The parts and the whole
by Hubert Filsen

What properties differentiate living systems from non-living entities? LMU biophysicist Erwin Frey is at the forefront of attempts to develop a new understanding of the distinctive features of complex biological systems. For the complete article, see www.en.lmu.de/news/insightlmu/2016/02_01.pdf
Munich’s eye on the sky
by Clemens Grosse

Munich’s first eye on the sky was the Observatory which opened in Bogenhausen in 1816. The Observatory was incorporated into LMU in 1937/38. This year the University Observatory Munich celebrates its bicentenary.

It’s a 10-minute bike ride from LMU’s Main Building in the Maxvorstadt to the Scheinerstrasse in Bogenhausen. The Observatory’s first Director, Johann Georg von Soldner (1776–1833), made the trip from the city to his workplace on horseback. The horse came with the job, because in 1816 Bogenhausen was out in the country, far enough away from Munich to afford a panoramic view of the sky. The original Observatory survives, and it still houses one of the most advanced telescopes of its day. The refractor was designed by the famous physicist Joseph von Fraunhofer. Installed in 1835, it was technically the finest telescope in the world.

The present Universitäts-Sternwarte München (USM) is the finest university-based astronomical observatory in Germany, though its activities are no longer concentrated in the Bavarian capital. Its excellent reputation rests on the instrumental capabilities of the Wendelstein Observatory, which is perched on the peak of the same name in the Bavarian Alps. In 2013, a state-of-the-art 2-m telescope went into operation on the mountain. “The telescope is ideal for teaching purposes, for follow-up observations of objects of moderate luminosity and for long-term observation programs,” says Professor Ralf Bender, the USM’s present Director.

But the USM has more to offer than a modern optical telescope. Its staff also build instruments for other observatories, including the European Southern Observatory (ESO) in Chile. Only recently, astrophysicists and engineers at the USM teamed up with colleagues in Germany and England to construct an instrument destined for the ESO: The ‘K-Band Multi-Object Spectrograph (KMOS) has been installed on one of ESO’s 8-m telescopes in Chile, and can provide spatially resolved infrared spectra for up to 24 objects simultaneously. Meanwhile, its builders have turned to an even more spectacular project, the construction of the ‘first-light’ camera for the largest telescope in the world, ESO’s 39-m European Extremely Large Telescope (E-ELT), which will also be erected in Chile and will go into operation in 2024. The USM is also a partner in the 10-m Hobby-Eberly Telescope in Texas. “International research collaborations are tremendously important for us,” says Bender.

The first stellar spectra

Bender’s early predecessors, such as Soldner, had their priorities too. During Soldner’s tenure in Bogenhausen, the Observatory’s telescopes recorded the first spectra of stars, thus initiating the field of stellar spectroscopy, which enables astronomers to determine the elemental composition of a star’s atmosphere. Hugo von Seeliger (1849-1924) focused on the more theoretical aspects of astronomy. His most famous graduate student was Karl Schwarzschild, who would later make ground-breaking contributions to astrophysics and the theory of relativity.

The decades following Seeliger’s tenure were a period of stagnation. The construction of a new building for the Institute of Astronomy under the leadership of Peter Wellmann in the 1960s and the reorientation of its research work towards modern stellar astrophysics, led by Rolf-Peter Kudritzki in the 1980s, form the basis for the present Observatory’s renown. With the arrival of Ralf Bender, the range of research done at the Observatory was extended to include extragalactic astronomy and cosmology. Moreover, its contributions to the design and fabrication of instrumentation have won the USM an enviable international reputation in this field.

As an integral component of the “Univers” Cluster of Excellence in Munich, the USM forms part of an outstandingly rich constellation of astrophysical institutions, which includes the Max Planck Institutes for Astrophysics and Extraterrestrial Physics, and the headquarters of the European Southern Observatory (ESO). “We cover the whole portfolio here,” says Ralf Bender, “from astrophysics through planet formation and dynamics to cosmology.” Its close links with fundamental physics also explain why the decision has been taken to relocate the USM, together with the Faculty of Physics, in Schwabing. You don’t need a horse to get from Leopoldstrasse to Schwabing. It’s just a leisurely stroll.

