



Leopoldina
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Leopoldina news

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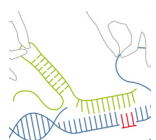
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Editorial

Dear Members and Friends of the Leopoldina,



Digitisation shapes our thoughts and actions and transforms societies. Vast troves of data are used, among other

things, to influence opinion-forming processes. This raises new ethical questions. Amidst the debate over the effects of digitisation on people and societies, we look ahead to the Leopoldina Symposium “Digitisation and its effects on people and society” in July, which is supported by funding from the Alfried Krupp von Bohlen und Halbach Foundation. The symposium, organised by the committee “Digitized Society”, will examine the human and societal impact of digitisation. The working group, which is a joint initiative of acatech, the Union of German Academies and the Leopoldina, prepares recommendations for how to best deal with digitisation. The programme includes distinguished speakers from science, business and civil society. In an interview in this issue, Presidium member Professor Thomas Lengauer gives a preview of what to expect at the symposium. Digitisation also plays a major role in creating a culture of innovation, as the recent Research Summit showed. At the summit, which was hosted jointly by the Stifterverband für die Deutsche Wissenschaft, the Commission of Experts for Research and Innovation, and the Leopoldina, the participants explored the question of whether we in Germany need to re-shape the playing field for innovation and entrepreneurship.

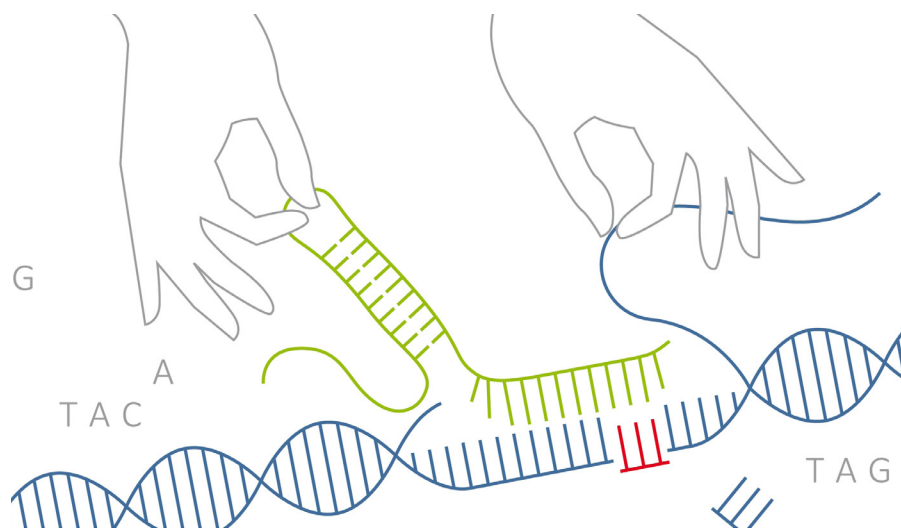
Now more than ever, the scientific community needs to play an active role in the debate over digitisation and its impact on society.

I wish you a thought-provoking read.

C. Lengauer

Leopoldina sparks public debate on genome editing in human cells

Discussion paper and Leopoldina Lecture focus on the ethical and legal issues surrounding the debate



Picture: Sisters of Design

The methods referred to by the terms “genome editing” and “genome surgery” are now being applied in medical research. Advanced clinical studies into gene therapy using these tools made the headlines when scientists successfully modified the immunocompetent cells of HIV-infected patients in a way that prevents these cells from becoming infected with HI viruses. Early-stage clinical trials are also being carried out into the treatment of various forms of cancer and hereditary diseases such as haemophilia.

Somatic gene therapy, which is the medical correction of genetic defects in body cells, is already widely accepted. However, there are great concerns surrounding germline gene therapy. In Germany, this form of therapy as well as the basic research required for its development is largely prohibited by the German Embryo Protection Act. At its core, germline gene therapy claims to provide an intergenerational cure for the more serious monogenic diseases, offering an alternative to the current pre-implantation genetic diagnosis procedure of selecting and rejecting human embryos. However, the risks associated with these procedures are almost impossible to calculate with current scientific knowledge. At the 10th Leopoldina Lecture, held at Schloss Herrenhausen conference centre on 21 February, Prof. Claus Bartram ML, Prof.

