Science in the Jagellonian University Museum

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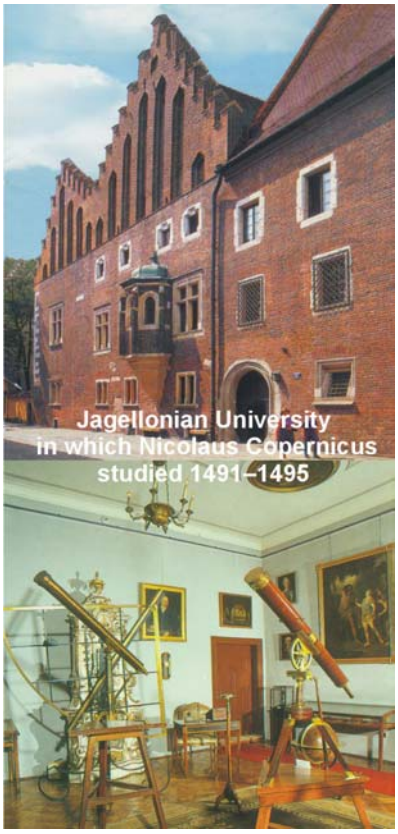
The collection of historical scientific instruments

The collection of scientific instruments in the Jagellonian University Museum comprises more than 2300 objects. It is the most important collection of that kind in Poland. Among the most important objects is an ensemble of medieval astronomical instruments, including the Moorish Astrolabe from 1054 – the oldest scientific instrument in Poland. There is a unique of brass instruments, including a torquetum, an astrolabe, and a celestial globe made by Hans Dorn (c. 1480). All these instruments belonged to Martin Bylica from Olkusz, a student and professor of the Cracow Academy and a court astronomer of the Hungarian King to Matthias Corvinus. He bequeathed them to his Alma Mater. There was a celebration of the whole Academy when the instruments came to Cracow in 1493. They were probably seen by Copernicus who studied here at that time. Another important object is the Golden Jagellonian Globe made at the beginning of the 16th century. In fact it is a mechanical armillary sphere with a clock mechanism and a small globe inside. The name of the newly discovered continent – America – was put on the globe for the first time. It was donated to the Academy by Prof. Jan Brożek, a mathematician and astronomer working in the early 17th century. His donation comprised a few instruments and a significant number of books. An astrolabe and a diptych ivory sundial from this donation are still exhibited in the Museum.



There are 55 globes in the collection of scientific instruments. The most splendid are: cellestial and terrestrial globes made by Gerhard Mercator in the middle of the 16th century and four globes of Willem Blaeu (early 17th century). Two globes made by Abel and Klinger in Nuremberg are from the first edition of globes with a map in Polish.

An important part of the collection, closely related to the history of the University, is an assortment of instruments from the first Astronomical Observatory founded in 1791. It includes either instruments used for astronomical observations like telescopes and quadrants (e.g. Dollond's telescope, quadrants made by Ramsden and Canivet) as well as meteorological instruments (barometers, thermometers and hygrometers), sundials, astronomical clocks and surveying instruments (graphometers, sextants, circumferentors).

Another significant group of instruments is the equipment of Prof. Karol Olszewski's cryogenic laboratory, the place where liquid air was obtained for the first time. The set of instruments includes condensing apparatus, compressors, cryostats, gas cylinders, vacuum flasks as well as instruments for spectroscopic and X-ray research. Numerous instruments from the late 19th and early 20th century were given to the Museum by faculties and departments of the University. This group comprises optical tools (spectroscopes, polarimeters), tools for electrostatic experiments (leyden jars, electrostatic machines, electroscopes), electric meters, spectral tubes, areometers, thermometers, surveying instruments (theodolites, levels) and chemical glasses.

The Museum houses also an interesting collection of microscopes (18th–20th century), a collection of drawing tools (Gourdin's pantograph from 1786), and a collection of calculating aids (Neper rods from the 17th century, Thomas de Colmar's arithmometer, c. 1870).

The collection of scientific instruments is a valuable source for research on the history of science and history of the Jagellonian University. It points to the fields of knowledge which were developed at different times (e.g. astronomy in the 15th century) and helps to understand details of the experiments conducted with the use of particular instruments.

Educational interactive exhibition "Ancient and modern sciences"

The exhibition was opened in 2000–2005. It was a pioneer project in Polish museums. For almost 5 years the exhibition was visited by more than 95 thousand visitors. The exhibition was addressed to students, who were the vast majority of the guests. The aim of this exhibition was to present in an interactive way some phenomena and show them in a historical context. Therefore, the interactive exhibition was bound to the collection of the scientific instruments. In the historical building of Collegium Maius, the location of the Museum, the guests had unique opportunity first to see antique instruments and next, in the interactive exhibition,

to use a copy or a model of the previously seen instrument, and perform an experiment or a measurement following the instruction.

