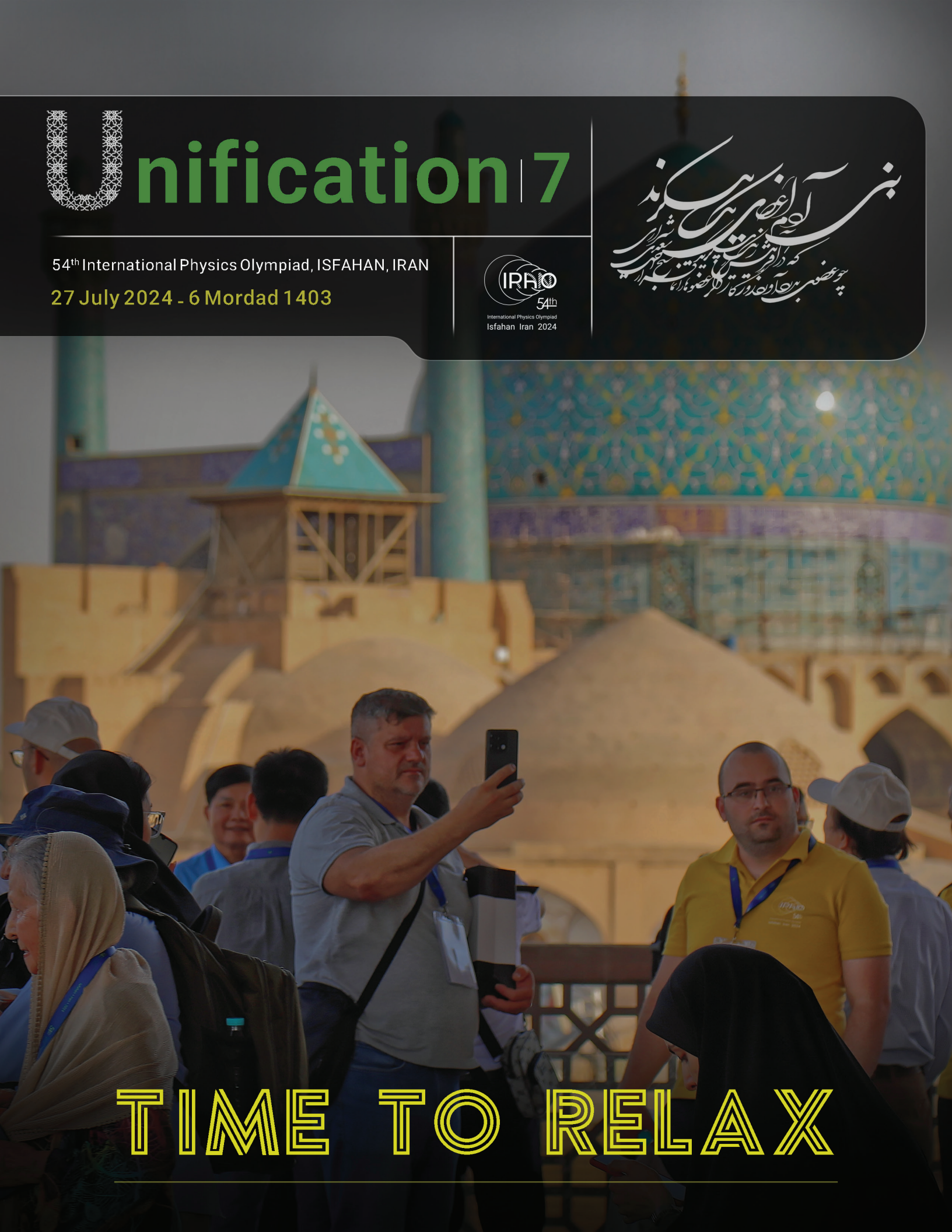
Unification 7

54th International Physics Olympiad, ISFAHAN, IRAN

27 July 2024 - 6 Mordad 1403

IPhO 54th International Physics Olympiad Isfahan Iran 2024

بنی آدم اعضای یکدیگرند
که در آفرینش ز یک گوهرند
چو عضوی به درد آورد روزگار
دگر عضوها را نماند قرار