Frank Buchholz, Prof. Ingrid Schneider and Prof. Jochen Taupitz ML had a lively debate with attendees about the opportunities, risks, and ethical consequences of gene therapies that use genome editing techniques.

On 29 March, a group of Leopoldina experts published a discussion paper entitled “Ethical and legal assessment of genome editing in research on human cells”. The authors want to encourage public debate on the ethical and legal issues that surround basic research involving genome editing in human – and particularly embryonic – cells.

In their paper, the authors reject the use of genome editing to enhance human traits outside of the treatment and prevention of disease. They also draw attention to the fact that the empirical basis required for the evaluation and subsequent normative assessment of the opportunities and risks presented by gene therapies can only be provided through basic research. Particularly relevant in this regard, they say, is research into somatic gene therapy and, building on this, the sort of basic research involving genome editing and germline gene therapy that is already being practised in European countries such as the United Kingdom and Sweden. (jf, yb)

■ [DOWNLOAD DISCUSSION PAPER](#)

Striving to improve global health

Ahead of the G20 summit, science academies hand over recommendations to Chancellor Merkel

Recommendations for improving global health were the main focus of the statement that the G20 science academies delivered to German Chancellor Angela Merkel on 22 March at the Leopoldina in Halle. During Germany's G20 presidency, the high point of which is the summit meeting of heads of state and government of the 20 leading industrialised and emerging nations (G20) in July in Hamburg, Chancellor Merkel is conducting a wide-ranging dialogue with civil society. For the first time, the science and research community is playing an official role in the G20 through the newly established Science20 Dialogue Forum. The Leopoldina was mandated by Chancellor Merkel to assume leadership of this new forum.

Call on G20 to develop strategies for tackling diseases

The Leopoldina, together with the national science academies of the other G20 states, drew up the Science20 statement for the 2017 summit. In the statement, titled "Improving Global Health: Tools and Strategies to Combat Communicable and Non-Communicable Diseases", the academies call on G20 states to strengthen public health systems and to develop strategies for tackling communicable and non-communicable diseases that address social, environmental and economic determinants of health.

The Science20 statement was presented to the public on 22 March at the Leopoldina in Halle. Speakers talked about current and future healthcare challenges, laid out strategies for creating effective, comprehensive healthcare systems and discussed these with the audience. Among those speaking were Prof. Harald zur Hausen ML, Nobel Prize winner; Prof. Lothar Wieler ML, president of the Robert Koch Institute; Prof. Christian Bréchet, president of the Pasteur Institute; Georg Schütte, state secretary at the Federal Ministry of Education and Research; Hajime Inoue, special representative for antimicrobial resistance at the World Health Organization; and Prof. Andreas Barner, president of the Stifterverband and former CEO of the pharma company Boehringer Ingelheim.

The highlight of the event was the de-



At the Science20 dialogue forum, Chancellor Angela Merkel takes questions from the audience and Leopoldina President Jörg Hacker.

Photo: Markus Scholz

livery of the Science20 statement to Chancellor Angela Merkel by representatives of the Science20 academies. In her speech before about 350 attendees from Germany and abroad, the chancellor stressed that "global issues require global solutions" and pointed out that the fight against infectious diseases was a focus of Germany's G20 presidency.

Chancellor thanks academies for easy-to-understand statement

She furthermore said that she was pleased that the academies had incorporated this issue in their joint statement and had also made recommendations on how to deal with non-communicable diseases such as cancers, diabetes and cardiovascular diseases. She continued by saying that with their clearly articulated recommendations, the academies enhanced the G20 consultations and demonstrated the potential of international scientific cooperation: "Only those who embrace openness, who collaborate outside of their own specialist fields and beyond physical borders, can benefit extensively from

such cooperation." Governments "could, in view of the numerous problems that we need to solve, only profit from scientific discoveries", said the chancellor, who, in her closing remarks, thanked the Leopoldina for the coordination of the Science20 dialogue process and called for a continuation of the forum.

Leopoldina President Jörg Hacker ML concluded the dialogue forum by giving a positive summary of the Science20 initiative and welcoming the announcement by the president of the Argentine Academy of Sciences to continue the Science20 dialogue process under Argentina's G20 presidency in the coming year. He added that he now looked forward to discussing the Science20 statement with the chief negotiators of the G20 states, the so-called "sherpas", in Frankfurt shortly afterwards, which will give him an opportunity to feed the recommendations directly into the preparatory work for the G20 summit in Hamburg.

