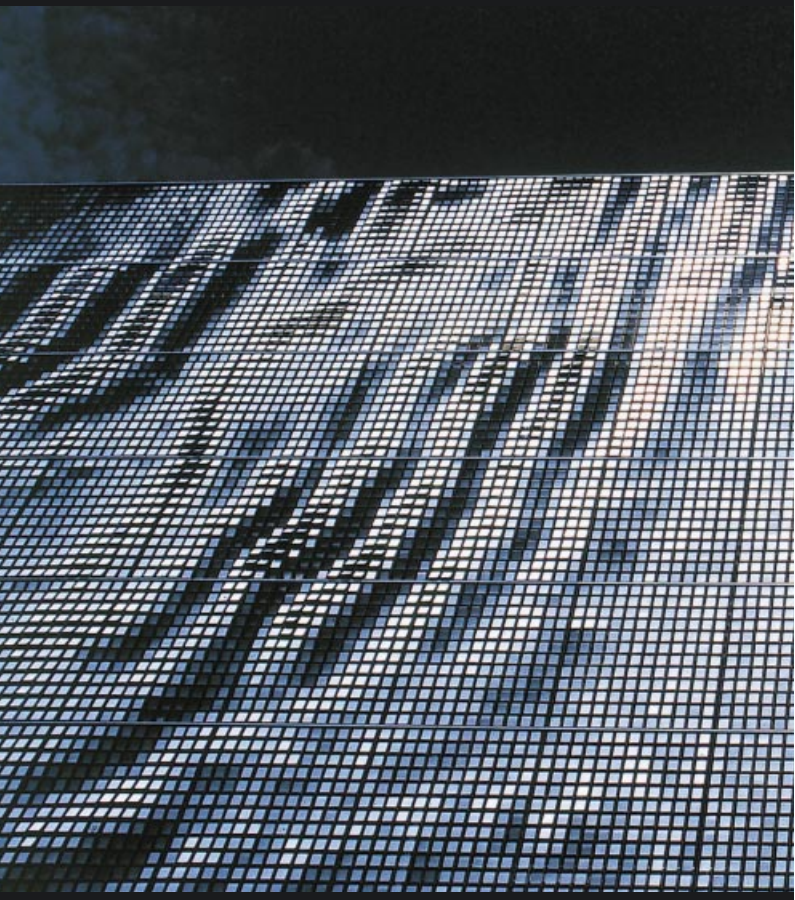
On the Trail of Natural Phenomena.

THE SWISS
TECHNORAMA
SCIENCE CENTER

«Anyone who loves nature needs to observe its phenomena as one needs air to breathe.» *Marcel Minnaert*



Get carried away in this amazing world of science. The interactive exhibits at Technorama invite you to touch, to try, to play and to understand – a true feast for all your senses. Switzerland's only Science Center will leave you mesmerized, no matter how old you are and no matter how much you know (or don't) about science, art and technology.

The whole exhibition is wheelchair accessible

Let your curiosity run wild. With more than 500 phenomenal exhibits over three floors, Technorama really has something for everyone. Who would have thought that learning could be so much fun? Set your gray matter to work and discover whole new worlds. Have a go – the experience will be physically and mentally phenomenal. The only rule here is "hands-on, brains-on"!

The Magical World of Mechanics.

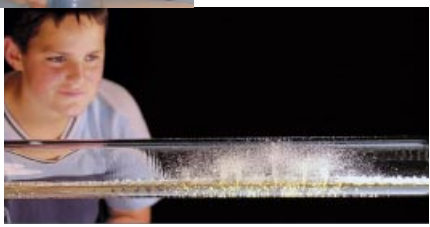
*A feast for the eyes – the **Fading Motion** pattern left by the rhythmic swinging of a pendulum slowed by friction.*

***Lissajous Double Spring** is the name given to the convoluted curves produced by a light diode at the end of a spring bar. These tiny works of art are formed when two vibrations occur at right angles.*

When everyone is on the same wavelength, harmony reigns. When they are not, it doesn't. It's great when your ideas resonate in other people's minds or the economic cycle reaches its peak. Here, these and other terms are made visible and tangible. By exploring the interactive exhibits, you grasp what

Pendulum Waves *is a strange object. One minute it loses its rhythm, the next it surprisingly reverts to a harmonic wave line.*

The ***Turntable*** *is a favorite stop-off point to discover the physics of rotating bodies using balls, disks, and rings.*