TIME TO RELAX

WIFICATION
IPhO 2024 Isfahan, Iran
No. 7
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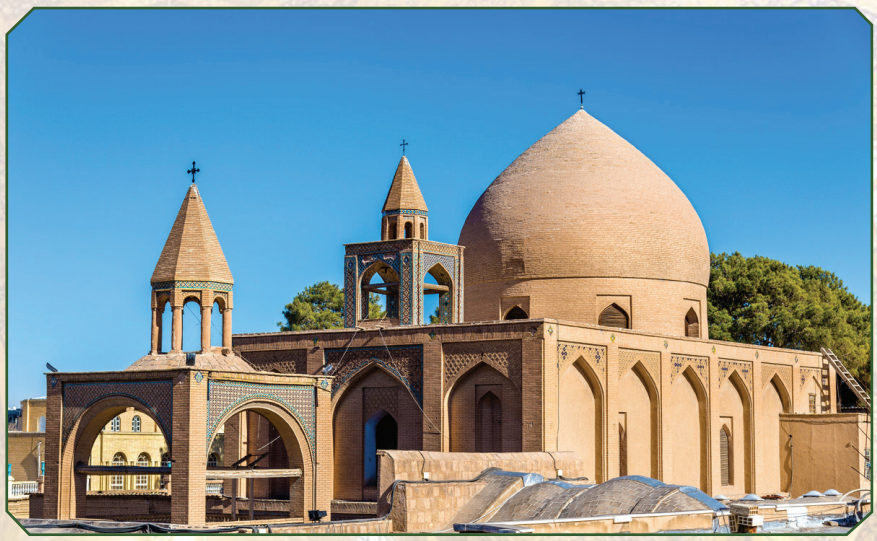
VANK CHURCH

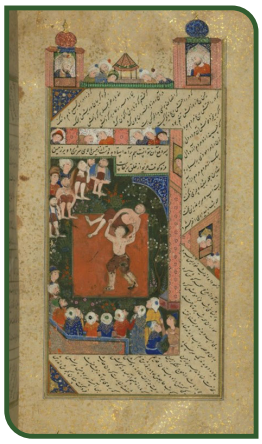
Vank Church is among the largest churches of Isfahan. This church was built during the Safavid era after the Armenians immigrated to Isfahan from the northern parts of Iran and Azerbaijan, during the reign of Shah Abbass I. This church, which has also been called *Amna Perkich* and *Saint Soor* in its history, was originally built in Jolfa during the reign of Shah Abbass II in 1605. In 1655, the church was expanded and presently it was restored to its old condition.

A tilework panel inscribed in Armenian can be seen by the entrance to the cathedral. The inside of the church is nicely decorated showing a mixture of Islamic and Christian styles. Inside the courtyard, there is the belfry and one can see the dome of the cathedral the interior of which is painted in the Persian style with very elegant blue and gold colors. The paintings on the walls are inspired by European art showing scenes of martyrdom, notably that of Saint Gregory.

The museum of Armenian culture stands next to the cathedral. The museum boasts a collection of 700 handwritten books including the first book printed in Iran, a variety of objects related to the Armenian community in Isfahan such as Safavid costumes, tapestries, European paintings brought back by Armenian merchants, embroidery and other ethnological displays related to the Armenian culture and religion. There are several carvings showing scenes from the Bible outside the museum. One of the oldest publishing houses in Iran is in this church. It was built in 1636.



TRADITIONAL SPORTS OF IRAN



Folio from a manuscript depicting a wrestling match.

Wrestling: The word for wrestling in Persian is ***kushti***; it comes from the ancient Pahlavi terms ***kust*** (side, similar to coast in English, *küste* in German, *côte* in French), and/or ***kustig*** which was the name of the holy girdle worn around the waist by Zoroastrians. Thus, wrestling is an ancient tradition in Iran, and is mentioned numerous times in the Iranian epic, *Shah-naameh*, as one of the main methods with which Iranian heroes faced and challenged the enemies of Iran. Wrestling has many regional variations in various provinces including Mazandran, Khurasan, Guilan, Azarbaijan, Kurdestan, Khuzestan, ...