(rn/chw)

■ STATEMENT CAN BE FOUND HERE

“A secret language of the brain”

Interview with Nobel Prize laureate Edvard Moser

We have our body's own navigation system to thank for our ability to find our way around. Three neuroscientists discovered where it is anchored in the brain, and received the Nobel Prize for this achievement in 2014. Prof. Edvard Moser ML is one of them. On May 15, the Norwegian scientist will travel to Berlin to report on his latest research findings in the Leopoldina Lecture, which is open to the public.

In 2014 you received the Nobel Prize for medicine, together with May-Britt Moser (Prof. May-Britt Moser ML) and the Brit John O'Keefe. Has your life changed since then?

Moser: It certainly has! Almost every day I receive invitations to lectures and events of all kinds – it's not

really possible to keep on top of the flood of requests. But of course I am delighted about the increased public interest in our work and in neuroscience in general. On such occasions, I like to do a little advertising to secure long-term funding for our research, as I did the other day at a meeting with our prime minister. Yes, this phone call from Stockholm in October 2014 has greatly changed my life. Now, it's a constant balancing act – between my obligations as head of a dynamic research laboratory and as an ambassador of science.

You must often get asked to present your discovery in a way that non-specialists can understand. What do you say then?

Moser: I start by explaining place cells, which John O'Keefe discovered in the brain in 1971. These are nerve cells which are active only when you're at a particular point in space. One cell would turn on only when I stood over there, the other only from a different position. But how do the place cells know that? What drives them? These were questions that remained unanswered for thirty years. May-Britt and



Edvard Moser received the 2014 Nobel Prize for medicine.

Photo: Ned Alley

I were also stuck for a long time – until we looked more closely at a neighbouring, higher-level area of the brain. We found a cell type there that maps places differently from place cells. We called these grid cells. Each of them covers a portion of the space in which we find ourselves, in the geometric shape of a hexagon. Fitted together, the hexagons look like a honeycomb. Grid cells completely cover the entire surroundings and create a kind of map in the brain, which is updated with our every move. Grid cells, place cells and other specialized types of cells work together in a complex network that tells us where we are. It's the GPS system in our brains.

You found it when you started looking in a new place.

Moser: Like other researchers, we started looking in the hippocampus, an important area for learning and memory where the place cells are also located. We tried this and that, and eventually realised that the place cells receive impulses from a neighbouring brain structure, the entorhinal cortex. Before that, hardly anyone

had worked on this hard-to-reach area. With a neuroanatomist to help us, we were able finally to record signals from the individual nerve cells located there.

It soon became clear that they activate the place cells, but we didn't yet understand the true significance of our findings. When we then discovered the hexagonal pattern, we first thought it was a technical artefact. It took half a year and many more attempts before we could believe it. We had decoded a secret language of the brain, a code with which we can find our way around almost anywhere. Suddenly a new world opened up before us. It was a real eureka experience.

Your discovery is considered ground-breaking and you were awarded the highest scientific honours. And yet you tirelessly continue with your research. What drives you?

Moser: Curiosity. It's a very strong motivation, and as a scientist, you need that to overcome lean periods and obstacles. If you just want to win the Nobel Prize, you won't.

What have you learnt from your latest research?

Moser: We know now more about how the orientation grid in the brain is produced, how it develops in our bodies when we are young, and what role the individual cell types play in this.

So that's also what your lecture in Berlin is about?

Moser: Yes, it focuses on the new findings. But I'm also going to discuss our previous studies, so that the context is clear.

INTERVIEW BY LILO BERG

■ REGISTER FOR THE LECTURE

“We want to reach out to society”

Interview with Thomas Lengauer about Leopoldina Symposium on the consequences of digitisation

The title of the Leopoldina Symposium being held in July is “Digitisation and its effects on people and society”. Presidium member Prof. Thomas Lengauer gives an overview of the issues and topics that will be covered.

Professor Lengauer, the Leopoldina is hosting a large symposium in July on the topic of digitisation. What do you hope to achieve with this event?