Translation: Paul Hardy
Rehearsing until it’s right
by Constanze Drewlo

Whether you want to make music or just passively enjoy it, campus life at LMU offers ample opportunities for both. The University Choir devotes a whole semester to rehearsing the program for its end-of-term concert in the Great Aula.

Singers from Finland, Canada and China are counted among its members. In fact, the University Choir is a world in miniature. Almost 200 students meet every week in the large Lecture Hall in LMU’s Main Building: Sopranos and altos on the right, tenors and basses on the left. And all minds are concentrated on a single goal – the Semester Concert in the Great Aula at the end of term. That is why they are here, to get every last detail of the program right.

All of us can sing!

Verena Egger, the Choir’s conductor, takes up her position close to the piano, and leads her charges through their warm-up exercises. Music is a matter of articulation, and although most of the singers have spent most of their day in lectures and seminars or studying in libraries, a succession of whole-hearted consonantal combinations – Zzzzzzzzzz, Brrrrrrrrrrrr, Phhhhhhhhhhhh – fills the space. “Everyone in the Choir is highly motivated,” says Vilja Haapanen, who comes from Finland and joined the Choir at the beginning of this semester. “We all love singing – and the standard is very high,” she adds.

That’s not surprising. Aspirants must make a strong impression at auditions, for competition for places in the Choir is stiff. More than 100 students applied for a place last term, although very few vacancies arise each year. “All of them can sing. In fact, everybody can sing,” Verena Egger affirms. “Different people mean different things when they say they can’t sing. In most cases, they simply lack the training and the practice needed for reliable control of their vocal cords. Of course, in the end, it is impossible for us to accept everyone who comes for an audition.” The Choir also provides individual voice training sessions for its singers, which gives students the opportunity to make the best use of the particular character and technical possibilities of their vocal apparatus.

Vilja was by no means sure that she would be accepted. “But I was in luck. The audition was not that hard and it was all over in a very short time.” But she is already excited at the thought of the upcoming concert. “I’ve told many of my friends to come and hear us,” she says, “and of course, I wouldn’t want them to be disappointed.”

The concert in the Great Aula will not be the University Choir’s sole public appearance in this semester. In fact, they have finished an international tour, which took them to Russia. Following five days of intensive rehearsals together with the Choir of the Technical University of St. Petersburg, during which they worked on Russian vocal works, they gave two concerts for Russian audiences. “For these concerts we learned Russian repertoire that was completely unfamiliar to us, and of course we included classical German pieces like “Der Mond ist aufgegangen” on our program,” Egger says. “And for our singers it was a great opportunity to perform in a very different setting.”

Scandinavian Choral Music

The end-of-term concert, “Northern Lights”, features Scandinavian music and gets underway in a few hours. At the final rehearsal, conductor Verena Egger focuses on the trickiest passages in the most challenging works. Camilla Ranfelt from Denmark, who is doing her Erasmus year at LMU, gives the necessary tips on pronunciation. “It was very funny,” she says. “I joined the Choir because I wanted to get to know German students, and then I find myself giving them lessons in how to pronounce Danish words,” she says, tired but pleased. The Choir rehearsed for 7 hours yesterday and for 3 more today. “Now I’m really looking forward to the concert, though I’m a bit nervous as well,” Camilla adds, before going on stage with her fellow choristers.

The lights in LMU’s Great Aula are dimmed, the audience settles down, and the concert for which the Choir has worked so hard begins.

Translation: Paul Hardy
Border crossings

LMU art historian Burcu Dogramaci studies the effect of emigration on the work of modern artists and teases out their influence on social perceptions of contemporary population displacements. For the complete article, see www.en.lmu.de/news/insightlmu/2016/02_02.pdf

