New in the Ars Electronica Center Linz

Robotinity – The New RoboLab

What Machines Dream Of – The New Exhibition

Opening March 11, 2011

(Linz, March 11, 2011) Humankind has been building machines for millennia. But what forces actually drive us on as we do so? Which sorts of timeless motivations are behind our strivings to create new automatons, machines, robots and androids? Is it the urge to comprehend and recreate nature and its processes? Or perhaps even our audacious pretensions to be capable of improving on the world as it is? Do we construct artificial devices in response to the boundaries we feel have been imposed upon us—to shift them outward or, if we can, abolish them altogether? Or is it simply our boundless curiosity that demands to be satisfied? The Ars Electronica Center delves into these fascinating questions in its completely revamped RoboLab and the "What Machines Dream Of" exhibition.

Robotinity

"Robotinity," a portmanteau of robotics and humanity, succinctly expresses the new RoboLab's central theme: that high-tech has become an integral part of everyday life; that human beings and machines are now living and working together, and that this will continue to intensify. The new RoboLab invites visitors to imagine themselves to be archeologists in the distant future and to ask: What would we discover on a dig through the remains of the 21st century, excavating the beginnings of the epoch in which human-machine coexistence was in its infancy? With examples culled from the realms of art, design and science, RoboLab sketches the trajectory of the rise of Robotinity.

What Machines Dream Of

What do machines actually dream of when they come to a standstill? If we briefly consider this absurd proposition, then the images and narratives that arise aren't so much about the machines themselves than about our own fantasies, dreams and fears connected with progress and technological development. The "What Machines Dream Of" exhibition is a collection of art-machines that, as opposed to their industrial and commercial counterparts, have absolutely nothing to do with rationality, perfection or efficiency-optimizing logic. But these seemingly senseless and useless devices engender formidable spiritual power and breathtaking beauty.

Art and Science in the Ars Electronica Center Linz

"Robotinity" and "What Machines Dream Of" are consistent applications of a strategy the Ars Electronica Center Linz has been pursuing since 2009: juxtaposition and intermingling of art and science. This course has evoked great interest on the part of the general public, opened up completely new points of view as well as prospects for collaboration, and thus made possible an internationally unique interdisciplinary approach to issues of tremendous importance to the whole world right now and in the days to come.

With queries, please contact

Christopher Ruckerbauer
Tel: +43.732.7272-38
christopher.ruckerbauer@aec.at
www.aec.at/press

Robotinity – The New RoboLab

The new RoboLab gathers together artworks, scientific developments, and visions of the future grouped into four thematic clusters: *Environment* is populated by robots whose forms and movements take after those of animals with whom humankind has coexisted since time immemorial, and thus alludes to a connection between our newly-acquired technological capabilities and our age-old instincts and behavioral patterns; *Medicine* focuses on earth-shaking developments in the field of medical technology, and illustrates how the organism and the machine are progressively growing together; the *LifeStyle* area spotlights robotic fashion trends; and *RoboLandscape* traces the history of robotic design—beginning with plain imitation of certain animals and plants, to the creation of mechanical men capable of walking erect, and culminating in completely new creatures not modeled on any natural precursors.

Environment

TELENOID (2010)

Hiroshi Ishiguro, Osaka University, ATR (JP), www.irc.atr.jp/Geminoid/Telenoid-overview.html

Telenoid, the latest robot to emerge from Dr. Hiroshi Ishiguro's R&D lab, follows in the footsteps of its robotic twin Geminoid that created quite a stir at the Ars Electronica Center in 2009. This current project focuses on new forms of telecommunication, whereby gaining insights into human behavioral psychology continues to play an important role. Telenoid resembles a baby; you hold it in your arms during the conversation. It's capable of registering changes in a speaker's voice and translating this input into gestures and expressions. Two people, each with his/her own Telenoid, can thus each converse with a three-dimensional interlocutor that directly conveys the facial expressions of the other person.

