

7. EUROPEAN PHYSICS OLYMPIAD LEIBNIZ NEWS

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17th

The Experimental Exam



Dedication and determination!

Anxious students lined up for the experimental exam on the morning of 17th June. The 5-hour experimental exam of the EuPhO 2023 started in the morning at the Leonore Goldschmidt School. There were total two experiments for this exam. The first experiment was based on a magnetic pendulum. The oscillation frequency of a pendulum could be modified by magnetic forces between the pendulum and its support. The students had to study the motion of the pendulum in a combined potential from gravitational and magnetic interaction terms using a certain setup. It was a rather delicate experiment and the students had to handle the equipment very carefully. There were 4 tasks in the first experiment. The first task was to determine the masses and the second one was to measure the

average magnetization. The third task was to measure the pendulum frequency and the power law component. The fourth task was about a nonlinear pendulum, where the students had to determine the magnetic separation and investigate the dependence of the pendulum period on its amplitude when tuned to the best cancellation. They also had to suggest a functional dependence and validate it with the appropriate data.

The second experiment was about an optical black-box. The task was to determine the contents of an optical black-box without opening it. The black-box had 4 optical ports (A, B, C, and D) for light, and 2 optical axes that were perpendicular to each other. There was up to one optical element behind each port, as well as another one in the center of the box. The students could use a laser and a laser mount with a wheel to rotate the laser. The first task was to determine the element placed centrally in the black-box. The second was to determine the elements in the remaining slots. The third task was to determine the characteristic properties for the optical elements used inside the box as precisely as possible. The students particularly enjoyed the second experiment, as it was a more hands-on experience for all them. The students of team Sweden even described this experience as 'feeling like detectives!'

Many students felt that the experimental exam was fun, but also very challenging. Some were worried about the results, while some were already thinking about preparing for the theory exams for the very next day.

We wish all the students all the very best for their upcoming theory exams!



This is what full concentration looks like!

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The Opening Ceremony



The Opening Ceremony



The choir performing at the Opening Ceremony

At 6 pm, the Opening Ceremony commenced at the Leibniz University. It began with a wonderful choir performance. Jaan Kaalda, president of EuPhO had some thoughtful insights, "We live in a fast- changing world. Today, we have so many means of communication; Even artificial intelligence applications such as ChatGPT almost does everything for you! Programs such as EuPhO help to connect the dots and think out of the box. I wish you good luck for the problems that we have prepared for you. I thank the German organisers for their efforts in preparing this Olympiad."

There was a presentation on the effects of light and laser, and its research in the Hanover- Braunschweig area. The effects of stimulated emission, the Einstein

telescope, and the solar constant were covered in depth. After the addresses, there was a delightful dance performance based on the song, "Blowing In The Wind" to thunderous applause. There was another presentation on light and matter by Quantum Frontiers. They threw some light on gravitational wave astronomy, the foundations of physics, Geodesy and gravimetry, nano and quantum engineering.

As each participating team was introduced, they all received a rousing welcome by the audience. The Opening Ceremony was followed by dinner.



The choir performance



A group of Markers

The EuPhO Chairperson speaks...

Dr. Stefan Petersen, Chairperson of the local organising committee speaks about the EuPhO and what he is looking forward to in this Olympiad.

“We, as organisers, are thrilled to have so many students enthusiastic about physics here in Hannover. Our preparations started around two years ago and it is still hard to realize that EuPhO 23 has now finally started. We cannot express enough thanks to all those people that helped EuPhO 23 come into reality. I am now particularly excited about how the students liked the experiments as we worked very hard to put up challenging but really nice problems. Also, I wish for all the participants and the leaders to have a very enjoyable time here in Hannover.”

Dr. Stefan Petersen



Team Switzerland



Team Latvia at the Opening Ceremony

The Maschsee

The Maschsee is one of the most popular excursion destinations and recreational areas in Hanover and attracts thousands of visitors every year, especially to the Maschseefest. The name of the lake derives from the 'Leinemasch' or simply 'Masch'. This is also the historical field name for the area where the lake was created.