Evolution

Building-blocks of life

Biological evolution was preceded by a long phase of chemical evolution during which precursors of complex biopolymers accumulated. Unfortunately, little is known about the range of small organic compounds that was present on the young Earth. However, recent discoveries made by the European Space Agency’s Rosetta mission have detected simple organic molecules that could also have been available on the young Earth, including a number of nitrogen-containing components. LMU chemist Thomas Carell and members of his research group have now shown that these simple molecules could indeed have served as precursors for the synthesis of molecules that are an integral part of all forms of life. “In particular, we have looked for ways in which these very simple substances could have given rise to the synthesis of key components of RNA under prebiotic conditions,” Carell explains. The origin of RNA is central to an understanding of prebiotic chemistry, because RNA is potentially capable of catalyzing its own synthesis, as well as other biochemical reactions. And indeed the LMU team discovered a reaction scheme – the so-called FaPy pathway – that could have fabricated purines, one of two classes of ‘bases’ found in both RNA and DNA. The FaPy pathway begins with the attachment of formamide to aminopyrimidines and gives rise to formamidopyrimidines, hence the acronym FaPy. A subsequent sequence of steps results in purines and several of their biologically important derivatives. “FaPy provides central biochemical components of life in high yield and with high specificity,” Carell explains. “So FaPy constitutes an experimentally attested scenario that can explain how the process of chemical evolution could have proceeded during the phase prior to the formation of the first cells.”

Pathobiochemistry

Rush-hour for neutrophils

The extent of the inflammatory reaction triggered by an acute heart attack, and of the resulting damage to the heart muscle, varies depending on the time of day at which the infarct occurs. Researchers led by Sabine Steffens, Professor of Clinical Pathobiochemistry in the Institute for Cardiovascular Prevention at the LMU Medical Center confirm that the intensity of the immune reaction is correlated with the level of recruitment of immune cells called neutrophilic granulocytes to the damaged heart. More importantly, they show that the number of neutrophils present in the circulation naturally fluctuates with the time of day, and that circadian variations in the expression of chemokine receptor CXCR2 play a crucial role in regulating the migration of granulocytes into the damaged tissue. “At the onset of the active phase more neutrophils leave the bone marrow than at other times. In humans, this phase occurs early in the morning. A myocardial infarction at this time of day thus leads to an exaggerated inflammation reaction induced by the availability of more neutrophils in the bloodstream,” Steffens explains. This has a deleterious effect on the clinical prognosis, because it stimulates scar formation. In addition, the LMU team showed that the level of the receptor CXCR2 found on the surface of neutrophils also varies with the time of day, being expressed at high levels immediately after waking. When the team prevented activation of the receptor by blocking the binding of its chemokine ligand, the degree of cardiac inflammation and the amount of damage to the heart muscle was reduced. “Our study shows that time of day plays an important role in determining the optimal treatment for an acute heart attack, and that CXCR2 constitutes an interesting target for drugs designed to control the recruitment of neutrophils to the site of damage in the aftermath of a heart attack,” says Steffens.
“I want to attract students and researchers to come study and work in Munich and Berlin,” says Simons. “International students and scholars contribute significantly to excellence in education and research because they bring a diversity of perspectives, experiences and languages that enhance the university experience for all students. Students who study abroad are more likely to succeed in the workforce as they not only gain technical skills but also soft skills like problem solving, cross-cultural communication, and decision-making. Employers are looking for this.”

Where the resistance lies

Many American students don’t consider going abroad because they assume that it will cost too much money and are worried about language barriers. But those who look into the options discover that at German universities such as LMU, more degrees – especially at graduate level – are being taught entirely in English, and there are no tuition fees. Students seeking a degree in English could find LMU less expensive than studying in the US, plus they’d gain the experience of being abroad that will benefit them professionally. They need to know this opportunity exists.

There is also a fear factor – crossing the Atlantic is a much bigger step than heading to a boardinger country. Simons’ goal is to help students and researchers navigate the information about studying and conducting research in Germany and find options that work for them.

“LMU is ranked number one in Germany according to the Times Higher Education World University Rankings 2016,” she says, “but this doesn’t mean everyone in North America knows LMU. It might be obvious to someone in Munich, but we have to spell out clearly why and how LMU stands out, and make it clear to international students who might have other options available. It’s a fierce competition.”

Getting it out there

With several projects up her sleeve, Simons first plans to optimize communication channels, such as developing a web platform that simplifies the complexity of the undertaking. Webinars, social media, and attending study abroad fairs will also be developed, all communication strategies to maximize outreach.

They also need to know that there is a support and welcome culture for international students and scholars. LMU has so many great faculty members who have built excellent programs, she says. Interested students and researchers in North America need know about all these opportunities.

