

N°6

Wednesday, July 23rd

—PHYSICS—

BEYOND FRONTIERS



International
Physics Olympiad
FRANCE 2025

Eyes on the infinite

The Paris Saclay
University

Along
the river Seine

Orsay museum
quizz





Dear IPhO participants,

Believe it or not, there is something better than doing physics — doing physics together. Contributing collectively to something greater than ourselves, something that brings us together and allows us to transcend our differences — this is true at every scale. During the many months that the Scientific Committee took to prepare the exam, discussions were sometimes tense and some decisions painful, like when they had to choose between questions or to remove interesting parts in order to shorten a question. But in the end, what truly matters is the joy of having worked together for you. And what an experience it was for them to work with the team leaders a few days ago to arrive at the final version of the questions! A huge thanks to all of the team leaders for the constructive spirit of the debates. Once again, the goal of providing you with the best possible questions guided all exchanges.

But believe it or not, there is something even greater than doing physics together — it's sharing physics, at every level, with everyone. Sharing by teaching, by contributing to public scientific debates, by discussing science with your family and friends, and through science outreach.

It took me some time to realize that all of us physicists have a role to play in scientific and societal debates. This isn't reserved for specialists in climate science, energy, or other specific topics. In fact, if you look closely, many subjects can benefit from a general physics perspective — a perspective grounded in the shared knowledge of all physicists. One example is the The Science Minute column from Monday's IPhO daily paper which is in fact an article we wrote just after the lockdown in France, during the heated debate about face masks. Explaining how it is possible to filter particles much smaller than the pores in a mask helped to debunk a lot of misinformation.

Sharing physics means offering a new way of seeing the world. Understanding the physical origins of phenomena does not strip the world of its wonder — quite the opposite, it deepens our sense of awe. The next time you see a rainbow, help those around you discover the secondary rainbow and its reversed color order. Point out the difference in brightness on either side of the arc and the presence of Alexander's dark band — and if you're lucky, the supernumerary bows too. The next time they witness a rainbow, they won't be amazed by just one — but by two, and all the phenomena that accompany them.

And the ultimate form of sharing? Performing experiments — and having others perform them. Demonstration experiments are a universal language that speaks to everyone, from the youngest child to the oldest adult, from physics experts to those most distant from science. I don't know anyone who can resist the magic of the tablecloth trick — pulling it out from under a set of dishes without breaking anything. And if you go a step further and teach someone how to do it — this stunning yet surprisingly simple demonstration, once you know the few pitfalls to avoid — is a guaranteed source of joy. I know no thrill quite like the relief of avoiding disaster, both for the person pulling the cloth and for the amazed onlookers.

There are many ways to share physics. Find the one that suits you best, and from now on, become a physics ambassador — in every moment of your life.

Jean-Michel Courty

Professor at Sorbonne University

Bronze medal IPhO 1983, Silver medal IChO 1984

Outreach medal of CNRS 2021



YESTERDAY'S HIGHLIGHTS

Visit to the place of birth of the Paris Saclay University

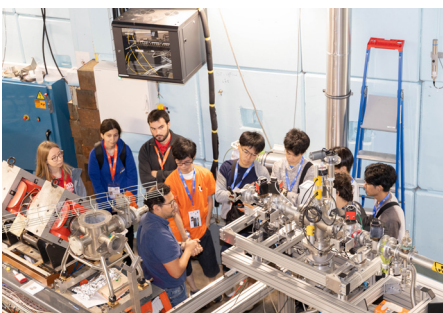


Let's step back 70 years ago. The small city of Orsay 25 km south west of Paris is a very quiet place with nothing really remarkable about it, expect its calm and its nice forest and river. The creation of CERN, the European Center for Nuclear (and particle physics) in 1954 will change its destiny forever (welcome butterfly effect!). The French physics community obtained in 1955 the money to construct two very large accelerators in Orsay to prevent the departure of all the experts to CERN. The laboratories Institut de Physique Nucléaire and Laboratoire de l'Accélérateur Linéaire are thus created in 1956 and hundreds of bulldozers and cranes rush to Orsay to build these machines. The key achievements of these labs over the years have been recognized by the "Historical Site" label delivered to each of them by the European

Physics Society. Around this "nucleus", the University of Orsay was created in 1970, and gradually transformed fifty years later into the Paris Saclay University with its 90000 students and is now the beacon of French research. The Irène Joliot-Curie laboratory, named after the famous daughter of Marie Curie, winner also herself of the Nobel Prize for the discovery of artificial radioactivity, that the delegations from Cuba, Japan, UK, Thailand and Turkey visited today is the merger of the two nuclear and particle physics laboratories mentioned above. Its director, Achille Stocchi, welcomed the delegation and presented the laboratory physics program (search for the fundamental laws governing the elementary particles, the nuclei, and the universe evolution) and presented several figures: a staff of 800 physicists, engineers, technicians with more than 120 PhD students coming from all over the world, its 80 M€ operating budget used to build, operate and exploit large scale instrumentation, particles accelerators, platforms. Our delegation has the pleasure to visit two of them: ALTO, a nuclear physics facility delivering stable or radioactive beams to hundred of users for fundamental or applied research, and SUPRATECH, a very advanced technological platform