Baa-Chookheh wrestling in Khurasan

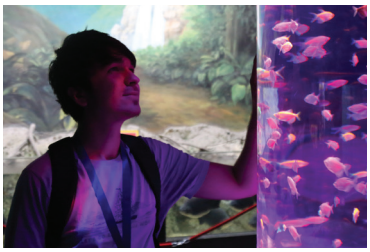
Polo: Polo (***chowgan*** in Persian) is said to have originated in ancient Persia dating back to 2000 years ago. It was mostly played by nobility and watched by kings. The ***Naghsh-e Jahan*** Square in Isfahan is considered to be the oldest polo field in the world. In the game of polo four riders team up to pass a ball through the goal of the opponent with a long-handled mallet. The game is said to have developed as training for cavalry.

Shah Mahmud Nishapuri: An illustration from the poem ***Guy u Chovgan*** (the Ball and the Polo-mallet)

Pahlevani and ***Zourkhanei*** rituals: In the site of UNESCO for the Intangible Cultural Heritage, this is described as "a ritual collection of gymnastic and callisthenic movements performed by ten to twenty men, each wielding instruments symbolizing ancient weapons. The ritual takes place in ***Zoorkhane*** (house of strength), a sacred domed structure with an octagonal sunken arena." The movements are done to the rhythm of a ***morshed*** beating on a ***tunbak*** (a percussive Persian instrument) and reciting poems from famous Iranian poets. The entrance to ***Zoorkhane*** is low so that everyone who enters has to bow. The earliest reference to this practice goes back to the Safavid era, yet people speculate on Mithraic origins for these rituals based on the similarities of architecture and rituals to those associated with Mithraic temples. Yet there are no texts or historical sites which can bear witness to the existence of these "houses of strength" prior to Islam.

Pahlavan Namjoo Zourkhane , Tehran (Tasnim News)

UNSEEN



PHOTOS


SeyedMohammad Hosseini
Behrad Mohammadian
Abolfazl Shiri

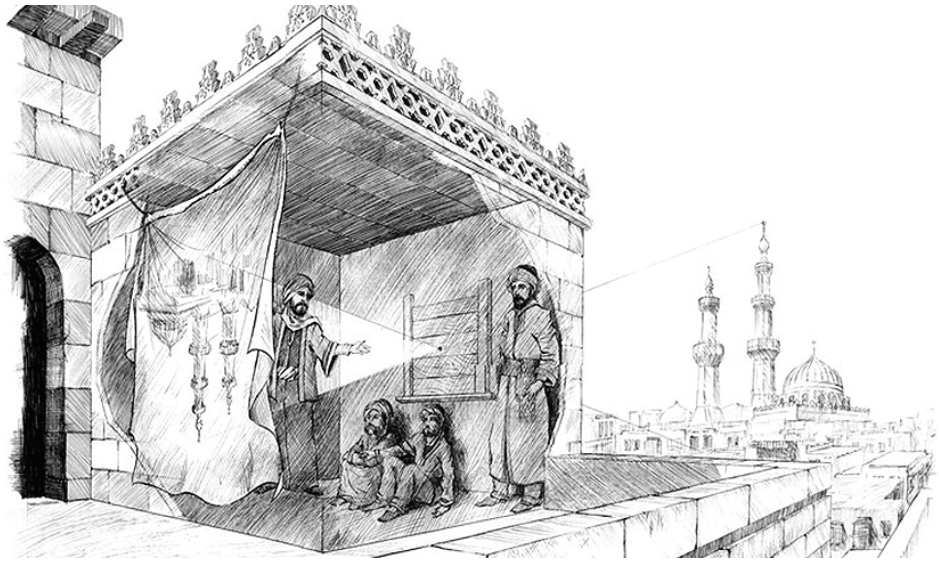

Macedonia

A RAY OF LIGHT IN THE ELEVENTH CENTURY

Nowadays, this fact might seem trivial to us that light is emitted from a source, travels in a straight line, and is reflected by any object on its way, and we see those objects as a result of this reflected light reaching our eyes. This fact is so obvious these days, that measuring the incidence and reflection angles has even become an experiment that can be done at home. Yet this piece of knowledge about light and vision, has had a long history, going back to the studies carried out by Ptolemy of Alexandria in the second century, Ibn al-Haytham (known in the West as Alhazen) of Basra in the eleventh century, Kepler, Snell, and Descartes in the seventeenth century. Ibn al-Haytham was an astronomer and mathematician from Basra (in today's Iraq) and his studies has an important role in the formation of optical laws and even the scientific method and scientific experiments. He was the first to employ the concept of a "ray of light" in his works. His most important work is *Kitab-al-Manzir* (Book of Views or Book of Optics), which was translated into Latin, probably in early thirteenth century. This work not only had a great impact on the ideas of such thirteenth century thinkers as Roger Bacon, but it also influenced scientists of later centuries such as Johannes Kepler.

