FINDING SOLUTIONS FOR


SUSTAINABLE
FUTURE

IN REVIEW

ENAC

SCHOOL OF ARCHITECTURE, CIVIL AND ENVIRONMENTAL ENGINEERING

EPFL
ÉCOLE POLYTECHNIQUE
FÉDÉRALE DE LAUSANNE

DESIGN & BUILD TOGETHER

FOREWORD

The year 2009 was a year of reorganization around ENAC's major themes: architecture, urban and regional planning, civil engineering and environmental engineering. Our transversal educational approach, "design and build together", was strengthened with the overhaul of the territorial development and urbanism minor and the encouragement of interdisciplinary Master's projects. A new joint civil and environmental engineering doctoral program was also created. These improvements will help us meet our unchanging goal: to prepare our students to take leadership roles in a rapidly changing world, and to conduct research that will bring innovative solutions to some of society's most pressing problems.

In research, the remarkable commitment of our professors and scientific collaborators led to a substantial increase in the number of grant proposals submitted to Swiss and European funding agencies. I am happy to report that the School's external funding grew substantially as a result of those submissions. ENAC is also enthusiastically participating in the "offshore" campus in Ras Al Khaimah. A wind tunnel that will be used for studying the fluid dynamics involved in wind power is being built on the site. We have also focused on strengthening our ties with other ETH domain institutions such as WSL and EAWAG, as well as with institutions abroad, particularly in China. Several important partnerships with industry were also established during the course of the year.

As you will see from the wide variety of interdisciplinary research and educational activities highlighted in this report, the School is a vibrant and committed community of students, staff and researchers whose collective efforts are making a palpable impact all around the world. Please do not hesitate to contact us at ENAC, and participate in this exciting endeavor. We look forward to hearing from you.

MARC PARLANGE, ENAC Dean

CONTENT

THE PROJECT AS EVOLUTION

TO ARCHITECTURE PROFESSOR DIETER DIETZ, RESEARCH AND TEACHING ARE INSEPARABLE. HE FOCUSES HIS RESEARCH ON THE EVOLUTION OF THE ARCHITECTURAL PROJECT, AND THIS IS ALSO HIS PRIMARY TEACHING OBJECTIVE.

DESIGN STUDIO ON THE CONCEPTION OF SPACE
http://alice.epfl.ch

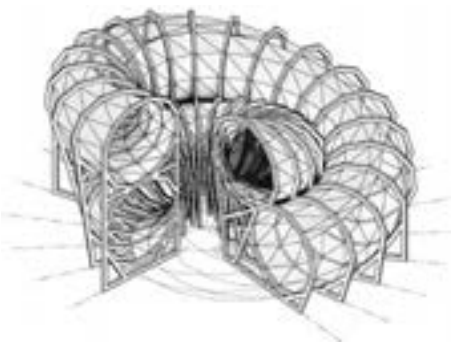
DIETER DIETZ, Director

PROJET EVOLVER
http://arpc167.epfl.ch/alice/WP_09/

The Zermatt Festival / ZGB Zermatt Bergbahnen AG / Zermatt Tourismus / Archeotech SA, Lausanne, EPFL, ENAC

DIETER DIETZ :

"The core of our research is the evolution of the project in itself.
How can a creative process be developed and understood as a continuous stream of information, interpretations and new ideas?
How can the tools of architecture contribute to producing, accumulating and passing along knowledge?"



In 2008, ALICE, Dieter Dietz's studio for second-year students, turned heads (and won a prize) in London with their project that floated on the River Thames, changing its form with the rising and falling tides. This year, ALICE had a new challenge: panorama. How do we view the landscape? How can architecture play a role in changing our perception of panorama? In the Entrée Alpine project, students were asked to invent a structure that allows the public to have an alternative reading of a traditional Alpine panorama.

The site chosen was the Stellisee, a lake above Zermatt with a picture-postcard view of the Matterhorn. What could be a more typical Swiss panorama? What could be more of a challenge than altering that overwhelming majesty, making it into a different kind of experience?