The Maschsee is an artificial lake which is 2.4 km long, and 180 to 530 m wide located at the south of the city center of Hanover. With an area of 78 hectares, it is the largest body of water in the Lower Saxony state capital. Numerous water sports take place at the Maschsee.

This artificial lake was created in the Leinemasch between 1934 and 1936. Just as it attracts water sports enthusiasts, it also invites you to stroll, cycle, or jog on its approximately 6 km-long shore paths. In recent years, the Maschsee has increasingly become a meeting

point for inline skaters. For walkers, there are a number of different beer gardens, cafés, and restaurants that invite you to coffee and cake or a good meal. On the north shore, there is a hotel in an exclusive location overlooking the lake.

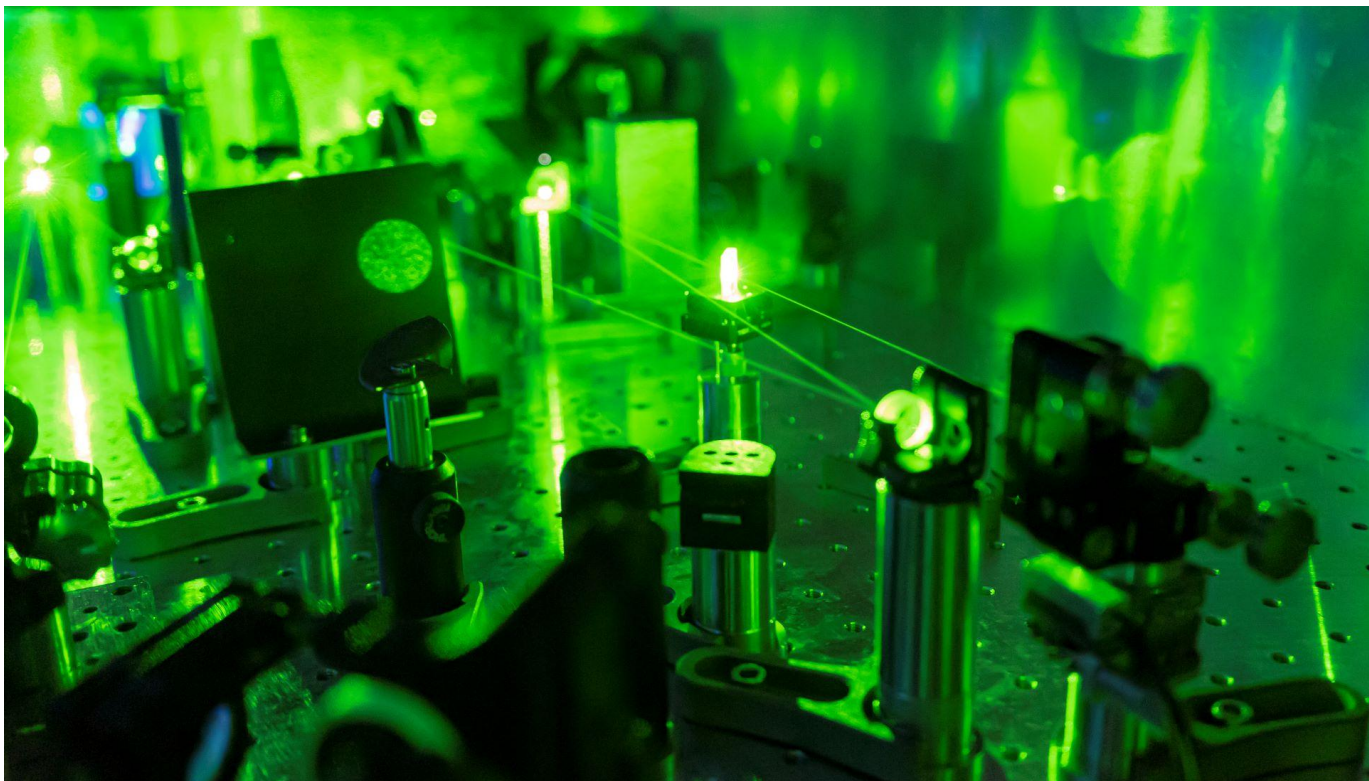
Due to seepage of water and evaporation, the water level falls by a maximum of 1.3 cm a day, which corresponds to 10,000 cubic meters of water. To keep the water levels constant, a pumping station at the Ricklinger Kieteichen takes care of the water balance in the Maschsee. It has three pumps with a total output of 1000 l/s.