Thomas Lengauer: We want to look at how technological developments occurring in digitisation are impacting our lives. We will also be asking how we can continue to shape digitisation so as to fully utilise its advantages while limiting its negative side effects. As the National Academy of Sciences, we will do so in a way that is as well balanced and scientifically informed as possible.

There are many conferences currently being held on digitisation. What is the specific focus of yours?

Lengauer: We are looking specifically at how the assistance provided by digital technology influences the way we search for information, communicate and make choices. We want to discuss how we learn and how we form our view of the world and come to decisions. Finally, we also want to raise the question: How do we interact with one another? That is a very concrete focus within the broad topic of digitisation.

The conference takes place shortly before the critical final phase of the Bundestag election. Was this a conscious choice?

Lengauer: In 2014, the Leopoldina created a standing committee dedicated to the topic of digitisation. Now, almost two years later, it is the right time to bring this topic before the public. When deciding on a date, this feeling was reinforced by the political developments of the past year. Think about the UK referendum on Brexit or Donald Trump’s election as US president. Think of the fake news and social bots that end up the focus of public interest. This has all helped raise awareness among the people, the media and decision-makers in politics and business about how digital media can selectively influ-



Thomas Lengauer discusses the upcoming symposium.

Photo: Christof Rieken

ence voter decisions. But this is merely a sub-topic of our symposium.

Who is the target audience of this conference?

Lengauer: The symposium is not only aimed at the scientific community. We want to reach out to society. We want to open this topic up to regular citizens, as well as journalists and representatives from government and business. That is why the conference is being held in Berlin. That is also why the conference language will be German and not English – which is quite a challenge when dealing with a topic where the experts are mostly from non-German-speaking countries.

The symposium will focus on both the individual and society. What can participants expect?

Lengauer: At the individual level, we are addressing the question of how human thought and action can be altered by

the use of digital assistants. What effects does digitisation have on our learning behaviour, cognition and concentration? The second focal point is how digitisation influences social processes and group behaviour. These group processes are not political per se. But this also gives rise to the question of whether digitisation reinforces or rather weakens democratic opinion-forming and policy-making.

The debate surrounding digitisation is a highly emotional one. How do you deal with that aspect?

Lengauer: Yes, for some, this is a topic that brings out criticism and prejudices, and then at the other extreme are the tech enthusiasts who think digitisation can do no wrong. With us, both sides get to voice their opinion. In every meeting there is a speaker who has a positive view of the technological possibilities and prospects. We then always ensure there is a “reflector” to challenge the proponent and outline the social consequences and risks involved. In this way, we hope to achieve a balanced representation that creates neither a terrifying nor naïve picture of technological progress. After this symposium, people should be better equipped to form a balanced opinion on what the new developments will bring.

SYMPOSIUM IN BERLIN

From 10 to 11 July, Leopoldina hosts the symposium „Die Digitalisierung und ihre Auswirkungen auf Mensch und Gesellschaft“ in the dbb Forum Berlin (Friedrichstraße 69, 10117 Berlin). Among the speakers are Prof. Gerd Gigerenzer ML as well as Prof. Elisabeth André ML.

INTERVIEW BY STEFAN VON BORSTEL

The Earth's organs

Class I symposium addresses the topics of climate and energy

The Earth's climate is the result of complex interactions between various systems. While solar radiation reaching the Earth can still be accurately predicted, a number of the Earth's systems are becoming significantly more erratic. In his opening lecture at the symposium "Climate and energy", held on 16 March 2017 in Halle, Prof. Hans Joachim Schellnhuber ML (Potsdam) described systems such as the Northern Hemisphere jet stream, the Amazon Basin and the Arctic sea ice as "the Earth's organs", and pointed out that the complex interrelationship between these organs is very sensitive to global changes.

Schellnhuber claimed that as soon as humans began using fossil fuels, they became a global geological force. The acidification of the oceans is a particularly devastating consequence, he explained, as its impact will continue to be felt for very long periods of time even after a noticeable reduction in carbon dioxide emissions. Schellnhuber ended his speech with the appeal: "We are burdening our descendants with the task of decarbonisation!"