Paro (seit 2003)

Japans National Institute of Advanced Industrial Science and Technology (AIST), www.aist.go.jp

Paro is an animal-like robot that has been in use in Japan and Europe since 2003 for therapeutic purposes—for example, providing care to people with Alzheimer's disease. Modeled on a baby seal, Paro registers environmental stimuli via two computers and five sensors that measure touch, light, sound, temperature and physical position. This enables it to interact with its human interlocutor. Paro is able to learn—it can recognize 50 different voices and responds to its name. The form of a baby seal was selected because most people have no preconceptions about how this creature behaves.

Tabby from CREATUREs (2010)

Atsuro Ueki (JP), http://surroundings.co.jp/works/prototypes/21

Every one of us owns and uses furniture. We associate highly personal narratives with certain favorite pieces. In light of this, it's no wonder that the ongoing amalgamation of everyday life, entertainment and robotics has not stopped short of our furniture. "Tabby" is a lamp with a furry coat; it seems to breathe and reacts to being stroked.

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www.aec.at/press

Animated Lamp V/a. g. r. a. (2008)
Romolo Stanco (IT), www.romolostanco.com

"Animated Lamp" hangs limply from the wall under the influence of gravity and its own weight, resembling a drop of water frozen in mid-plunge. But as soon as it's switched on, it leaps to life. Like an organic corkscrew, it curls up crazily and maintains its shape until the lamp is switched off again. The secret is shape memory wire, which consists of an alloy that "remembers" its shape and reassumes it as soon as it's heated up by electrical current. Among the many uses of such alloys are in the fields of medicine and space travel.

RoboEarth (running until 2013)
http://www.roboearth.org/

RoboEarth is a World Wide Web for household & service robots. This repository of "experiences" derived from their interaction with human beings makes the information available online where it's accessible by all other robots. The aim is to store as much information as possible about best-case and sub-optimal interaction patterns and to facilitate downloading it as updates. Robots can thus "learn" and better adapt to their human environment on an ongoing basis. RoboEarth is funded by the Cognitive Systems and Robotics Initiative from the European Union Seventh Framework Programme. The project is scheduled to end in 2013.

Medicine

NAUTILOS, Near-Autonomous InjectabLe Optofluidic System (under development)
Christian Karnutsch (DE), www.ionas.eu

NAUTILOS is a leading-edge R&D project. Its mission is to develop a miniature submarine that is injected into the human organism, where it remains on constant patrol. When it comes upon pathogens or cancer cells, it can target, engage and eliminate them. The project is only in its initial stage. It is estimated that NAUTILOS will be ready for deployment in 15-20 years. Researchers are currently working on shrinking a complete biomedical lab down to one square millimeter. This "lab on a chip" will constitute NAUTILOS' core—analyzing the blood flowing past and, when ordered, launching an attack on harmful organisms. To save time and space, the mini-lab employs optofluidics that analyze the blood with purely optical means—that is, with light. The blood is illuminated to measure how its individual components react to light. Constantly comparing the test results to standard values makes it possible to immediately recognize dangerous changes in the blood's makeup or the presence of viruses.

Retina implant (under development)
IMI Intelligent Medical Implants GmbH, Bonn

The retina implant is an intelligent visual prosthesis that bridges and replaces the defective functions of the retina and thus can enable blind people to regain modest visual perception. It consists of three parts. The implantable retinal stimulator receives and/or generates electrical signals that are imparted to the ganglia cells and sent on via the optic nerve to the central nervous system. The visual interface looks like a pair of sunglasses. It captures video images and also conveys the energy required by the implant to the inside of the eye via wireless transmission. The pocket processor contains rechargeable batteries that supply

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energy for the entire system. It also contains a microcomputer that translates the image data from the visual interface into simulation commands for the retina stimulator.

Glass eyes (mid-19th century)

Anton Schwefel (Vienna, 1820); on loan from the Technisches Museum Wien, www.tmw.at

In 1822, a pair of glass eyes cost 10 gulden, a sum equivalent to the price of 100 kilograms of bread at the time.