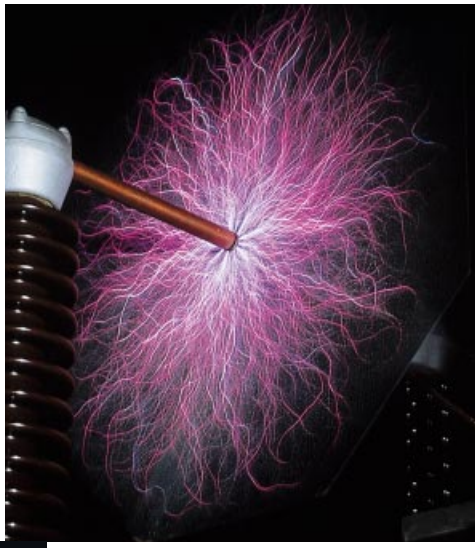


Visible Effects of the Invisible *– watch how invisible sound waves are made visible: in a liquid they become pulsating waves, effervescent bubbles and spouting fountains.*

Take a ride on the ***Rodeo Gyroscope*** *to get the full-body experience of the elusive concept of angular momentum.*

is behind many phenomena and how they are interlinked. Finally, you'll understand what mechanical terms power and motion, momentum and torque actually mean.

Electrify what you learned at school.



*High levels of excitement about high voltage – experiments in the **High Voltage Show** twice a day.*

*The **Tesla Coil** turns high tension into a noisy and magical force as hundreds of thousands of volts leap across an 80 cm gap, setting aglow neon tubes without the aid of a cable connection.*

Forces as puzzling and abstract as electricity are made easy and visible with our experiments. Discover the forces that hold matter together and produce their physical and chemical properties. Find out for yourself where the strengths of electrical current lie, and what can be achieved with the right voltage. Learn that there is more

*On the **Generator Bike**, just producing enough electricity to boil a sip of water can make you work up a sweat. Imagine how much more physical energy it takes to produce the electricity from a wall socket.*

*Touch half a million volts of direct current from the **Van-de-Graaff Generator**. The only thing that will be hurt is your pride with this hair-raising experiment.*

to electricity than screwing a light bulb, amplifying music, or getting engines and generators to run.

Making experiences stick.

*Through the lodestone, man has long understood that nature exerts strange forces between the earth and the sky. These **Electromagnetic Games** help you to discover, through creative and tactile play, the mysterious long-distance effect of magnetism.*

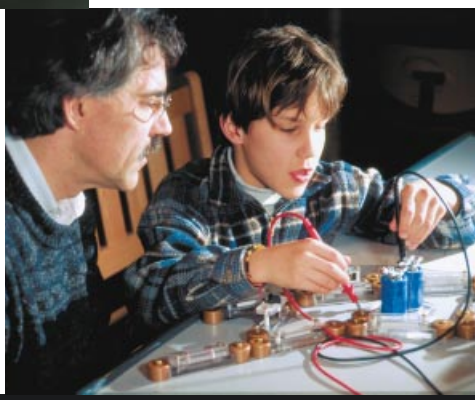
*Ferrofluid – part liquid, part magnet – is a mixture of oil and nano size magnetic particles made from lodestone, the smallest in the world. The **Ferrofluid Hedgehog** vividly captures magnetic fields at work.*

You cannot actually see electricity, but you can use it, discover it and even predict how it behaves. Anyone who visits our electronics laboratory will leave knowing how diodes, transistors and condensers work.
Everyone knows that where there is an electric current, there is always an invisible magnetic

*The highlight of this section has to be the **Dancing Trees**. Ground iron particles cover a square made up of 81 magnets. Press the button and watch how these tiny particles dance in perfect rhythm with Rimski-Korsakow's "Flight of the Bumblebee" or rap music!*

*Under extremely low temperatures the electrical resistance of **Superconductors** (demonstration) abruptly reaches zero.*

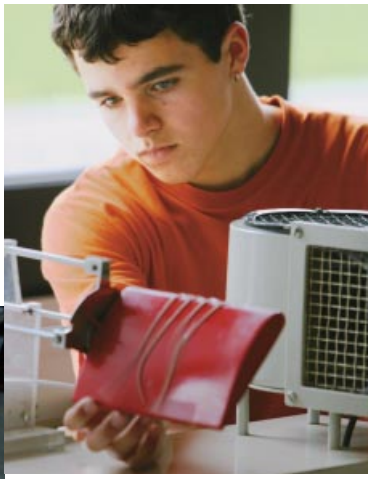
*Persistent experimentation in the **Electronics Laboratory** makes even diodes, transistors and switching logic easy to understand.*



field. But magnetism is as real as light and sound, and you can actually touch it. Magnets are unruly things, repelling and attracting at the same time, as if possessed by a mischievous ghost. There is no doubting their power of attraction.

Bring out the scientist in yourself.