The central focus of the speech given by Prof. Peter Schlosser ML (New York) was the impact of climate change on the Arctic. He talked about the Paris climate conference, which saw the international community enter into an agreement to keep the global temperature rise well below two degrees Celsius. But this value, he explained, is just an average, meaning that temperatures could rise far more drastically in certain regions. For example, this two-degree scenario would see the Arctic heat up by five degrees Celsius – transforming it from the ice-covered white Arctic we know today to a "blue Arctic" with great expanses of water.

Prof. Ottmar Edenhofer (Potsdam) used his speech "The atmosphere as common property" to describe various potential pathways to decarbonisation. He explained that it is not only the annual level of CO₂ emissions that is important; far more significant is the total amount of carbon dioxide released up to now. The atmosphere, according to Edenhofer, must be thought of as a landfill site with limited capacity. Progress is finally being



The new members of class I

On 15 March, the new members of class I received their certificates of membership. From left to right: Leopoldina Secretary-General Prof. Jutta Schnitzer-Ungefug (Halle), Prof. Volker Springel ML (Heidelberg), Prof. Steinrück ML (Erlangen), Prof. Frank Würthner ML (Würzburg), Prof. Beat Meier ML (Zurich), Prof. Ferenc Krausz ML (Munich), Prof. Peter Schlosser ML (New York, USA), Leopoldina President Prof. Jörg Hacker ML (Halle), Prof. Burkhard Wilking ML (Münster), Prof. Gerhard Fettweis ML (Dresden), Prof. Heiner Igel ML (Munich).

(jk)/Photo: Markus Scholz

made and the effect of renewable energies is also measurable, he said, but global economic growth and the resurgence of coal use would cancel out all saving effects. Edenhofer continued by pointing out that real progress is only achievable with a dynamic emissions trading system, and that the revenue achieved by these means would ultimately be greater than the losses suffered by fossil fuel sources.

The research conducted by Prof. Elke Weber ML (Princeton) focuses on why people feel the need to stick to familiar behavioural patterns and how this status-quo bias can be overcome. She explained how, in this context, our approach to climate change resembles our approach to other problems in life such as inadequate retirement provisions or an unhealthy diet. In her speech, Weber emphasised the importance of more effective communication on the advantages of establishing a new status quo. In doing so she referred to the website www.connectingonclimate.org, which presents findings from communication about climate change.

Chemist Prof. Wolfgang Schnick ML (Munich) demonstrated how technological advancements can make a concrete contribution to climate protection. Purely by chance, Schnick discovered the light-emitting properties of a rare earth metal, europium. Today, this material is used in many applications, from cars to smartphones, to provide LED light and thus help save electricity.

The previous evening, astronomer Prof. Volker Springel ML (Heidelberg) had already packed out the auditorium with his Leopoldina Lecture "Simulated universes: The creation and destiny of our Milky Way". Using impressive simulations, Springel turned the birth of our universe into a tangible experience. He summarised the prospects for the Milky Way as follows: In roughly two billion years, our galaxy will merge with the galaxy Andromeda. For astronomers – if they still exist at this time – this is a rather gloomy prospect, as once this occurs the light from distant galaxies will no longer reach us.

(ca)

EASAC Council meeting in London

European academies network debates Brexit and a new mechanism for advising the EU Commission on science policy

On 17 and 18 November 2016, the twice-yearly meeting of the EASAC Council took place at the Royal Society in London and was dominated by the outcome of the Brexit referendum in late June 2016. On the day before the EASAC Council meeting, the Royal Society held an event at which representatives of British research institutions debated the impact of the referendum on the UK research landscape. Members of the EASAC Bureau were invited to attend as guests. In this role they actively took part in the discussion on the threat of reduced research collaboration between British and other European scientists. During the Council meeting, the EASAC strategy for the years 2017 to 2021, which the Bureau had drafted in advance, was discussed and approved unanimously by the representatives of EASAC's member academies.

Much of the discussion focused on the start of a joint project among five European academy networks (EASAC, Academia Europaea, ALLEA, Euro-CASE and FEAM), which had launched on 1 November 2016. Through October 2020, a European Commission-funded project consortium consisting of these academy



Former Vice-President of the Royal Society, Martyn Poliakov, EASAC President Thierry Courvoisier and his predecessor Jos van der Meer, (left to right) at the EASAC meeting in London. Photo: Royal Society

networks will provide support to a High Level Group of Scientific Advisors, which was set up by the Commission. This High Level Group is part of a Scientific Advice Mechanism under the responsibility of the Commission's Directorate General for Research and Innovation.