The students' solution, Evolver, is astonishing, beautiful, and, like the floating form in London, very real. It's a structure in the form of a double loop that forms a single 720-degree path. Along the path, a continuous frame opens onto the panorama, changing the viewer's perspective as he or she walks through it.

The sky, the lake, the mountain behind the lake, the ground, all appear in a smoothly unfolding view that widens and narrows as the viewer walks through the structure. The opening onto this altered panorama is initially alongside, then above, and then it moves low and the viewer must step over it, looking at the ground. The Matterhorn isn't ever in the frame. Stepping out of the structure, one immediately wants to go back in, this time walking in the other direction.

Originally envisioned in metal, the group ended up building the structure in wood, in the EPFL+ECAL Lab. The students had to break down the project into its basic components so that it could be reassembled, like a huge jigsaw puzzle, on the site. The pieces were designed based on a detailed topographical elevation that the students surveyed themselves. The students did all the sawing, the drilling, the assembling of the major elements in an EPFL parking lot. They blogged the whole experience in images – designs, drawings, construction – and their blog is a sort of visual, in silico testimony to what the ALICE lab is fundamentally after: a record of how a project evolves. The blog reveals just how deeply the students went into their investigations, how circuitous the route to their ultimate solution was, and how many ideas were abandoned along the way. This record of "process" brings a sense of depth and richness to the project, a dimension impossible to capture just by looking at the finished structure.

Dieter Dietz and his tutors – Katia Ritz, Olivier Ottevaere, and Daniel Pokora – negotiated with the authorities in Zermatt, arranged the transport of the pieces, and when the truck couldn't make it up the road to the lake with the largest sections, they worked with Zermatt officials to arrange for a helicopter.

Zermatt was enthusiastic and supportive, and provided housing up at the 2600m Flüalp hut during the assembly of the structure. Once the design had been finalized, the students managed to construct Evolver in only three weeks, with the help of the lab team. "Most of the time, you don't get to actually build what you design," notes Ottevaere. "It was a unique learning experience for them."

Stepping out of the structure, one immediately wants to go back in, this time walking in the other direction

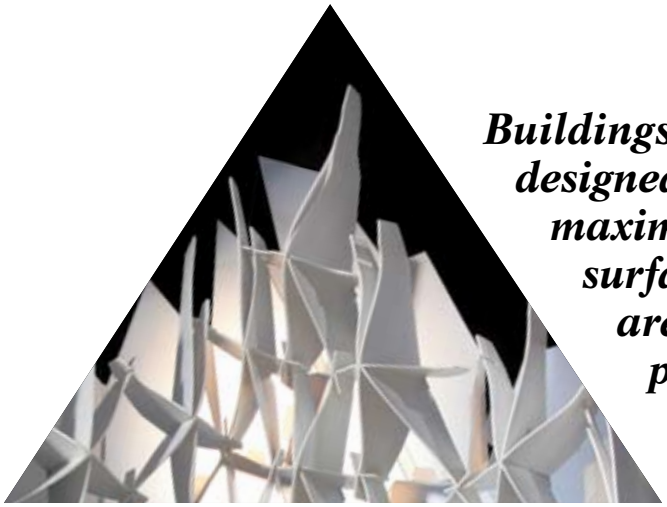
HOW TO GROW A BUILDING

ARCHITECTURE IS COMING OUT OF THE STUDIO AND INTO THE COMPUTER ROOM, GENERATING EXCITING NEW ORGANIC FORMS BASED ON SCIENTIFIC MODELS OF THE NATURAL WORLD.

