interact closely in order to be able to comprehensively cover questions ranging from the molecular level through to the marketing of renewable raw materials. The Straubing Science Center has grown from an initiative by TUM (2001). It has become the role model for interdisciplinary research on the "Grand Challenge" research related to Biogenic Resources.

Since 2008, the Straubing Science Center has run the interdisciplinary and international Renewable Raw Materials Masters course.

www.wz-sraubing.de
The German Heart Centre in Munich – the University Hospital of the Free State of Bavaria at the Technische Universität München – is a European leading specialist center for the treatment of cardiovascular diseases in both adults and children. It was founded in 1974 as the first heart center in Europe.

Today, all the facilities and specialists needed for the diagnosis and treatment of heart and circulatory diseases are housed under the same roof. It combines the clinics for heart and vascular surgery, cardiovascular diseases, pediatric cardiology and congenital cardiac anomalies with the Institutes of Laboratory Medicine, Anesthesiology and Radiology/Nuclear Medicine.

The heart and vascular surgery hospital is an international pioneer in the field of surgical treatment of acquired heart disease. Congenital heart disease in children receives special emphasis.

www.dhm.mhn.de
The TUM University Hospital

The university hospital Klinikum rechts der Isar covers the entire spectrum of modern medicine. Around 4,000 members of staff work there in 34 clinics and departments. Around 50,000 people a year are treated on an in-patient basis and 200,000 on an out-patient basis, to the highest medical standards. Thanks to the close cooperation between medical care and research, patients benefit from new knowledge generated by scientific studies at an early stage.

The research focuses on:
- cancer treatment
- infections and allergies
- cardiovascular diseases (in collaboration with the German Heart Centre Munich)
- neuronal diseases

TUM’s Faculty of Medicine and the University Hospital are major contributors to all of the newly established National Health Centers.

The institutes of theoretical medicine and the clinics currently have around 1,500 students of human medicine.

www.med.tu-muenchen.de
Deutsches Museum

The origins of the Deutsches Museum, founded in 1903, date back to the TUM alumni Oskar von Miller, Carl von Linde and Walther von Dyck. Today, it is renowned as one of the largest and most-visited natural science museums in the world. The TUM runs the TUMlab jointly with the Deutsches Museum as a hands-on laboratory for students and teachers.

Scientists at the TUM are available to the museum’s public via the TUMlive project that regularly links scientists by videoconferencing. They provide insights into their laboratories, explain their research subjects and answer questions from visitors.

The appointment of the physicist Wolfgang M. Heckl, Director General of the Deutsches Museum, to the newly created Oskar-von-Miller Chair for Science Communication in 2009 is evidence of the many years of collaboration between the TUM and the Deutsches Museum. The two institutions have close ties due to a long-term cooperation contract.

www.deutsches-museum.de
The TUM Architecture Museum housed in the Pinakothek der Moderne is both an archive and an exhibition, combining collection, teaching and research – a unique position as a university institution in Germany. Numerous exhibits are produced in seminars or in the laboratories and studios of the TUM.

The teaching collection for the education and training of architects forms a bridge with the public on questions of urban development, cities of the future and art and design in construction.

The collection comprises around 500,000 outline concepts, drafts, plans and sketches, together with sections and architectural surveys by more than 500 architects since 1750.

In addition, there are architectural models and extensive collections of photographs and written documents.

The research museum stages changing exhibitions of historical and current items of architecture. Guided tours, discussion forums, lectures and other events open up architecture to an interested public.

www.architekturmuseum.de
Cutting-edge research

The Technische Universität München is one of the foremost research universities in Europe. This is confirmed by many assessments, including the funding ranking of the Deutsche Forschungsgemeinschaft (German Research Foundation, DFG) and the research ranking by the Centrum für Hochschulentwicklung (Centre for Higher Education, CHE). The TUM was very successful in the competition of the Excellence Initiative organized by the State federal and state governments in 2006. The funded projects include five Clusters of Excellence, of which are two headed by the TUM.
Origin and Structure of the Universe

In the cosmos, extremes collide: huge distances and gigantic galaxies beyond our imagination together with minute particles that are of major significance for the development of the universe.

Until now, scientists have not been able to find a satisfactory explanation of how the cosmic building blocks of matter, space, time and the fundamental forces have formed. It is also still open to debate why today’s generally recognized standard model of physics cannot explain many of the phenomena in modern particle physics and astrophysics.

In the Origin and Structure of the Universe Cluster of Excellence, nuclear and particle physicists, cosmologists, astronomers and astrophysicists work together to shed light on the mysteries of the universe. The unique, internationally visible research center was founded in October 2006 at TUM as part of the national Excellence Initiative. The interdisciplinary project brings together the physics faculties of Munich universities, the University Observatory Munich, several Max Planck institutes and the European Southern Observatory.