Cochlea implant (since 1977)

MED-EL (AT), www.medel.com

A cochlea implant consists of an audio processor worn behind the ear and an implant positioned just beneath the scalp. The processor converts sound waves into digital information and sends it wirelessly to the implant. From here, a highly flexible electrode leads all the way to the innermost recesses of the cochlea, the spiral-shaped part of the inner ear. The electrode stimulates the nerve structures of the cochlea at the precise point naturally meant for the particular sound's pitch, and the auditory nerve transmits these signals on to the brain. This makes hearing possible—by children who are born deaf as well as by adults who have lost their ability to hear.

CardioWest C-70 TAH (since 2004)

http://www.medel.com/at/show/index/id/7/title/--BER-MED-EL
SynCardia Systems Inc. (US); on loan from the Deutsches Museum, Munich, www.deutsches-museum.de

The CardioWest C-70 TAH is a complete artificial heart. It is implanted into patients with total heart failure to bridge the time until heart transplantation—often up to a year. The artificial heart consists of an implantable core device and an air compressor outside the body. The implant is made of polyurethane and consists of two chambers (ventricles), each of which is divided by a membrane into a blood-filled and an air-filled half. The air chamber uses air pressure to suck in the blood or pump it out into the pulmonary system (lungs) or circulate it throughout the body. Valves ensure proper blood flow. The CardioWest device goes back to developments by Willem Kolff and Robert K. Jarvik in the 1970s and '80s. The Jarvik-7, the first permanent artificial heart, was first implanted in 1982.

EndoCapsule (market launch 2007)

Olympus Austria GesmbH (AT), www.olympus.at

Up to now, endoscopy entailed inserting a tube into the body, which usually meant that the examination was painful. But now, there's Olympus' EndoCapsule, a pain-free form of endoscopy that makes it possible to examine the entire small intestines and to find any bleeding or lesions there. Instead of a tube, the EndoCapsule is shaped like a pill and measures a mere 26x11 mm. Positioned in the "nosecone" of the swallowable capsule is a miniaturized camera that sends about 50,000 high-definition color images to a receiving device during the EndoCapsule's eight-hour trip through the stomach, duodenum and large & small intestines. This provides physicians with a close-up look inside the entire digestive tract. With a volume of 2.2 cm³ and weighing only 4 grams, the EndoCapsule is one of the world's smallest cameras.

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Da Vinci System (since 1998)

www.intuitivesurgical.com, Hospital of the Sisters of Mercy Linz, www.bhs-linz.at

The da Vinci robot makes it possible to perform complex operations that are minimally invasive to the human body. During these procedures, the surgeon steers the robot via hand motions and foot pedals, and the robot carries out these movements in real time. The da Vinci features four robotic arms that are inserted into the body through 1- to 2-cm incisions. On the ends of the arms are fine surgical instruments that can be maneuvered three-dimensionally just like the human wrist and thus allow for extremely precise sequences of actions. Tiny cameras on the ends of the arms send high-resolution images to the surgeon stationed at the da Vinci console. There, all tissue layers and structures can be studied in detail and enlarged up to 30x. The numerous potential advantages offered by this surgical method include shortened hospital stay, less pain, low risk of infection, less blood loss, reduced scarring and fast recovery. All surgery to remove a cancerous prostate performed in Linz since 2008 has been done with da Vinci. To date, 400 prostate patients have successfully undergone this operation. Other areas of application include renal pelvis grafts and nephron-sparing surgery to remove renal tumors.

Thigh prosthesis made of leather (early 20th century)

On loan from the Department and Collection of the History of Medicine, Medical University of Vienna, www.meduniwien.ac.at

This leg prosthesis was probably based on a design by C. Geffers. It was constructed of lateral steel rails, leather and wood. The strap-on thigh sleeve and the upper part of the lower leg are made of leather, and the two parts are flexibly interconnected by a wooden ball. The lateral steel rails can be locked at the joint by a lever to prevent the device from buckling when the wearer is walking. The foot is made of wood and flexibly connected via a spiral spring to the lower leg portion, likewise made of wood. This prosthesis was held on by a hip strap; many thigh prostheses were secured by a shoulder strap too.