dedicated to the production and test of superconducting cavities, the building blocks of all particle accelerators. The students were impressed by these huge jewels of modern technology. But also by what one finds just next to it: boots, ropes, bolts, screwdrivers, gloves, etc., showing them that physics is based on instrumentation and instrumentation relies also quite a lot on everyday tools in addition to super fancy equipment and therefore that all skills are needed to make discoveries! They were shown the safety rules and procedures necessary to run an accelerator. One student was so interested that he decided to test them right away by pushing (inadvertently) on the emergency OFF button. He was pleased to see that the recovery procedure worked well in just a few minutes!



The students were certainly pleased and impressed by the discovery of this flagship of French research. They also appreciated the quiet walks in this green but elongated Orsay campus. But of course what they may remember even more is the delicious hot lunch at the Orsay canteen! The IPhO delegations and organizing team therefore thank very warmly IJClab for the discovery of all its treasures!

IT'S TIME TO CORRECT THE EXAMS



The olympiads from a marker point of view



Bruno Pagani
Marker of IPhO France 2025

“ I am marker for the Experimental Examination during this olympiad. My job started on Saturday morning, at exactly the same time as the candidates. However, we were not at Ecole polytechnique, but at École Normale Supérieure (another very famous higher education institution in France), inside the city of Paris. After listening to the general rules and instructions for markers,

the subjects were revealed to us by their authors in the same way that they were to the team leaders the previous day. We were also given a bit of time to get an in-depth understanding of the problems. We were able to test the experimental kits (two of them had been brought there) in order to check some points and verify our understanding of the experiments and measurements expected from the candidates. This proved to be very useful. After a lunch break, we moved on to the marking scheme. The authors went through it item-by-item, with explanations on how some things should be interpreted, especially in light of discussions and votes that occurred during the international board meeting the night before. We also had a demonstration of calculation sheets that would enable us to enter candidates' measurements and automatically get the expected plot as well as any corresponding linear fit, which indeed was of great help! At that point, we began to receive our first batch of examination papers to mark, so we started by going through them all together and studied how the marking scheme would work in some potentially delicate cases. We called it a day around 8 pm and restarted

on Sunday, 9 am again. On this second day, we worked in pairs (which had been decided previously, based on experience) to go through the papers of four or five delegations that had been attributed to us. Every time something was not straight forward to grade, we reported to the subjects authors (who stayed with us the whole week-end) and – if appropriate – a new general ruling was shared with the whole room (we ended up filling two rows of blackboards with precisions on how some cases should be treated). It was a very intense day, ending at 10 pm after only two breaks for lunch and dinner, but we managed to finish on time! The procedure was very similar for the Theoretical Examination, which I attended as an observer and helper, excepted that it happened on Monday and Tuesday and that there were more markers because there were three problems instead of two and the schedule was tighter, everything having to be finished by 7 pm Tuesday evening. Interestingly, the theoretical examinations proved to be less prone to delicate cases, only half of the blackboard surface being enough to accommodate all of them. Now we only have the moderation part left!

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TODAY'S PREVIEW

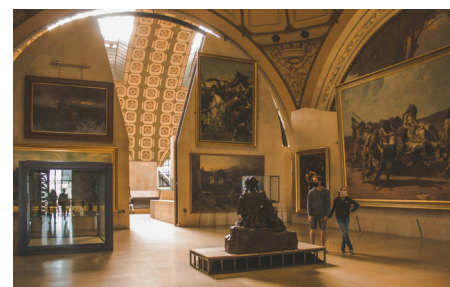
Along the river Seine



About the river Seine

The Pont Neuf is the oldest stone bridge in Paris. It was “wrapped” by Christo and Jeanne-Laure 40 years ago. Just downstream, a small square - the Square du Vert-Galant - houses an equestrian statue of King Henri IV (1553-1610).

Just beyond, on the right as you descend the Seine, you'll see the Louvre Museum. Then, on the left, continuing downstream, we see the Eiffel Tower, built for the 1889 Universal Exhibition and saved from demolition by its scientific laboratory and radio antenna at the top. The names of 72 male scientists are written on the first floor. In the near future, they will be joined on the second floor by the names of 40 women scientists....



About the Orsay Museum

Before being a museum, the place was a railway station for 50 years, inaugurated in 1900 for the Universal Exhibition. Its name comes from the quay on the Seine where it is located: the Quai d'Orsay. In France, when we talk about the Quai d'Orsay, we're talking about the Ministry of Foreign Affairs, also located on the same quay of the Seine. Construction of the station required 12,000 tonnes of metal, almost twice as much as was used to build the Eiffel Tower!