Cognition for Technical Systems

The research objective of the CoTeSys Cluster of Excellence is to produce intelligent machines, for example service robots and autonomous workbenches. Around 100 researchers from the three Munich universities, a Max Planck institute and the German Aerospace Center work at the CoTeSys, which is the basis for the upcoming Norbert Wiener Institute for Cognition Systems at TUM.

The scientists come from a very wide range of disciplines – brain researchers, computer scientists, biophysicists and mechanical engineers – and look at the fascinating question of how technical systems can have cognitive abilities such as perception and planning. The aim is to develop equipment that can work with people, react flexibly to obstacles, and find solutions to problems.

www.universe-cluster.de

www.cotesys.org
Nanosystems Initiative Munich

Nanotechnology deals with extremely small structures: a nanometer is equal to one millionth of a millimeter. Nanostuctures play an increasingly important role in information technology and biotechnology. The aim of research at the NIM is to produce artificial and multifunctional nanosystems and develop them for application.

The Nanosystems Initiative Munich brings together internationally respected scientists from the Munich area in physics, biophysics, physical chemistry, biochemistry, biology, electrical engineering and medicine. The interdisciplinary way of working guarantees an internationally competitive research program and is an ideal environment for technological innovation.

To set itself up as the most attractive nanoscience research center in Germany, the NIM offers internationally known young researchers excellent research conditions in cooperative teams, early scientific independence and long-term career prospects.

www.nano-initiative-munich.de

Center for Integrated Protein Science Munich

Proteins are vital components in all organisms. Research on proteins is therefore central to life sciences, with significant contributions from chemistry, medicine, biology, biochemistry and biophysics.

At the Center for Integrated Protein Science Munich (CIPS™), leading Munich scientists are developing a new type of protein research. Along with TUM and the Ludwig Maximilians University, other members include Max Planck institutes and the Helmholtz Center Munich.

Until now, protein research has concentrated on individual proteins. It’s different at CIPS™, where research concentrates on the function of proteins in living cells and on different types of tissue. In this way, an understanding of the interactions is gained in order to later be able to control and use them in a specific way.

www.cipsm.de
Munich Centre for Advanced Photonics

The Munich Centre for Advanced Photonics (MAP) brings together leading international physicists, biologists, chemists and doctors working to develop optical technologies of the future. It involves faculties of the TUM and the LMU, the Bundeswehr University Munich and the Max Planck Institute of Quantum Optics. Siemens AG is the key industrial partner.

The new rays enable doctors and biologists to observe the structure of biomolecules and also minute changes in tissue and use this information for the diagnosis and treatment of, for example, tumors.

The research center offers talented young researchers long-term career prospects. The Centre for Advanced Laser Application (CALA) has emerged from the joint research as a new initiative and pursues the long-term goal of detecting sub-microscopic tumor centers as early as possible using cutting-edge laser and X-ray methods. CALA is located in Garching.

www.map.uni-muenchen.de
Deutsche Forschungsgemeinschaft (German Research Foundation): concerted cutting-edge research

The Deutsche Forschungsgemeinschaft (DFG) provides the national “gold standard” in research funding due to a highly effective independent peer review procedure. The collaborative research centers and transregional collaborative research centers, as well as research facilities set up for the medium term in connection with the interdisciplinary collaboration of high-level scientists involving several universities, are all based on international quality criteria.

Collaborative research centers (SFB) headed by TUM:

- High-fidelity Telepresence and Teleaction (SFB 453)
- Facultative Microbial Pathogenesis and Innate Immunity (SFB 576)
- Growth and Parasite Defense – competition for resources in economic plants from agriculture and forestry (SFB 607)
- Solid-State Quantum Information Processing (SFB 631)
- Managing Cycles in Innovation Processes – integrated development of product service systems based on technical products (SFB 768)
- Imaging for Selection, Monitoring and Individualization of Cancer Therapies (SFB 824)
- Forces in Biomolecular Systems (SFB 863)
- Molecular Mechanisms Regulating Yield and Yield Stability in Plants (SFB 924)

SFB/transregional collaborative research centers headed by TUM:

- Technological Foundations for the Design of Thermally and Mechanically Highly Loaded Components of Future Space Transportation Systems (TR 40)
- Neutrinos and Beyond – Weakly Interacting Particles in Physics, Astrophysics and Cosmology (TR 27)
Planet Earth, as revealed through investigation of its gravity field, is the focus of this technically demanding mission. The ESA GOCE (Gravity Field and Steady-State Ocean Circulation Explorer) satellite launched on March 17, 2009, measures the most minute differences in Earth’s gravity field with hitherto unequaled precision. Professor Reiner Rummel, Senior Fellow at the TUM Institute for Advanced Study, has played a prominent role in the design of the physical measurement principle of the satellite and heads the European GOCE Gravity Consortium.