Beware of simplistic and often deceptive explanations: in reality, the reason airplanes fly has nothing to do with the ***Bernoulli Principle****! Experiment with a model airplane wing and an electric fan. You'll be amazed at how quickly you'll understand the secret of flight.*

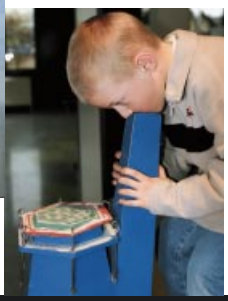


Mini-Drop Tower: *Microgravity in action. Watch what happens to a glass of water in free fall – as if by magic, a perfect air bubble forms, with water all around!*

Because our interactive exhibits will awaken your thirst for knowledge, Technorama has provided a special laboratory where you can be a real scientist for the day. Whether you're young or old, student or teacher, come in and get to grips with the physics of alpha particles, photons or magnetic domain structures. See the effects of microgravity at the Mini-Drop Tower. Or why not get a taste of the biology

*The **Kitchen Laboratory** – a must-see for anyone who wants to find out more about those infamous E numbers. Discover what really makes strawberry yogurt pink and gives cleaning products their special powers.*

***Sonic Resonance** at work: as the water level in the glass tube fluctuates, watch how pitch and wavelength interact.*



*The **Tonoscope** makes the human voice visible. Not only will you hear every ooh, ah and um that you make but you'll see them too!*

and chemistry involved in what we eat in the "Kitchen Laboratory"?

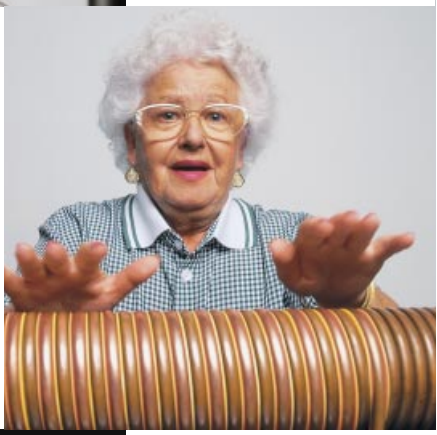
In the morning, the Youth Laboratory is reserved exclusively for pre-booked school classes (Tuesday–Saturday).* It is open to everyone in the afternoon, holidays and Sundays.

*** Reservations: Phone +41 (0)52 244 08 50, jugendlabor@technorama.ch**

Don't trust your five senses.

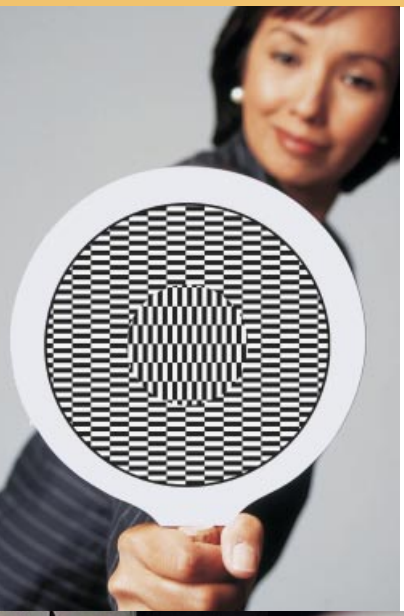
*Vision-distorting glasses make a game of **Difficult Aim** or **Slanted Basketball** utterly unpredictable.*

*A **Hot and Cold** experiment stimulates the skin's heat and cold receptors moderately but simultaneously – causing the brain to wrongly make the deceptive association heat = pain.*



*These **Impossible Nuts** make the brain rebel against what the eyes can see. Can a pencil really be made to pass through them?*

What we perceive is not always real. Use your eyes, ears, fingertips and hands to explore these phenomenal objects on a safari trip through the world of sensory perception and misperception. The brain is like a computer – it needs time to process information. When there is not enough time it can short-circuit. Prejudgement and imagination can also cause



*Move this page gently back and forth while focusing on the black-and-white pattern. Notice how the center disk becomes a **Floating Pattern**. If not, keep trying!*

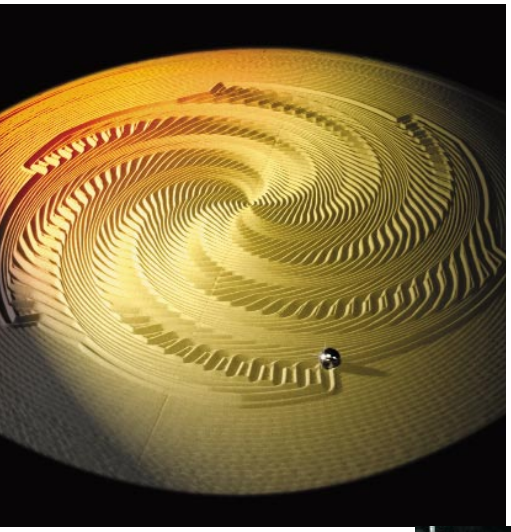
*There is something clearly wrong with the **Tilted Chess** board. And yet, there exists an elusive perspective that makes the figures look normal again.*

*Drawing in perfect perspective is as easy as pie with **Alberti's Perspective Window**, used since Renaissance times.*

the brain to process sensory information incorrectly. The experiments are a fun way to help you understand why this happens. All it takes is a little patience and sometimes a bit of teamwork.