The subject matter of the exhibition was chosen from the three fields important in the development of science during the history of the Jagellonian University, namely, physics, mathematics and astronomy. Every branch of science was presented in a separate room.

The world of waves

20 exhibits dealing with different features of wave motion. Phenomena such as polarisation of light, interference, diffraction, mechanical vibrations and resonance were presented. The majority of the experiments showed the properties of sound and light.

Between an abacus and a bit

The historical timeline of the development of calculating tools was shown with the use of models of different calculating aids. The models shown in the exhibition included an abacus and frame abacus, two models of Neper bones – the first tool for multiplication, a slide rule, a mechanical arithmometer and a computer.

Astronomical Room

Two topics: "To measure time" and "Angels on earth and in Heavens". Models of different astronomical tools used for angular measurements and copies of such historical instruments as a torquetum, an astrolabium, a horary quadrant and a cross-staff were presented. Tools used to measure time: sundials, a clock mechanism and a set used to send a time signal by Polish Radio completed this part of the exhibition.

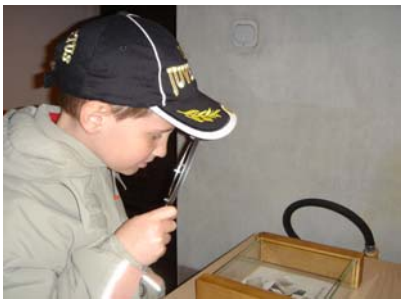
The "Ancient and modern sciences" in 2005 was transformed into a travelling exhibition and began a journey around several museums and universities in Poland. In September 2005 it was shown in Lublin and in March–June 2006 in Częstochowa. The exhibition is expected to visit Sandomierz, Jarosław and Białystok.

The interactive exhibition "Senses"

The subject area of this exhibition is focused on the human body, its biology and physiology. It is an attempt to explain is now of us how our sense organs are build and how they work. The exhibition is organised as three "theme-islands" dealing with different aspects of senses.

The first theme is *"Receptors – the gateway of the nervous system*". The aim of this part is to provide a basic knowledge about the structure and functions of the sense organs, and to show their diversity. This is presented with the use of 28 experiments. The visitor can learn understand the structure of ear and the role it plays in the hearing process and have an opportunity to test an osteo-tympanic conduction of sound. A model of an eyeball explains the constitution of the eye and the mechanism of accommodation. Other exhibits show the function of the retina and the pupil, clarify phenomena of an afterimage and a persistence of vision and give an opportunity to test colorvision and peripheral vision. Three exhibits concern the senses of touch and smell. The visitor checks his ability to recognise shapes and letters by touch as well as try to recognise several different smells.

"*Mono and stereo*" – the second part, focuses our attention on the consequences of the fact, that some organs of our senses are dual. Thanks to them we can see in three dimensions and localise the source of the sound. Several experiments deal with the three-dimensional pictures. Different types of 3D pictures like anaglyphs, holograms, lenticular images, steropairs and pictures seen by polarising glasses (like in IMAX) are presented. A computer presentation of 3D photos designed for the shutter glasses and a model of the mirror stereoscope supplement the review of 3D methods. Two experiments show the properties of hearing – in the first the visitor has to find the exact place where the long pipe was hit, in the second the visitor would learn that it is much easier to distinguish a sound from a noisy background if the source of the sound is in a specified position.



As a supplement, two experiments were added to this room. One deals with smell. Some organic compounds may have different optical isomers that are the same in every way except being non-superposable mirror images of each other. Carvone is an example of such a compound. The two isomers of carvone have different smells – spearmint and caraway. The other shows properties of touch.

The visitor is invited to put his left hand on a hot plate and right on a cold one, and then to put both hands on a lukewarm plate – he would feel that the plate is cold and warm at the same time.

The human brain does not analyse all information arriving from the sense receptors. Whether it is due to evolution or just by accident, the analysis of stimuli is very selective. We see, hear and sense only what is important for survival and safety. If we knew which information is neglected we would know how to *"deceive our senses"*. This is the topic of the third part of the exhibition.

The most popular result of such deception are optical illusions. Geometrical illusions – a Poggendorff line, a big model of "Cafe wall" and different variants of "Grey steps" presented at the exhibition are only a few examples of such phenomena.

Other senses may also be fooled. Our hearing does not always recognise the pitch of the sound. One may test his tone memory or play on the "strange piano". Touch is not able to measure temperature. When touching plates made from different materials we feel that some of them are cold (metal, glass) and others are warm (wood, cork). A thermometer reveals that all plates have the same temperature.

The last group of experiments is related to the co-operation of senses. It is very difficult to maintain balance on one leg while watching a moving panel with a striped pattern or to write one's own name while seeing only a mirror image of one's moving hand.

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We recommend also the Technical Museum of Cracow with the interactive exhibitions "Playing with Science"

http://www.mimk.com.pl/