Thought-controlled prosthesis (2008)

Otto Bock, http://www.ottobock.at/, Vienna General Hospital, Medical University of Vienna, www.meduniwien.ac.at

A conventional prosthetic arm allows three motions: open/close the hand, rotate the hand inward/outward, and bend/stretch the elbow. The movements can only be performed one-after-the-other. They have to be laboriously initiated and consciously carried out in what turns out to be quite a strength-sapping procedure that doesn't even result in precise, fluid movements. Intelligent prosthetic devices by Otto Bock feature major improvements: they can directly implement mental commands, and the joints can also be moved simultaneously. The prosthesis is controlled by the nerves that were originally responsible for moving the arm. Plus, instead of just three joints, seven active joints are available, which expands the user's potential range of motions.

MOBILITY (2010)

Otto Bock Healthcare, www.ottobock.com / Art+Com, www.artcom.de

For the World Expo 2010 in Shanghai, ART+COM created an impressive installation that reflects a facet of mobility: an array of 100 white prosthetic hands each holding a small mirror and each rotating on its axis. The mirrors reflect a floodlight's beam onto the wall across from them. At first, the points of light move about chaotically; then, they coalesce into the shape of the Chinese character meaning "mobility." All the prosthetic hands in this spatial

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installation were manufactured at the production facilities of Otto Bock, a leading developer and manufacturer of state-of-the-art prostheses. Each hand is attached to an individually controllable stepper motor, which makes it possible to smoothly control the movement of the points of light.

LifeStyle

SiliFulin (2009)
Ryota Kuwakubo (JP), www.vector-scan.com

Sili means hip, fulin means swing—and their combination suggests what Ryota Kuwakubo is up to here. Robotics engineers are often inspired by how people behave and move or by the human physique, but Ryota Kuwakubo takes the opposite approach. He asks: what if we had a tail? Would we communicate differently or move in different ways?

Fluid Dress (2010)
Charlie Bucket (US), www.casualprofanity.com

"Fluid Dress" is a futuristic designer garment that enables its wearer to spontaneously display brief messages or express moods. The dress is made of 180 meters of clear plastic tubing that was woven on a loom developed by the artist himself. Via a computer hooked up to a pump & valve contained in a backpack, the wearer determines both the color of the fluid and the proportion of air to fluid pumped into the tubing. The result is a dynamically pulsating garment that can be spontaneously and individually adapted to the wearer's state of mind.

RoboLandscape

Blob Motility (2010)
Akira Wakita, Akito Nakano, (both JP), http://metamo.sfc.keio.ac.jp/project/blob/

Blob is an extraordinary R&D project to develop a display that uses a fluid which can assume any three-dimensional form. Blob's secret is its unique programmable magnetic gel. Located beneath the display are electromagnets arranged in a honeycomb pattern that carry out the actual transformation control.

Freqtric Drums (2004-2011)
Tetsuaki Baba (JP), http://freqtric.com

"Freqtric Drums" is the outcome of Tetsuaki Baba's effort to develop new human-machine interfaces. Just like using a touchscreen, communication here takes place via touch, but unlike tactile computer input, the human beings themselves become interactive surfaces and can communicate with each other via skin contact. Not just face to face; body to body too.

JAMMING GEAR (2008)
So Kanno, Kenichiro Saigo (both JP)

"JAMMING GEAR" creatively combines entertainment and technology. The futuristic instrument consists of intermeshing gears, each one of which produces its own specific

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sound. Setting a gear in motion causes all the others to rotate. The result is a truly unique form of mechanical and acoustic interplay.

SWITCH (2010)

Ars Electronica Futurelab (AT), EK Japan Co., LTD (JP)

At first glance, "SWITCH" looks like an ordinary picture applied to slats (like a closed venetian blind). But a small sensor inside the picture frame registers every sound and movement nearby. When it's activated, the slats flip as if by magic and reveal a different picture. "SWITCH" is the outcome of a collaborative R&D project conducted by the Ars Electronica Futurelab and ELEKIT. It lets users experiment with experience design and playfully get a feel for the work done by interaction designers on a daily basis.

myBOT (2011)

Hideaki Ogawa, Gerfried Stocker, Emiko Ogawa, mar Canet sola, Roland Haring and Christopher Lindinger

"myBOT" is an entertaining way to play with identities. The first step is to take portrait photos. Next, you use a simple program to process them into a short stop-motion animation sequence. Then you select just the right robot body from a gallery of options and specify its behavior. The result is a customized myBOT that might be funny or serious, offbeat or nerdy. "myBOT" enables you to design a robot in a way that's fun and easy.