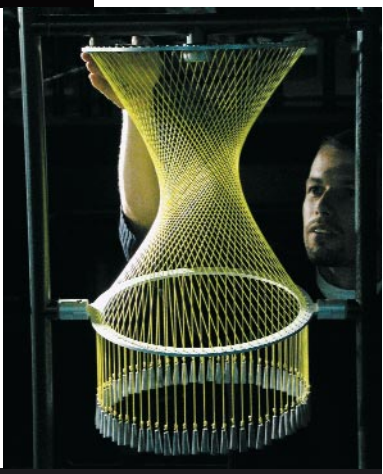
Do you still believe what you see?
In the end, you'll see what you believe!

Making math fun.



Sisyphus III *is a wonderful work of art. Watch as the steel ball, guided by an invisible (magnetic) hand, traces patterns in the sand that are reminiscent of Japanese Zen gardens. No sooner do they appear than they dis-appear again. This is math for meditation!*

Do you speak geometry? If not, let these ***String Models****, such as the revolving cylinder, help. They make geometric terms like double cone, ellipse, hyperbola and parabola come to life.*



If you are one of those unfortunate people who think that fun ends where math begins, visit MatheMagics to lay this belief to rest once and for all. We've done away with boring mental acrobatics. Instead, learn through playing around with our interactive exhibits. Diagrams, hyperbola, parabola, logic puzzles and transformations will reveal the secrets of this far-from-boring science and provide endless fun.

*The **Moebius Strip** will fascinate even the greatest math skeptic. This twisted strip of metal seems to have two sides. But has it? Loop this mathematical loop to discover the truth!*

*At the **Race Track**, two boys are getting ready to launch their balls, each on a different lane. The ball that has further to travel always wins! It seems to defy logic again, and again and again...*

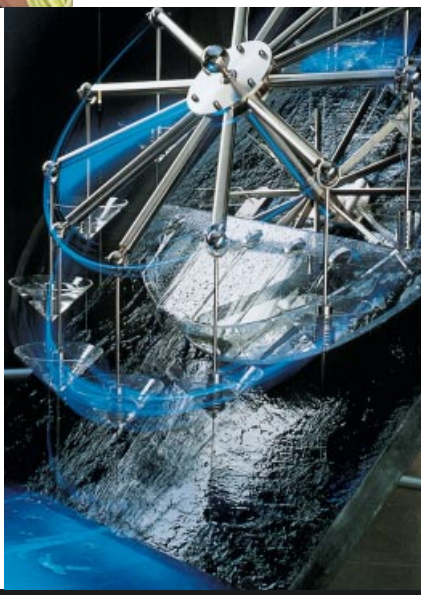
*You need patience and perseverance to solve many tricky problems – such as this **Table with Loose Legs**. An enticing experience that leads to a sudden, unexpected Eureka! moment.*

Old Pythagoras's "quod erat demonstrandum" is revealed with amazing simplicity! Math is like sport or playing the piano: practice makes perfect! Have a go yourself – it may take a while for the penny to drop, but when it does, you'll have every reason to feel proud.

Open up nature's bag of tricks.

*How can you stay cool when you are face to face with the world's biggest raindrops? The **Strobe Fountain** demonstrates visual persistence, the stroboscopic effect, and how to fraction running water.*

*It is impossible to make a prediction just based on physical laws and on initial conditions. The **Chaotic Fountain**, first built as a teaching prop in the 1960s by the American meteorologist Edward Lorenz, demonstrates chaos theory.*



Dive into aquatic research with our "phenobjects". Watch how vortices and waves swell and fade, how water flows and what amazing things happen to it. The most spectacular highlights have to be the Fire Tornado, the magic Cloud Rings and the ever-popular Giant Bubble

*At five-meters high, the **Fire Tornado** is a safe yet fun exhibit that allows you to explore the imperfectly understood phenomenon of tornados.*

*When physicists talk about "vortex rings", they are referring to **Cloud Rings** that seem to appear as if by magic – one phenomenon that you just won't get enough of!*

Machine. These exciting experiments will make chaos theory visible, even tangible. You will experience the unpredictability of chaotic systems and see how small causes can have big effects.

Welcome to the Aha! experience at Technorama.

It's all about phenomena!