Two pages from Kitāb al-manāẓir

What has been Ibn al-Haytham's important achievement? He was, to some extent, under the influence of the works of Ptolemy on optics in the second century. But he came up with a new systematization and investigated everything once more. The Greeks before Ibn al-Haytham assumed that light shines from the eyes onto the objects, but ibn al-Haytham introduced the idea that light emanates from a source, shines on objects, and the reflected light enters our eyes. He arrived at these results by doing experiments, combining his experiments with mathematical reasoning, and formulating laws for reflection and refraction of light. He did his experiments by building a camera obscura (Latin for 'dark chamber'). He also correctly explained refraction as a result of the slower speed of light in a denser medium. The laws he discovered for the refraction of light were used by Descartes and Kepler in the seventeenth century. Ibn al-Haytham also studied eye's anatomy. Of course, he did not arrive at the correct conclusion that images form inside the eye in the same way they do in a camera obscura, and like Galen, the Greek-Roman surgeon before him, he believed that vision occurs in the transparent lens of the eyes.



THE THEORETICAL QUESTIONS

The team responsible for designing the theoretical problems started searching for appropriate subjects at the end of last summer. The committee included Saman Moghimi-Araghi, Ahmad Shirzad, Seyed Mahdi Fazeli, Keyvan Aghababayi Samani, Mohammad Ansarifar, Mehdi Saadat. After a while Mehdi Mirzavand also joined this group. This committee had weekly meetings to come up with ideas for appropriate problems. Individuals from outside the group were also asked to propose ideas for problems. From the various subjects proposed, five were chosen and turned into questions. Three of these came from the committee itself, and two from outside the group. During these weekly meetings initial versions of the complete questions were developed, which were then sent to Muhammad Khurrami, Seyed Ahmad Tabatabayi, Ali Akbar Abolhassani to be checked and solved. Based on their suggestions some modifications were made. Finally, the committee voted to choose three questions for the Olympiad. The ones that were chosen were: The Greenhouse Effect by Farhad Shahbazi, Black Widow Binaries by Suroush Shakeri, and Trapping and Cooling Atoms by Saman Moghimi-Araghi. The committee tried to choose problems that involved current topics in physics and/or were relevant to the science community of Iran. It is estimated that 1000 person-hours of work was expended by this committee alone to finalize the problems. At IPhO2024, the discussion session went on quite smoothly and the final form of the problems were ready for the theoretical competition on Thursday.

Grading the theoretical exam papers at IPhO 2024

INTERVIEWS

The leader of the Chinese team, Shou Jiang, in an interview with Isfahan National Radio and TV said that he was really impressed with the experimental setup, and that it was the best setup so far among the setups he has seen in the APhOs and IPhOs he has been to. He added that the problems were also well-designed, but maybe too many data points were asked for. His students had a hard time but they were able to finish most of the problem somehow. In separate interviews, Professor Radjeep Singh Rawat, the head of IPhO, said that IPhO2024 has been going on quite well at all stages so far, and then Paul Stanley, the secretary of IPhO said that he also was very impressed with the equipment, the setup, the design, the problem statements, as well as the task assigned to the students, they were among the best for what one would expect from an Olympiad. The unique ideas of what the students were going to measure as well as the high-quality equipment were quite surprising. Somebody went through a lot of trouble to put together some good equipment that would produce some high-precision results in an experiment that the students would complete in less than five hours.

I have a quantum car. Every time I look at the speedometer I get lost...

Quantum Difficulties

The key and the cup

Tie one end of a string to a cup by tying a knot around its handle and tie the other end of the string to a key as shown in the figure below. Pass the string over a pen or a rod with the cup hanging on one side while you are holding the key in such a way that the rest of the string is bent over the pen and is almost horizontal. Let go of the key. Even though the cup weighs several times the key, you don't have to worry about the cup being broken, why?

scan me!

www.ipho2024.ir

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Ministry of Education | Isfahan University of Technology | Shahid Rajaee Teacher Training University | Young Scholars Club