Various competitions take place on the water throughout the year, most notably the annual Hanover Dragon Boat Festival. When the ice thickness of the lake exceeds 13 cm in winter, the city administration officially opens the lake for entry by hoisting the city flag on the northern shore. Around two million visitors turn Hanover's most beautiful shore into a party and nightlife mile for almost three weeks at the Maschsee Festival.



Dragon Boat Festival in 2012, Maschsee

PhoenixD 120 scientists from six disciplines working on novel optics



Smartphone cameras, online streaming via optical fibres, laser welding of car bodies, and 3D imaging in medicine; optical technologies make our everyday digital life possible. Now, optics is about to take the next evolutionary step: its miniaturisation. It should make the technology so cost-effective, that it will enable many more digital applications in the future - from autonomous driving to mobile medical diagnostics. Developing the performance of these key technologies is the goal of the Cluster of Excellence 'PhoenixD: Photonics, Optics, and Engineering - Innovation across Disciplines' at Leibniz University Hannover. More than 120 researchers from the six disciplines of physics, mechanical engineering, chemistry, electrical engineering, computer science, and mathematics are developing the precision optics of the future. They investigate how complex optical systems can be made more efficient through modern manufacturing processes like 3D printing. The cluster comprises of scientists from Leibniz University and the project

partners Technical University Braunschweig and Laser Zentrum Hannover e. V. The German federal government and the state of Lower Saxony jointly fund the research cluster PhoenixD via the German Research Foundation (DFG) with around 52 million euros from 2019 to 2025.

Are you interested in starting a career in this promising field of optics and photonics? Leibniz University Hannover offers a Bachelor's and a Master's degree in Optical Technologies and you can obtain your PhD with PhoenixD scientists. Meet the PhoenixD team at their joint stand together with the research groups QuantumFrontiers and DQ-mat in the Lichthof located at the entrance hall in the university's main building on Friday (17-21 h) and Tuesday (10-14 h). The team there will try to answer all your questions. Do you dare to spin the fortune wheel and test your knowledge? There are prizes to win!

Learn more about PhoenixD at: <https://www.phoenixd.uni-hannover.de/en/>

To know more about the degree programmes of Optical Technologies in Hannover, see:
<https://www.phoenixd.uni-hannover.de/en/phoenixd-research-school/students>

German Precision

The human mind tends to form associations between 2 words. Some of these that are agreed upon by many, prevail throughout decades and keep becoming stronger. One such association is that of 'Precision and Germany'. The Germans have built a stellar reputation of being one of the most precise people on earth. They are often considered to be highly efficient and matter-of-fact.

This preciseness starts from their native language itself. The structure and logic of German language allows for the formation of innumerable compound words which not only give out a precise meaning but also help a person with limited German vocabulary to decipher the meaning.

For example, 'gloves' are called 'handschuhe' which literally means 'hand shoes'.

A 'slug' is called 'nacktschnecke', literally meaning 'a naked snail'! Perfect isn't it?

Similarly, an 'umbrella' is called 'Regenschirm' meaning rain shield, 'headlight' is called 'scheinwerfer' meaning 'shine-thrower'. The list goes long but does not fail to bring a smile to your face after you yourself deciphered the meaning even if you are acquainted with only primary German words.

