HANSA MEETS HUMBOLDT

In the science city of Lübeck it is all about interaction.

Both the Humboldt brothers reach out to the queen of the Hansa: Wilhelm von Humboldt (1767-1835) with his educational ideal of learning through research and research through learning; Alexander von Humboldt (1769-1859) with his spirit of discovery and love for natural sciences. On the Old Town Island, Hansa and Humboldt are united on the Science Path. From the castle gate, symbol of the Hanseatic tradition of Lübeck, to the Museum of Nature and Environment, scientific phenomena are demonstrated, for example through the wind organ, the centrifuge or the Möbius strip. At each exhibit you find an explanation of the phenomenon, possibilities of experimenting and a reference to the universities of Lübeck.

The Science Path awakens the spirit of discovery and amazes. From here the idea of the "City of Science" spreads out to all parts of the town. At each place there is also an interactive element that illustrates the phenomena and intrigues.

A city that is able to enthuse people for science will not have to worry about its future.

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Lübecks Universities und Research Facilities:

- University of Lübeck
- Lübeck University of Applied Sciences
- University of Music Lübeck
- Federal University of Applied Administrative Sciences/Departmental Branch of the Federal Police
- Fraunhofer Research Institution for Marine Biotechnology

Realization of the Science Path: TRIAD Berlin Projektgesellschaft mbH, Zyklus Metallwerkstatt GmbH

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HANSE trifft HUMBOLDT
LÜBECK STADT DER WISSENSCHAFT

THE SCIENCE PATH LÜBECK

Playfully experience the world of science on Lübeck's Old Town Island and in all the other districts.

CAMERA OBSCURA

1 ST. GERTRUD

If light falls through a small hole in an otherwise light-proof, hollow object, then an upside down inverted image is produced in it. As a result of this effect, a projection of the external space is created in the hollow object. The projection of the camera obscura (Latin: camera "chamber", obscura "dark") is extremely faint and can only be observed in adequate levels of darkness.

Location: Meesenring (Shopping Mall)

Partner exhibit in the old town:
Kaleidoscope

HUMMING STONE

2 KÜCKNITZ

The humming stone is a large stone with a hole in it. If you put your head into the hole and breathe out while humming, you will feel a tingling sensation all over your body. You can feel these vibrations clearly, especially if you place your hands on your neck. The sound waves reverberate from the stone walls and thereby amplify the natural resonance effect.

Location: Kücknitzer Kirchplatz

Partner exhibit in the old town:
Earpiece

TRAVELLING WAVES

3 SCHLUTUP

The sculpture in the Schlutup Market, designed by Winni Schaak, is an object of art that invites everyone to participate: The Wellenlauf symbolises the ocean, but at the same time acts as a compass needle, rotating 360 degrees on a compass rose. Water and technology, and the correlation between sea travel and nautical science, are given an artistic expression in this interactive sculpture.

Location: Schlutuper Marktplatz

Partner exhibit in the old town:
Binoculars

BIG SEESAW

4 MOISLING

The big seasaw symbolises one of the oldest tools and one of the first machines created by man. It clearly combines mental and physical activity: The different markings on the twelve and a half metre long rocker enable you to determine your sitting position on the board precisely and thus to bring it into balance.