No stranger to living abroad, Simons was born in Finland, but when she was five, in order to follow her father’s career in cell biology, her family moved to Germany where opportunities in sciences research were excellent. In her adult life she has lived in Beirut, Rome and now New York (again), where she and her husband are raising their two children.

“I do like to discover new countries and I love the energy of a new place,” she says, “but I do like to grow some roots, too.”

While NYC is home indefinitely, she feels it is important to keep their connections abroad, so traveling to Finland each summer to see family is very important, as is watching children’s news on German TV on the internet each night.

“Most people who have had a chance to go abroad say that it has changed their life,” say Simons. It did for her, too.

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www.germanuniversities.org
LMU: The most highly regarded German university

In the Times Higher Education (THE) World Reputation Ranking 2016 LMU Munich is listed in 40th place. LMU thus maintains its standing as the most renowned of the German universities and is rated among the top 10 in Europe as a whole. LMU, ranked 40th in the list, retains its position as leader of the German contenders – as the only one to make the Top 50. THE’s World Reputation Ranking 2016 is based on an opinion survey carried out in the first quarter of 2016 to which leading academics worldwide were invited to contribute. In all, 10,323 scholars and scientists in 133 countries responded to the questionnaire.

www.timeshighereducation.com/world-university-rankings

Nationwide study: Holocaust Studies firmly established at LMU

Educational establishments in Germany, not least its universities, have a particular duty to study the genesis and implementation of the Holocaust, and the history of the Nazi era as a whole, and to communicate their findings to their students and the wider public. In light of its own inglorious history during the lifetime of the Third Reich, LMU has a special responsibility to meet this obligation. However, a new study on “The Present Status of University Teaching on the Holocaust”, carried out by the Free University in Berlin with the support of the Conference on Jewish Material Claims Against Germany, strongly suggests that many German universities need to do more in this respect. According to the survey, on the curricula of most of the 78 university institutions considered, the Holocaust does not receive the attention it deserves. However, LMU is rated highly in the study. This positive assessment is primarily attributable to the close institutional collaboration between the Department of History at LMU and the Institute for Contemporary History (Institut für Zeitgeschichte, IfZ) in Munich. With its Center for Holocaust Studies, which opened in 2013, the IfZ has taken on the task of stimulating further research on the topic and fostering international contacts between historians who specialize in the field. The results of these endeavors in turn provide the input for a broad range of teaching programs, which are organized jointly by the History Department at LMU and the IfZ.

Anatomy Institute refurbished

The renovation of LMU’s Institute of Anatomy (Anatomische Anstalt), the first building in Europe to be constructed of reinforced concrete, has been concluded. The completion of the project was celebrated with a special ceremony on July 11th. A complete overhaul of the structure, which was opened in 1907, had become unavoidable, not least because of the Institute’s significance for medical education at LMU: Some 10,000 medical students receive their training in general and microscopic anatomy there each year. The successful outcome of the campaign, carried out between 2010 and 2015 confirms that LMU has managed to reconcile modern demands for fire and occupational safety measures, and barrier-free access, with due consideration for the building’s unique status. For their sensitive approach to their task, its planners won the Bavarian Prize for Heritage Conservation in Gold in 2014.

LMU Data Science Lab: Assistance for data analysts

Nowadays, employers expect computer programmers to do more than programming. They must also be able to implement ideas. The new Data Science Lab program at LMU serves as an interface between academic data science and the practical needs of business firms. Students work with real datasets provided by real companies, and can exercise and enhance their analytical skills with the support of LMU’s informatics specialists. The participating firms can look forward to receiving concrete proposals for the solution of their problems in the area of data science, and are stimulated to hire graduates with a demonstrated ability to handle these problems. Moreover, the projects undertaken by students in the program involve the analysis of highly diverse datasets. These include data collected at CERN, where physicists who are probing the subatomic structure of matter, data generated by car manufacturers, and data relating to metal fatigue in aging gas turbines. LMU is setting up a new laboratory which will be equipped with state-of-the-art technology and provide users with optimal facilities for problem-solving.

http://dsl.ifi.lmu.de/data-science-lab

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