The crucial question for any science center is: "How can we make learning about science an enjoyable and memorable experience?" The answer is "phenomenally" simple: let nature's phenomena be the tools for learning. Interacting with hands-on, participatory exhibits prompts both children and adults to ask their own questions and builds confidence that they can discover the answers. Exploring scientific phenomena, experimenting and observing the results stimulate the curious visitor's mind to an intellectual involvement in what's really going on. Technorama's hands-on exhibits let you teach yourself at any age.

Self-perpetuating learning, hands-on and brains-on.

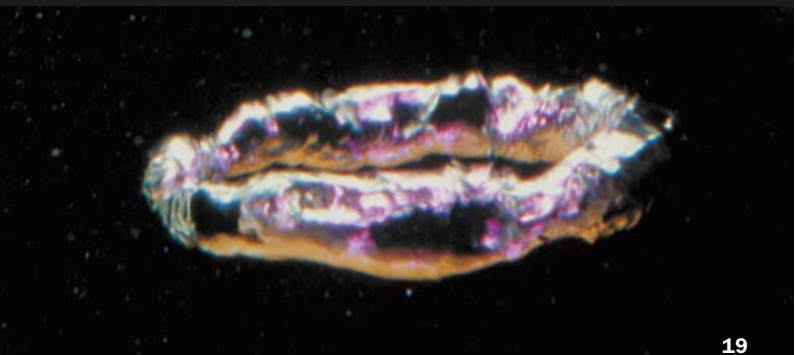
In Switzerland's only science center learning is an instinctual experience. Technorama's exhibits appeal to all the senses and stimulate visitors to get involved. Personal interests and a self-paced approach are welcome. They allow to "be in charge" while experimenting. 500 exploratory exhibits let you follow your own inclinations and natural aptitudes, ensuring that the experience is neither too demanding nor too tedious.
A wealth of phenomena and their effects are immediately intriguing, often arousing curiosity

with surprising, counter-intuitive experiences. This leads again and again to Aha! discoveries.

For the young and the young at heart.

Every year thousands of pre-school children visit Technorama. Their enthusiasm is obvious proving that playful, phenomena-based learning works for all ages. There is no need for children's versions of exhibits, or an oversimplification of nature. Young children enjoy the "grown-up" style of Technorama's exhibits. They want to share their excitement of discovery alongside adults! After all, didn't we each begin our playful exploration and learning about nature long before we started school? No matter how long since one may have been a student, the invitation to playful learning is almost irresistible.

Technorama, Switzerland's Science Center, is a special place where young and old, school groups and families, groups and individuals can enjoy and share an amazing experience – discovering what makes this phenomenal world go round.

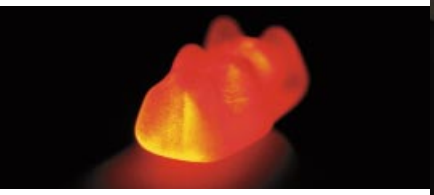


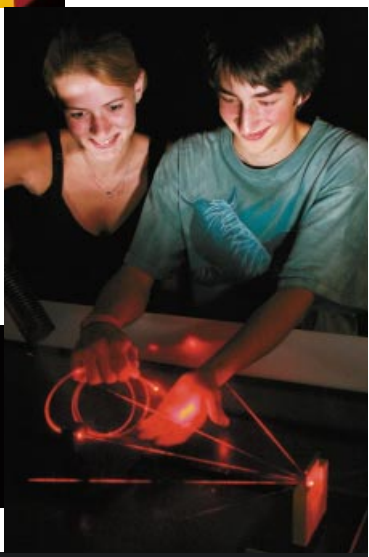
Tripping the light fantastic.

At ***Colored Shadows***, stand in the light and watch how your silhouette takes on seven different colors.

The daily ***Laser Demonstration*** reveals the amazing properties of "perfect" light and how it is used in day-to-day life: from reading bar codes to creating special disco effects to reproducing the wave patterns of your voice.

Get switched on to lasers with help from the jelly bear.





Let there be light, and there was light. It comes in all shapes and forms: sunlight, moonlight, candlelight, glow-worm light, even electric light. You can see light, you can switch it off and on, and use it to find your way in the dark. Light can be visible and invisible. But one thing is certain, light is as important as life itself.

*Experiment with the **Model Eyeball** and see how the design of your own eye is infinitely more sophisticated than any man-made optics.*

*You're in control of yarn speed, strobe light colors and the stroboscopic effect: let your imagination run wild creating astonishing three dimensional kinetic sculptures with **Light Spinning**.*

*Scientists and artists have long dreamed of harnessing light. But now you can do it with the **Plasma Ball**, one of Technorama's highlights. Shape luminous cascades, snake-like streams of electrons and charged atoms with your bare hands.*

Light is the perfect demonstration medium. Look at the bright and dark sides of light under the microscope. Few aspects of science are better suited to making abstract physics accessible.