The European Space Agency (ESA) is investing around 350 million euros in this major research project that will take several years. GOCE will orbit our planet around 22,000 times at a height of approximately 255 kilometers, passing through 27 million measurement epochs.

The measuring method actually detects deviations of one millionth of the gravitational constant (9.81 m/sec²). Knowing the gravitational field exactly helps to understand the processes in the Earth’s interior and thus the physics and dynamics of earthquakes. The researchers hope that the mission will in the long term contribute towards an earthquake early warning system. Science is anticipating better information on climate change as a result of the detailed recording of ocean currents from high-precision gravitational data.
Supercomputing Center – Leibniz Computer Center LRZ

The Munich Centre of Advanced Computing (MAC) headed by TUM scientists was set up in Garching with the aim of establishing the Garching site as the European center for computer-supported simulation.

Simulation, along with theory and experiment, ranks as the third pillar in gaining knowledge in the natural and engineering sciences today. Its bases are not just modern high-performance computers and software, but predominantly the correct interpretation of large quantities of data. Apart from TUM institutes in the natural and engineering science faculties, MAC also includes facilities of the LMU, the Max Planck Society and the Leibniz Computing Center of the Bavarian Academy of Sciences. MAC scientists are already heavily involved in other areas of advanced computing, for example the national high-performance computing (HPC) software program.

The Leibniz Computing Center in Garching has an SGI Altix 4700 high-performance computer with a capacity of 62 teraflops and robot-assisted cassette systems with a capacity of 8,000 terabytes to store and archive data. From 2012 onwards, the next-generation high-performance SuperMUC computer will be installed at the Leibniz Computing Center. This 3 petaflops-computer will rank as one of the most powerful computer systems in the world.

A new alliance has been forged with the King Abdullah University of Science and Technology (KAUST) in Saudi Arabia.
SuperMUC

Technical data for the new high-performance computer (2012)

- Peak performance of 3 petaFLOPs, corresponding to 3 quadrillion floating point operations per second
- More than 14,000 processors
- Main storage of 320 terabytes
- Backing storage of 12 petabytes
- Revolutionary cooling concept: “high-temperature liquid cooling”
- Unequaled energy efficiency due to highly innovative system software to control performance
TUM International

TUM is a global player and maintains links with 150 partner universities worldwide. Some 23 percent of its students come from abroad. TUM offers more than 20 English-language master’s courses. The top rankings received and the numerous Alexander von Humboldt prize winners opting for a research residency at TUM document its outstanding international reputation. With its TUM Asia Pte. Ltd. (German Institute of Science and Technology) subsidiary enterprise, the TUM was the first German university to establish an affiliate abroad in 2001. The study programs have produced hundreds of qualified graduates in the business sector and in top positions in industry.
A TUM Asia subsidiary heads the major "Electromobility in Megacities" project (2010) at the CREATE research campus of the Singapore National Foundation. www.gist.edu.sg

China
TUM has set up a cooperation network with the top universities in China. TUM.China Co., a subsidiary enterprise of TUM.International GmbH, coordinates TUM’s academic and economic relations with China in Beijing, including the alumni network.

Brazil
São Paulo, the metropolitan region with numerous German enterprises, is the headquarters of TUM.Brazil. The Latin American network of TUM is based here.

USA, India, Egypt
The next TUM branches abroad are planned in Boston (TUM.USA), Mumbai (TUM.India) and Cairo (TUM.Arabia).
Munich – the business capital

The Munich region offers ideal conditions for scientific and entrepreneurial careers. Bavaria's Silicon Valley is an important high-tech industry location. The largest biotechnology center in Europe is developing on the Martinsried – Munich – Garching – Freising-Weihenstephan axis. TUM has established an intense collaboration network within the Munich Metropolitan Area.

Blue chip companies are headquartered in Munich, including seven DAX 30 enterprises alone, with the information and communications technology, automotive, media, aerospace/satellite navigation and biotechnology and life sciences industries being strongly represented.

TUM has built up a strong and diverse network of cooperation arrangements in research, working for example with BMW, MAN, Siemens and Wacker Chemie. General Electric opted for TUM's Garching Campus as the base for its European research and development center. Together with TUM, Audi runs the INI.TUM Competence Center in Ingolstadt where engineers and natural scientists work on projects related to automotive engineering.

Many other enterprises and foundations as well as private individuals, fund projects in research and teaching at TUM. As a result of generous support from the Else Kröner-Fresenius Foundation, TUM was able to build the Else Kröner-Fresenius Center, a unique competence center in Germany combining the fields of nutrition sciences and medicine, in 2001.