Location: Brüder-Grimm-Ring 6-8,
behind the Astrid-Lindgren-School

Partner exhibit in the old town:
Abacus

FLUTE ROCKER

5 INNENSTADT

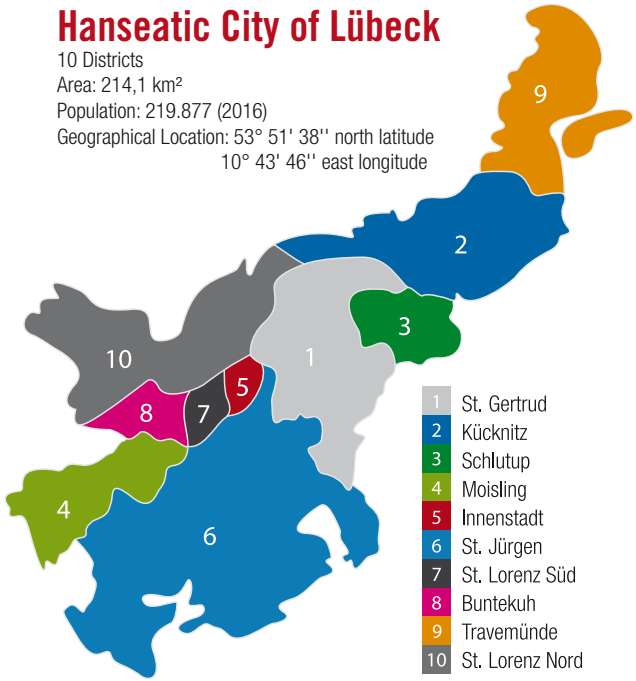
The flute rocker is a simple audio device, that gives players a physically tangible experience of cause and effect. The three rocker boards mounted at ground level can be moved independently of one another. When the boards are moved, air pressure is generated for playing the pipes. By shifting one's weight or moving from one board to another, varying simple melodies are generated. Six different notes can be produced.

Location: Kanalstr. 42-48,
next to Musik- und Kunstschule Lübeck

Partner exhibit in the old town:
Wind organ

Hanseatic City of Lübeck

10 Districts
Area: 214,1 km²
Population: 219.877 (2016)
Geographical Location: 53° 51' 38'' north latitude
10° 43' 46'' east longitude



1 St. Gertrud
2 Kücknitz
3 Schlutup
4 Moisling
5 Innenstadt
6 St. Jürgen
7 St. Lorenz Süd
8 Buntekuh
9 Travemünde
10 St. Lorenz Nord

WHIRLPOOL

6 ST. JÜRGEN

Every child knows this principle from day-to-day experience: laundry and salad are both spun dry. The whirlpool in St. Jürgen demonstrates the centrifugal force with which this is performed. Laboratory experiments and biomedical technology have proved that the centrifuge is indispensable. For example, the speeds achieved in the ultra centrifuge are used to extract protein molecules. In medicinal diagnostics, the centrifuge is used to separate blood into its various components.

Location: Falkenstraße 1,
Hüxwiese

Partner exhibit in the old town:
Centrifuge

Photos: Tim Jelonnek, Dirk Hourticolon, Wissenschaftsmanagement Lübeck

PIXEL WALL

7 ST. LORENZ SÜD

On the pixel wall, pixels are arranged in a tabular form; these can change colour. On the big pixel wall, viewers will observe the same phenomena and problems as present in a digital image, but on a much larger scale: it is difficult to portray a non-jagged arc on the pixel wall. The individual pixels depict a smooth line only when the observer steps away from the wall.

Location: Hansering 20b

Partner exhibit in the old town:
Needle scanner

SOUND TUBE

8 BUNTEKUH

In physics, a sound tube is used for measuring the duration of an echo, for example. A ten metre long plastic tube is fitted with a microphone at both the ends. If you burst a small balloon at one end, the sound will travel back and forth several times. Up to 17 echoes can be detected in one second. The speed of sound can therefore be calculated as 17 x 20 m/s = 340 m/s.

Location: Karavellenstraße 8,
„Neuer Spielplatz" (Baltic Schule)

Partner exhibit in the old town:
Phonograph

PING PONG WHEEL

9 TRAVEMÜNDE

The ping pong wheel tricks the human eye. Two balls are arranged on a vertical axis inside a cylinder that has been cut in two– one ball at the top, the other at the bottom. The two halves are horizontally displaced and arranged on the axis of rotation. This ensures that they are subjected to the wind on all sides causing them to move. Because of the high speed of rotation, it looks like there is only one ping pong ball inside, bouncing up and down.