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What Machines Dream Of

LOST #2, (2011)
Ryota Kuwakubo (JP)

Ryota Kuwakubo makes common, everyday objects dance along the walls of this installation, forming things of poetic substance and mysterious landscapes. A simple pasta sieve can morph into a majestic skyscraper, a light bulb into a whole power plant. Ryota Kuwakubo only uses objects whose value and significance are usually defined in terms of their function. It is precisely this linkage that Ryota Kuwakubo severs.

Die Weltmaschine (1958-1981)
Franz Gsellmann (AT)

A dream and the sight of the Atomium at the Brussels World's Fair inspired Franz Gsellmann to create The World Machine, which he worked on for 24 years until shortly before his death. This project became his sole pursuit in life. Serving as its components were all sorts of stuff that Gsellmann bought at flea markets, received for free or found in junk yards. The artist took objects that society had deemed useless and had heedlessly disposed of. He endowed them with renewed meaningfulness and an extraordinary new function as parts of his machine. Object by object, Franz Gsellmann realized The World Machine he had once dreamt of. Shortly before his death in 1981, he declared the construction to be complete. The World Machine is six meters wide, three meters tall and two meters deep.

DEUS CANTANDO (God, singing) for computer-controlled piano and screened text (2009)
Peter Ablinger (AT), Winfried Ritsch (AT), Thomas Musil (AT)

"DEUS CANTANDO" plays with the interpretive capacities of the human brain. Transcription software makes it possible to reconstruct the frequency spectrum of a spoken text by means of a piano. Winfried Ritsch's computer-controlled piano performs the "composition" with consummate precision. Each one of the 88 electromechanical fingers is capable of up to 16 keystrokes per second. The interpretive capacities of the human brain then transform what were initially abstract musical structures into a sequence of words in a human language. The result is an emphatic plea to save the Blue Planet and to protect human existence on Earth– the text of the 2009 Declaration of the International Environmental Criminal Court that was founded at the World Venice Forum pursuant to an initiative of Adolfo Pérez Esquivel and the Dalai Lama.

Schattenspirale (Shadow Spirals, 2008)
Hans Polterauer (AT)

Inspired by the era in which "the movies learned to move," Hans Polterauer has produced an extraordinary film with objects and light. But unlike a conventional motion picture in which a series of images unreels past a stationary light source, here the objects remained fixed and the light source is in motion. Under the illumination of an LED lamp, initially bent wire spirals suddenly become visible and cast fantastic shadows onto the installation space's wall. The subsequent movements of the light source change the shape of the shadows, breathing life into them.

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Tel: +43.732.7272-38
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Stroboskopscheibe (Stroboscope Disc, 1999)

Hans Polterauer (AT)

When a sequence of images moves slower than 16 frames per second, the human brain can perceive each one separately. If it moves faster, we perceive it as continuous motion. This effect—on which the magic of motion pictures is based—is what Hans Polterauer takes advantage of in this work of art. He positions three-dimensional objects on a disc that is set in motion and illuminated with a rapidly blinking light source. The result is a series of images that "overtaxes" the capacity of the human brain, which gets the impression that it's not the disc but rather the objects themselves that are moving.

Geregelter Zufall (Regular Randomness, 2010)

Hans Polterauer (AT)

According to Hans Polterauer, our existence is played out at the nexus of chaos and order. Thus, what initially appears to be a swarm of insects darting and looping about without ever alighting on one spot turns out, upon closer inspection, to be an array of wires responding to the attractive force of a circling magnet. The magnet moves uniformly, but produces seemingly chaotic movements—seemingly, since, amidst this disarray, order nevertheless prevails and the wires describe a perfect circle.

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