Orsay Museum quizz

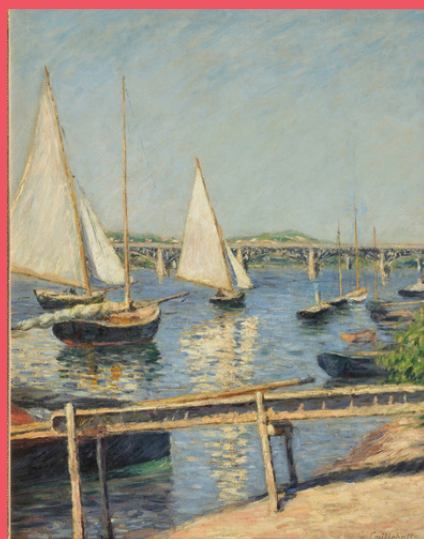
When Art meets Physics

(In some cases, several good answers are provided)



1. Look at Claude Monet's La Gare Saint-Lazare (1877). What physical phenomenon could explain the presence of a blue steam?

- A. Reflection
- B. Diffraction
- C. Diffusion
- D. Quantum interference



2. Assuming that the wind comes from the west, what time is it in Gustave Caillebotte's Voiliers à Argenteuil?

- A. 11 am
- B. 1 pm
- C. 4 pm
- D. Not enough information to answer

3. In many impressionist works, shadows aren't black but colored. What does this reveal about the nature of light?

- A. Light is made of a s
- B. Shadows reflect the ambient light colors
- C. Artists make shadows unrealistic on purpose
- D. Shadows are always darker than their surroundings



4. Assuming the two chairs are identical, can you determine the length of Van Gogh's bed in « Chambre de Van Gogh in Arles »? Its height? (the flat part of a chair has a typical height of 45 cm)



5. In « La Nuit étoilée » from Van Gogh, the night sky is very bright given the presence of many stars. In fact the light we receive from a star located at a distance r is proportional to $1/r^2$ but the numbers of stars at radius r goes like r^2 . Can you therefore explain what the night sky is black?

- A. The above data are wrong

B. Many stars at a radius r are not emitting light anymore

C. The light emitted by some stars has not reached us yet .

D. We can not get the light from all stars since some are masking others



6. Why the sun looks red in Monet's London Parliament?

- A. Too much red wine !
- B. The sun is going to set
- C. The fog is diffusing the blue light away
- D. Lot of pollution in London



7. Seurat « Circus » is painted with small dots. At which distance the dots are not visible anymore? Can you deduce from this your eye resolution. Does it depend of wavelength?



CHINA



FINLAND



LATVIA



LITHUANIA



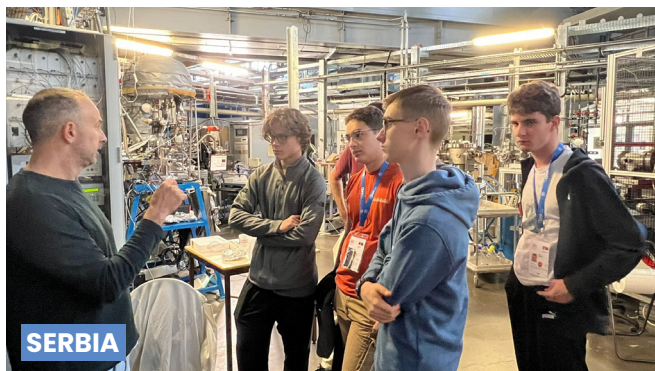
LUXEMBOURG



JAPAN

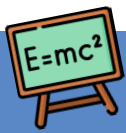


BELGIUM

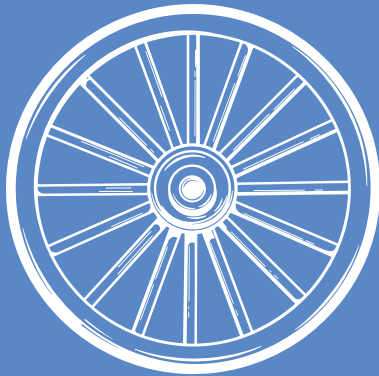


SERBIA





Physics on this day



JULY 23, 1886

Gottlieb Daimler patents the first automobile (16 km/h cycle)

Although this was only the second patent filed for a motor vehicle, the «stahlrswagen» (wheeled steel car) by Gottlieb Daimler (1834-1900) is considered the prototype of the first automobile: four wheels, 560 cm³ twin-cylinder engine. Carl Benz's first patent in 1885 was for a tricycle with an engine...

In any case, the Benz and Daimler brands joined forces in 1926...



Schedule

Wednesday, July 23



Student

Group 1:

9:00AM – 12:00PM:
Visit – Orsay Museum

2:00PM – 4:30PM:
Boat cruise

Group 2:

10:00AM – 12:30PM:
Boat cruise

1:30PM – 4:30PM:
Visit – Orsay Museum

Group 1 & 2:

6:00PM – 7:00PM: Experimental conference



Leaders & observers

8:30AM – 9:30AM: Medal Thresholds Meeting

10:00AM – 5:00PM: Moderation Ecole polytechnique

8:00PM – 11:00PM: International Board Meeting



Happy birthday to



Romans JEMELJANOVs
from Latvia

    Join us on : @ipho_2025

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