Location: Fährplatz,
Travemünde

Partner exhibit in the old town:
Chaos pendulum

PARTNERSTEPPER

10 ST. LORENZ NORD

The principle, upon which sports equipment like the stepper is based, is known to us from the partner exhibit, Möbius strip. In the field of mechanical engineering, it is often used as a drive belt because it guarantees uniform wear. Thus, the Möbius strip, which represents this drive technology, is a two-dimensional surface with only one side. The strip, which implements the uniform drive technology of the stepper, is basically a twisted figure of eight. The phenomena of physical drive and sport activity are combined here.

Location: Bewegungstreffpunkt
Humboldtwiese (near Dornbreite 130)

Partner exhibit in the old town:
Möbius strip

THE SCIENCE PATH
LÜBECK

Voyage of Discovery:
stroll, experiment und marvel!

1 KALEIDOSCOPE

Location: Große Burgstr. 4
The ST. GERTRUD district is in partnership with the CAMERA OBSCURA exhibit.

If a beam of light falls on the boundary of a medium, it will be either completely or partially reflected, depending upon the medium. In a kaleidoscope, the reflection of light is effected by three or four mirrors. If small colourful pieces of glass are introduced in front of the mirror, these are visible in addition to several of their mirror images. Consequently, regular patterns can be seen. This basic phenomenon from the field of geometrical optics is ideal for achieving different colour effects. Students can learn more about this phenomenon in the "Physical Technology" course at Lübeck University of Applied Sciences.

2 EARPIECE

Location: Kleine Burgstraße/Große Altefähre
The KÜCKNITZ district is in partnership with the SUMMSTEIN (Humming stone) exhibit.

The sounds that we hear are the result of a process, in which sound waves and tones are generated. They trigger signals in our ears, which are forwarded to our brain via nerve fibres. The auricles are important for the localisation of sound waves; they mainly help in determining direction. The earpiece serves as an artificial extension of the auricle improving the hearing sensitivity by acting like an amplifier for sounds from a specific direction. In the Biomedical department of Lübeck University, knowledge of sound perception is essential. The correct sound of instruments and room acoustics are also important topics in the study of music (Lübeck Conservatory).

3 BINOCULARS

Location: House of Science, Breite Str. 6-8
The SCHLUTUP district is in partnership with the WELLENLAUF (Travelling waves) exhibit.

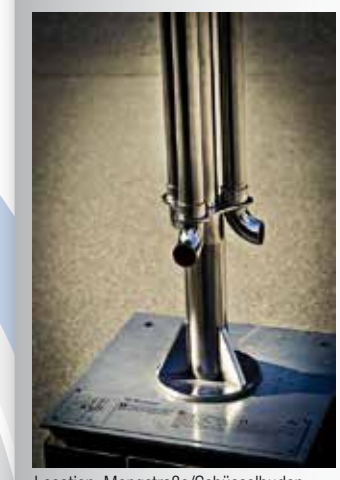
If you want to observe an object from close quarters, but can't get close to it, you have to use other means, e.g. binoculars. If the object to be observed seems infinitely far away, the beams emanating from the object must be considered as parallel. Two lenses arranged at precise angles ensure that the object to be observed appears significantly larger. The Civil Engineering department at Lübeck University of Applied Sciences demonstrates that such optical procedures are useful not only for sailors, but also for real estate survey.

4 ABACUS

Location: Pedestrian Zone, Breite Str. 35
The MOISLING district is in partnership with the RIESENWIPPE (Big seasaw) exhibit.

The Abacus is one of the earliest-known calculation tools in the world. Every bead is first assigned a value (e.g. 1, 10, 100), which is either added or subtracted depending upon the position of the bead. Multiplications and divisions are also possible. The Abacus is still the tool of choice for calculation if there is no reliable electricity supply. Mathematics, as applied at Lübeck University in the Institute of Mathematics, uses complex mathematical models for describing biomathematics.

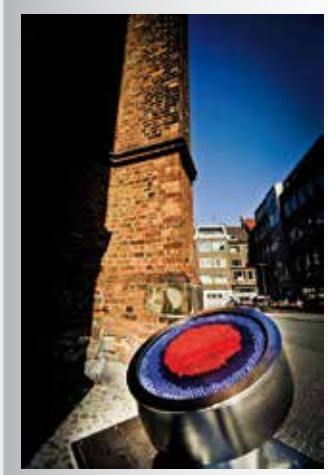
5 WIND ORGAN



Location: Mengstraße/Schüsselbuden
The INNENSTADT district is in partnership with the PFEIFENWIPPE (Flute rocker) exhibit.