Since 2002, Linde AG has funded the Carl von Linde Academy. Carl von Linde, an inspiring teacher and brilliant engineer, was one of the foremost TUM alumni. The Carl von Linde Academy adds aspects from cultural studies to strengthen the social and entrepreneurial skills of the students. The Munich Center for Technology in Society (MCTS) is one of the upcoming key Integrative Research Centers at TUM.
Munich – Garching – Weihenstephan: TUM

With its three major sites, TUM puts its stamp on the Munich Metropolitan Region.

Technische Universität München was founded in 1868 by King Ludwig II as the “Royal Bavarian Polytechnic School of Munich” in the heart of the then residential city. The first major discoveries were the refrigerator and air liquefaction (C. v. Linde). Ever since, the school has developed to a leading affiliation of science, technology, and medicine. TUM has become the number 1 German university in the Shanghai Ranking ARWU 2011, ranking no. 47 worldwide.
Munich Campus

The heart of TUM beats in its hometown of Munich. When people talk about Munich, they think of the German scientific and economic metropolis, of sports, music, theater, art and museums – the "Florence of the North." But they also think of the Bavarian lakes and mountains that again reinforce the atmosphere of the "cosmopolitan city with a heart." Hardly surprising, then, that people are eager to study, teach and conduct research here. For many scientists, Munich is the dream city that most people talk of as Paradise.

Munich, Arcisstrasse 21: This location has been the headquarters of TUM since it was founded and is home to the “building faculties” – Architecture, Civil Engineering and Surveying – along with the Department of Electrical Engineering and Information Technology as well as the TUM School of Management. The urban surroundings are also home to the Faculty of Medicine with its two university hospitals, the TUM School of Education and the Faculty of Sports and Health Science. New building and renovation work has enabled the original site of TUM to be constantly adapted to meet the demands of a modern teaching and research establishment. The investments in buildings amount to 605 million euros in the period of 2006–2011 alone.
Garching Campus

The Garching Campus has developed in the north of Munich from the Neutron Research Facility (1957). It is very well situated in terms of transportation links and is only a short ride from the center of Munich by subway (U6). The nearby International Munich airport has developed into an prominent hub for air traffic.

With around 12,000 students, the Garching Campus is the largest of the TUM’s sites and is home to the Physics Department, the Departments of Chemistry, Mathematics, Informatics, the Faculty of Mechanical Engineering along with many interdisciplinary research institutes set up by the TUM, the Max Planck Society (Astrophysics, Extraterrestrial Physics, Plasma Physics, Quantum Optics), the Bavarian Academy of Sciences (Walther Meißner Institute for Low Temperature Research, Leibniz Computing Center) and the European Southern Observatory.

The state has invested around 1.3 billion euros in the TUM’s Garching infrastructure since 1995, which has helped to establish one of the largest research centers for natural science and technology in continental Europe.
Weihenstephan Campus

The Center of Life and Food Science Weihenstephan has developed from the surroundings of traditional agriculture and food sciences. With the integration of the site in 1930, TUM expanded its portfolio to include subject areas that are to become of vital importance in the 21st century. Many new research buildings and a first-rate faculty recruitment policy have very quickly turned the traditional site into a research center attracting top-class scientists. Weihenstephan is a global brand in life and food sciences and the site of the only university in the world with its own brewery (Staatsbrauerei Weihenstephan). The scientific portfolio covers the entire “food chain” - from plant and animal breeding to nutritional medicine, but it also includes the key challenges of environmental research.
Culture and leisure

The “cosmopolitan city with a heart” offers a wealth of leisure opportunities. Its sights, cultural attractions and shopping facilities, together with its economic life, attract more than 100 million visitors and business people every year.

Munich has more than 200 museums, galleries and collections. The TUM is situated in the new museum quarter, right next to the three famous art galleries and the Brandhorst Museum. The Deutsches Museum, as TUM’s strategic and outreach partner, is the oldest, and along with the Smithsonian Institution in Washington, the most eminent technology museum in the world.

Munich’s attractions include castles, churches and palaces, among them the Nymphenburg Palace with its magnificent park, and the historic Residence in the city center.

As a media city, Munich is home to top-notch businesses active in the film, radio, television and publishing sectors. Stars and young artists are familiar figures in its cultural life. More than 50 theaters, music venues, jazz clubs, discos and party venues ensure a varied nightlife.

The English Garden, one of the largest city center parks in the world, and the Isar River provide extensive “green oases” in the city, attracting locals and tourists, sports enthusiasts and people taking a stroll, surfers on the Eisbach and cyclists. Beyond the gates of Munich lie the Alps and Bavarian lakes, just a short distance away.

In the Munich Philharmonic Hall, the TUM orchestra performs every year in honor of the jubilee alumni.
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