Seeing three-dimensionally.

*Small, everyday, realistic looking objects, magnified several times, seem to jump out of the **Magic Box** right into your face. A spellbinding 3D effect starts deep inside the box and extends into the room – beyond the pane of glass.*

***Probing a Hologram** is one of the basic experiments that help you understand the whys and wherefores of 3D technology.*

This section is a real eye-opener! It is full of three-dimensional imagery, packaged and transferred into stereo photographs, holograms and PHSCologramsTM. In an impressive demonstration of the conversion of spatial and time data, they reproduce original color, space or movement. Using laser beams, holography

*The acronym for photography, holography, sculpture and computer is **PHSCologram**™. Computers break down as many as 30 photographs, taken from slightly differing angles, into lines and put them back together in a single image.*

One of the first real-enough-to-touch green laser portrait holograms, made in Russia in 1991 (with a 25 ns pulsed neodymium laser, if you're interested!).

was the first genuinely three-dimensional method of image reproduction. Also, several PHSCologramsTM provide near-perfect illusions of reality. Simply interact with the exhibits if you want to know the secret behind these effects.

Wood and the imagination.

Wooden balls mysteriously appear and disappear in these big wooden toys. Their rhythmic flow seems to combine space and time, visibly and audibly.

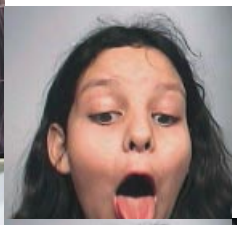
Put the old saying "touch wood" into practice. Pierre Andrès' creations are not just to be marveled at. Go ahead – touch them, lever them, crank them, pedal and rattle them. Watch as wooden balls the size of apples find their way through bizarre labyrinths and smaller balls skip through space and time – with the satisfying sound of wood on wood. The French artist

Half a dozen mysterious, complex and yet somewhat old-fashioned looking wooden mechanical devices – all handles and levers, drivers and connecting rods – fascinate everyone from toddlers to seasoned engineers.

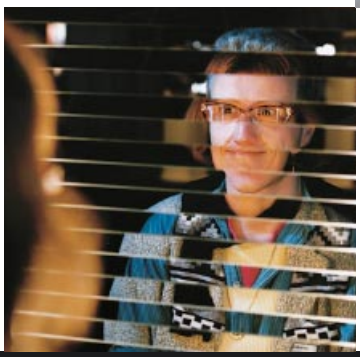
wanted his works of art "to make wood sing and people smile". These wonderful wooden machines had previously been on display at the Centre Pompidou and the Musée d'Art Moderne in Paris, where they also proved to be a fascinating draw.

Face-to-face with your own face.

*Using the **Cubic Faces**, combine the most expressive parts of various faces to create imaginary new faces – some strange, some stunning, others unlikely and others seemingly impossible.*



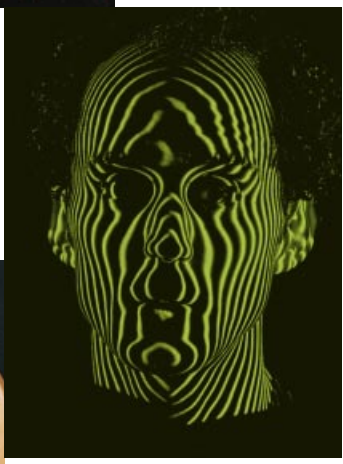
***Face Morphing**: Thanks to a user-friendly computer programme, transform your face in front of your eyes.*



*How would you look if you had someone else's eyes? Sitting across from one another at **Your Father's Nose**, a special mirror with alternating gaps, children and parents, husbands and wives, brothers and sisters, grand-parents and grand-children can combine their features. New faces appear as if designed by a gene-blender.*

What stories do faces tell, and what do they hide? How are they unique? What would you look like with a different face? Faces convey vast amounts of information. They send out non-verbal messages, a highly efficient means of communication. Explore the expres-

*What is your skin type? Explore your face with a macro video lens and capture it on screen, hugely magnified, at the **Skin Types** exhibit. How is the skin on your earlobe different from that on the tip of your nose or around your mouth? Watch your beard grow or your pupils react to different light intensities.*



*Would you like to read your face like a map? A light grid with contour lines produces a **Relief Map of Your Face.** The more imaginative your grimacing, the more exciting the map. More than 40 facial muscles are needed to create some ten thousand different facial expressions.*

Why are facial expressions so difficult to read upside down? Our so-called egocentric coordination system interferes with our efforts to turn it rightside up in our minds. This experiment is known to have made even self-important politicians laugh.