Flutes are known to have existed for nearly 35,000 years. They are instruments with a single pitch, in which sound is generated by a stream of air. The pitch depends upon the length of the flute, which can be "reduced" artificially by holes. The wavelength of the resulting standing waves is dependent on the flute's length, and correspondingly the pitch. The deepest note is produced with the greatest length, i.e. when all the holes are closed. A wind organ is dependent upon the natural flow of air (wind), which generates a random melody. In Lübeck the University of Applied Sciences is engaged with the theoretical fundamentals of acoustics.

6 CENTRIFUGE



Location: St. Petri, Schmiedestraße
The ST. JÜRGEN district is in partnership with the WASSERSTRUDEL (Whirlpool) exhibit.

Here, two physical effects can be observed: The inertia of the mass and the centrifugal force, i.e. the centrifugal force in the rotating reference frame, which is directed outwards. If a mixture of substances is introduced into the centrifuge, the particles with maximum density are transported outwards during rotation because of their mass inertia, whereas the particles with lower density tend to move towards the centre. Correspondingly, a centrifuge is used for separating differing material or gas mixtures. At Lübeck University, this a.o. is used by the Department of Medicine during blood tests.

7 NEEDLE SCANNER

Location: Holstenterrassen, An der Obertrave
The ST. LORENZ SÜD district is in partnership with the PIXELWAND (Pixel wall) exhibit.

The aim of imaging techniques is to produce a true-to-scale image of a real object. Different methods can be used for this: from X-ray diagnostics to magnetic resonance tomography (MRT). This image-based medical technology provides us with more precise information about the form and function of an organ and is used e.g. for measuring the size of tumours. The Fraunhofer-Institute MEVIS plays a pioneering role in the field of image-based personalised medicine on an international level.

8 PHONOGRAPH

Location: University of Music, An der Obertrave
The BUNTEKUH district is in partnership with the SCHALLROHR (Sound tube) exhibit.

The invention of different sound recording techniques allows the conservation of selected sound events and their repetition as often as desired. The needle tone technique, which is used in phonographs or in the advanced record players, records the sound sequence through corresponding deviations of a spiral groove. A stylus reproduces the mechanical movement of the needle as sound or tone. Today, concerts in the conservatory are recorded on CDs and DVDs using high-quality recording techniques. Experts are also trained at the Academy for Hearing Aid Acoustics.

9 CHAOS PENDULUM

Location: An der Obertrave/Dankwartsgrube
The TRAVEMÜNDE district is in partnership with the PING PONG RAD (Ping pong wheel) exhibit.

If you look at a simple pendulum, you can predict its movements precisely. In this case, the general principles of kinetics, i.e. engineering mechanics are applicable. The pendulum comes to rest only in one particular position.
However, this is not the case for a chaos pendulum. The chaos pendulum moves in unpredictable ways, because several interconnected pendulums are set in motion at the same time. You could learn more about this by studying engineering sciences, e.g. at Lübeck University for Applied Sciences.

10 MÖBIUS STRIP

Location: Museum of Nature and Environment, Mühlendamm 1-3
The ST. LORENZ NORD district is in partnership with the PARTNERSTEPPER exhibit.

The Möbius strip has only one continuous edge and thus, only one complete surface, i.e. there is no inner side and outer side, as is the case with simple strips. Thus, it forms one endless loop. In this arrangement, the strip assumes the lowest-energy state, which plays a role in physics as well as chemistry. This principle is also being used in the field of electrical engineering for building electric resistors with low inductance. A simple mechanical application of this strip is found in drive belts, which undergo uniform wear and tear because of the design of the strip. This is a topic dealt with in the Department of Applied Natural Sciences at Lübeck University of Applied Sciences.

Photos: Thorsten Wulff