Let's move on to the precision of German announcements. As a tourist, one notices quite a few such announcements especially when you take the train.

One such announcement was 'Ausstieg in fahrtrichtung rechts', which means 'Exit on the right in the direction of travel.' This is a very clear message as to which side the train exit would be. There is no confusion whatsoever and this is particularly useful for visually challenged tourists.

Germany boasts of an array of prominent companies that have been carrying the reputation of 'the world's finest Mechanical Engineering solutions.' Precision and attention to detail is the crux of mechanical engineering. Through the years, Germany has been known to rule the world in this very field. Cars manufactured by German companies like BMW, Mercedes Benz, Audi, and Volkswagen never fail to surprise the world with the kind of detailing that percolates into their designs. The world, in fact, awaits the release of a new model and longs for the magnificence they all display.

One such detail is that of the logo on the wheels of the car. All the 4 wheels obviously spin as the car moves forward, but the logo is designed to avoid spinning and does not leave its stoic upright orientation. One cannot help but wonder what amount of design and manufacturing accuracy must have gone into creating this!



The BMW Logo on the wheel

People's Specials



Jurij Bajc, Leader of Team Slovenia

Jurij Bajc, Leader of Team Slovenia

"I expect and hope that my students get some medals, although I do not want to pressure the students into getting medals! They worked really hard and one student even won a gold medal from the Astronomy Olympiad. As we were the organizers last year, I think this year's process for the translation was very smooth. The organizers have distributed all the tasks of the Olympiad very well. The schedule is quite good. I'm also happy to see the number of students increasing per year in EuPhO in general. But for this, we also need to work with graders from across many places. While the problems are different than the IPhO, we need to accordingly address grading in a right way. All students solve the problems in different ways. So it is actually a very different challenge than the IPhO. One of the main challenges now would be keeping the same format and quality of the EuPhO with the rise in the number of participants."

Dirk Brockmann-Behnsen, Member of the Organizing Committee

"I was responsible for the IPhO for Lower Saxony for about 10 years, so I am a bit involved in such competitions. When Gunnar came up with the idea of having the EuPhO 2023 in Hanover, I was very excited, even though conducting an Olympiad can be a very challenging task. It is really great to meet people all around the world and learn new cultures. I was a teacher for more than 20 years, and it is an honour to see such bright students coming here from everywhere. This has been a truly wonderful experience for me!"



Dirk Brockmann-Behnsen, Member of the Organizing Committee

EVENT SCHEDULE

June 18

Students' program

7:00 - 7:45	Breakfast and packing of lunch
7:45 - 8:45	Meet in Lobby and transfer with guides
9:00 - 14:00	Theoretical Exam
14:00 - 14:30	Packed Lunch
14:30 - 15:15	Transfer by public transport with guides
15:30 - 17:30	Sports activity on University Sports Ground
17:30 - 18:15	Transfer by public transport with guides
18:30 - 19:30	Dinner
19:45 - 20:30	Scientific Lecture by Frank Ohme, Max Planck Research Group, Binary Merger Observations & Numerical Relativity
20:45 - 22:00	Meet with Academic Committee and leaders

Program Leaders and Observers

5:00 - 8:00	Translation of Theoretical Exam
8:00 - 10:00	Breakfast
10:00 - 10:30	Walk to Hannover Main Station
10:45 - 12:00	Train trip to Goslar
12:00 - 13:00	Packed Lunch and Walk to Rammelsberg
13:15 - 15:15	Visit of the UNESCO World Heritage Rammelsberg
15:30 - 17:00	Walk to Goslar & town visit
17:00 - 18:30	Dinner at Brauhaus Goslar (brauhaus-goslar.de)
18:30 - 20:10	Walk to Goslar station & Train trip to Hannover
20:15 - 21:00	Transfer by public transport
21:00 - 22:00	Meet with Students and Academic Committee
22:00 - 22:45	Transfer by public transport

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