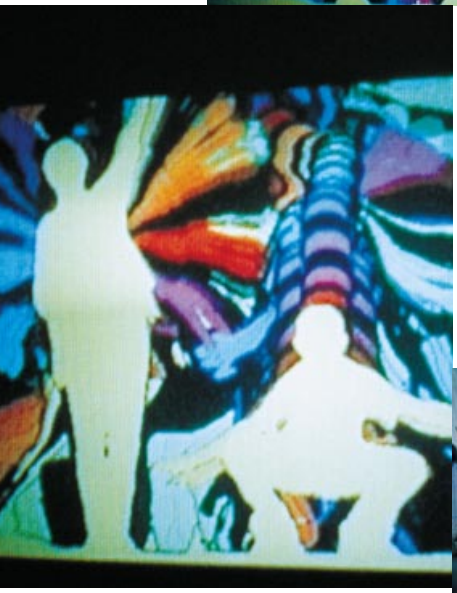
sive way your face mirrors your mood at a given moment. Study your own face to learn why the physicist Lichtenberg claimed that: "The human face is the most entertaining surface on earth for us."

Showing robots who's boss.

One of Technorama's top ten attractions is the **Nine Men's Morris Roboter**. It waits for the arrogant fools who think they can beat it at its own game.

At the **Genetic Inheritance** exhibit, it only takes five minutes to identify your hereditary factors. Find out how a single gene can determine many inherited physical features, and how dominant and recessive genes work.

Welcome to the "Inverted Disco". You usually dance to a given tone and rhythm. Here it is the other way round – quite an unusual experience indeed! How you walk shows you how you are and is as unique as your fingerprints. Let the machine that measures gait symmetry prove it. Want to know what happens to your joints



*The **Shadow Box** "freezes" movement in time against phosphorescent walls. Imagination and physical fitness are the only limitations in this stunning shadow play.*

*Echo your own body movements at **Recollections III** where a combination of video and computer technology creates multicolored life-size images. The choreographed dialogue, enriched with a special effect feedback, is a playful and sensual experience.*

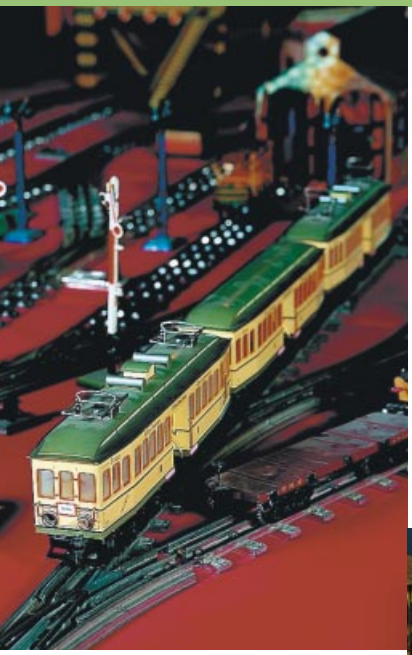
when you jump up and down? Step on to the biomechanical platform and the computer and piezo-electric sensors will work it out. On the Mac, check out the gene checklist and discover how one single gene is responsible for you inheriting a whole range of physical characteristics.

For the young and the young at heart.

A JU 52 – its unmistakable sound evokes the exciting era of pioneering air travel.

A Märklin passenger ship – built between 1909 and 1914 – is a real gem. A collector's dream!

Technorama is the main station of one of the world's foremost collections of model trains*. It is said that emperors, kings and Hollywood stars have fallen under the spell of these tinplates (to use their specialist name)! They are sought-after collectors' items and, even in this age of fancy computer games, still have the power to fascinate. Antique Märklin train engines from the early 20th century elegantly



Tinplate nostalgia – it shows a scene from bygone days when few people would ever get to see such fancy train carriages in real life.

make their way round the indoor railway tracks. And there is more to tinplates than trains. Marvel at the exquisite models of boats (from submarines to ocean liners), planes, airships and steam engine models.

***Dr. Bommer Toy Train Foundation**

Appease your hunger as you quench your thirst for knowledge.

The self-service restaurant can accommodate many hungry guests indoors and out. It also caters for family and business banquets!