Detailed reports on the progress of projects under way at EASAC were another important topic of the meeting. In

November 2016, these included "Genome Editing", "Valuing Dedicated Electricity Storage in Grids", "Multi-Functionality and Sustainability in European Forests", "Homeopathy", "Food and Nutrition Security and Agriculture", "Soil Sustainability", "Negative Carbon" and "Smart Villages" (Village-Level Energy Solutions in Developing Countries). (csd)

People

Deceased Members

■ Axel Brennicke ML

22 January 1953 – 26 February 2017
| **Blaubeuren**

Genetics/Molecular Biology and Cell Biology

Molecular biologist Axel Brennicke investigated the DNA and RNA of plant mitochondria. He was able to prove that cis- and trans-splicing occur regularly in mitochondrial RNA and that there is interaction between the two processes. This discovery represented a major breakthrough in molecular biology. Axel Brennicke was director of the Institute of Molecular Botany at Ulm University.

■ Jaromír Demek ML

14 August 1930 – 5 February 2017
| **Brno, Czech Republic**

Earth Sciences

Jaromír Demek worked in the field of geomorphology. His research explored the periglacial geomorphology of the polar regions as well as the methodological foundations of his discipline. Demek developed, among other things, a method to assess the impact of society on nature.

■ Fritz Eiden ML

29 August 1925 – 6 March 2017
| **Munich**

Chemistry

Fritz Eiden was active in the field of pharmaceutical chemistry. He performed analytical investigations of psychotropic medication and conducted experiments aimed at identifying such medication and assessing its value. His research in the area of organic synthesis led to an intensive study of the pyrone class of compounds

and, in particular, an examination of the reactive behaviour of various substituted pyrones.

■ Ernst Helmreich ML

1 July 1922 – 4 February 2017
| **Schliersee**

Biochemistry and Biophysics

Ernst Helmreich dedicated his scientific life primarily to shedding light on the underlying processes of cell metabolism, on events in the cell membrane and on the functioning of enzymes. In 2003 he received the golden Cothenius Medal of the Leopoldina for his lifetime achievement in science, in particular for his work on G proteins and protein phosphorylation.

■ Manfred Kirchgeßner ML

21 May 1929 – January 2017
| **Freising**

Agricultural and Nutritional Sciences

Manfred Kirchgeßner, former Senator and representative of the Agricultural and Nutritional Sciences Section, made a significant mark on this field through his research into nutritional physiology and animal nutrition. His investigations focused on both applied questions related to agricultural livestock and basic research into nutritional physiology. Kirchgeßner worked for 40 years at the University Institute for Nutritional Physiology and Animal Nutrition in Freising-Weißenstephan.

■ Andreas Oksche ML

27 July 1926 – 23 January 2017
| **Giessen**

Anatomy and Anthropology

Andreas Oksche worked in the field of neuroanatomy and investigated in particular

the diencephalon. His specialisations included the pineal organ and extraocular photoreceptors. The former Senator of the Anatomy Section was honoured with the golden Cothenius Medal of the Leopoldina in 2003, and with the Behring-Röntgen Research Medal in 2010. He received both awards for his lifetime achievement in science.

■ Hans Rorsman ML

2 March 1930 – 16 August 2014
| **Lund, Sweden**

Internal Medicine and Dermatology

Hans Rorsman was considered one of the leading dermatologists in Sweden. He investigated the role of basophil leukocytes in allergic reactions. Rorsman also published work in the field of biochemistry on the decrease of melanin in humans and animals under normal and pathological conditions. His principal focus was diseases such as malignant melanoma, the so-called “black skin cancer”.

■ Gert-Horst Schumacher ML

21 May 1925 – 13 January 2017
| **Rostock**

Anatomy and Anthropology

Gert-Horst Schumacher investigated the biomechanics of the skull, specialising in the functional morphology of chewing musculature. In addition to biometric work on skeletal and bone growth, the former Senator also delved into medical history topics. Schumacher served as a professor at the University of Rostock from 1959 until his retirement in 1990.



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Abbreviations:

ML = Member of the Leopoldina