Phone +41 (0)52 244 08 70
Fax +41 (0)52 244 08 75
E-mail: restaurant@technorama.ch

Auditorium, Seminar and Group Rooms 1st/2nd

*The **auditorium** seats 150, the **seminar room** and **two group rooms** seat up to 40. Convenient rail and road access are added reasons why Technorama is a preferred venue for conferences/meetings and seminars.*

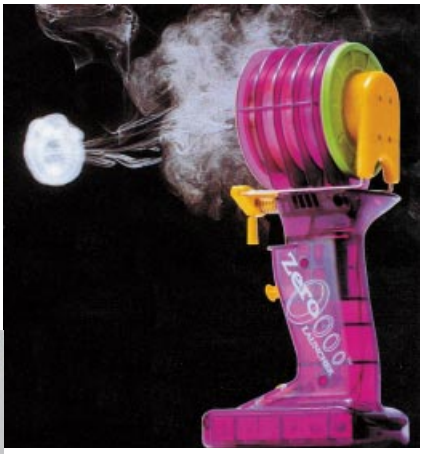
Need a break? Then it's time to visit our self-service restaurant. Choose from our good-value meals, snacks and treats any time of the day.
Technorama is also a favorite meeting venue and many groups use our auditorium, seminar room and group rooms to host their events and meetings. We suggest booking well in advance.

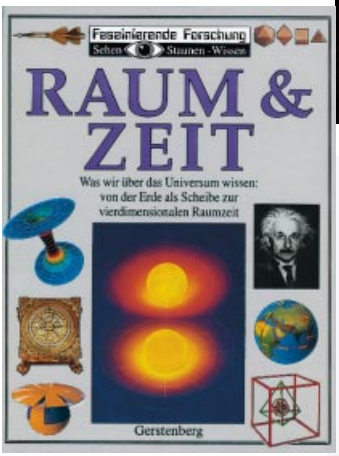
Relax on the lawn.

*To understand some phenomena you have to see them in action. So, why not experience the laws of physics for yourself on our giant reverse yo-yo **Boyo**? Feel how energy is transferred to the yo-yo every time you pull the rope in this test of physical and mental strength. Or, see the principle of coupled pendulums in front of your very eyes on our giant **Magic Swing**.*

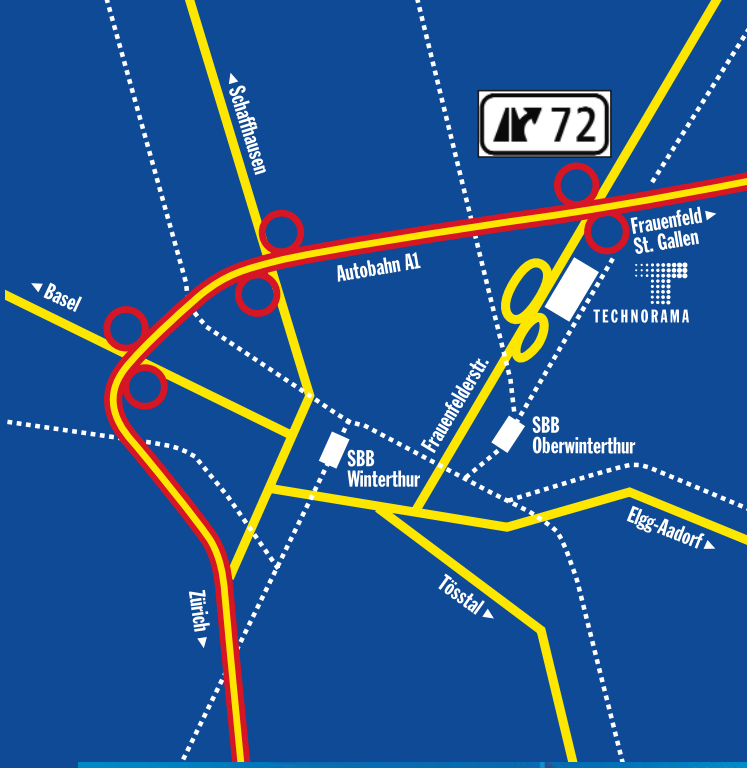
Technorama visitors love to linger in our park, opposite the main entrance – especially from spring to autumn. Take a break to digest the exciting things you've learned. Stroll around, have fun, have a picnic or enjoy a barbecue. Mentally and physically refreshed, you can return to Technorama, ready to make more exciting discoveries.

Start experimenting at home.





Would you like to have your own Eureka! moment at home? Visit the Technorama Shop and choose from the wide selection of clever gadgets, interesting reference books and miniature experiments. Or why not buy a gift voucher for tickets to Technorama? Special opening hours make our shop a treasure trove for last-minute gifts.



Drive to Technorama on the A1 motorway and exit at Oberwinterthur (junction 72). Free parking.

Or take the S-Bahn S12, S29 or the regional train to Oberwinterthur, followed by a brief 8-minute walk. You can also take the No. 5 bus from Winterthur's main railway station.

Technorama
Technoramastrasse 1
CH-8404 Winterthur

Phone +41 (0)52 244 08 44
Fax +41 (0)52 244 08 45
www.technorama.ch
info@technorama.ch

Technorama is open Tuesday to Sunday from 10 a.m. to 5 p.m. Closed on Mondays and December 25th; open on other public holidays (including those falling on Mondays).