MEDIA AND DESIGN LABORATORY ENAC/IC
http://ldm.epfl.ch

JEFFREY HUANG, Director

Huang's research on computer-generated organic architecture is sponsored by grants from the Swiss National Science Foundation ("Phototropic architecture")
and the Swiss Cooperation Program in Architecture ("Superstudio")



Buildings can be designed like plants, maximizing external surface angle and area to integrate photovoltaics

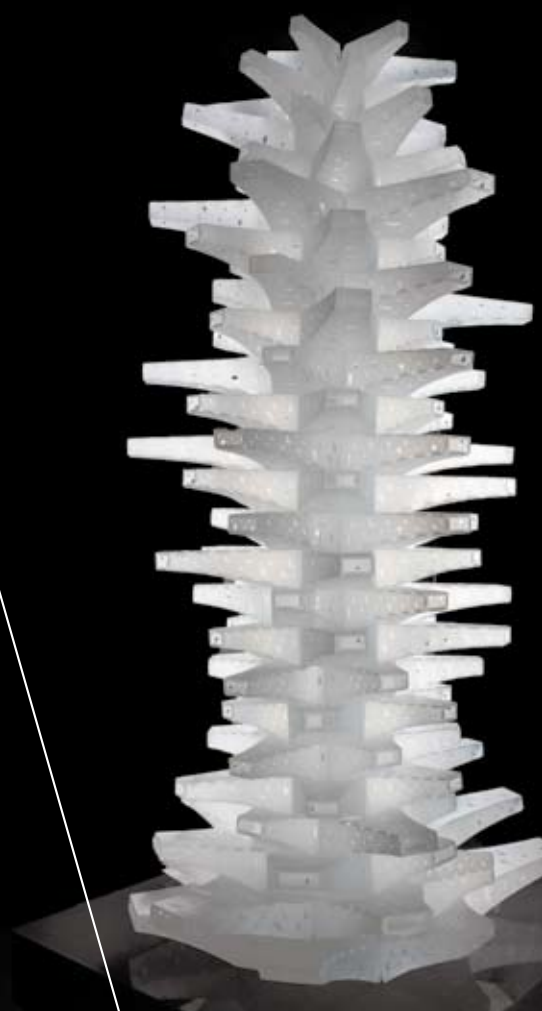
Walk into architecture professor Jeffrey Huang's office in the computer science building, and the first thing you'll notice, once you've taken in the architectural models displayed on the long table that runs the length of the room, is a low, square table in the center of the room. Pull up a chair, and the table becomes an interactive graphical interface. Huang takes the earth in his hands, stretches it, rotates it, zooms in on the Northern Hemisphere. Together we find my mother's house on the outskirts of Santa Fe; there's a car in the driveway. This is not architecture, but it speaks more clearly than words how computers and technology are changing the way we interact with information, how quickly the limits of possibility are being pushed back with every new discovery and development that emerges.

In his research and teaching, Huang explores how this unstoppable technological juggernaut could be leveraged in the world of architecture. Architecture, he explains, is rooted in the concept of the studio, a master-apprentice model that dates to the beaux-arts era and involves painstaking drawing and tracing, largely based on rectangular shapes, because that's what corresponds to the design and industrial tools that have traditionally been available. Here, computers play a marginal role – creating project renderings and doing the occasional calculation. Huang is proposing something completely different – nothing short of a studio revolution, where computers hold a pivotal role in the genesis of a new kind of design.

Using computers in the fundamental design process, Huang explains, opens up the possibility of new organic forms, shapes and structures that would be impossible to imagine or draw by hand. He's particularly interested in forms inspired by nature, because they are uniquely adapted to specific environments, something that is often important in architecture. Huang's ideas go a step beyond designing buildings that mimic natural forms, however. Here, the design takes as its starting point actual biological models – of plant or crystal growth, genetic algorithms, or species colonization, for example – that have been developed by experts in those fields. These models are turned into architectural algorithms that can generate organic structures that meet specific constraints, and thus result in buildings that fit their physical context in a unique and sustainable way. Buildings can be designed like plants to maximize external surface angle and area to integrate photovoltaics, or designed to withstand specific wind or seismic conditions, while at the same time meeting internal space and flow configuration requirements.

In his "Organicités" studio, master's students experienced this new way of doing architecture. Using bio-inspired geometrical models as a starting point, they wrote scripts and algorithms that caused buildings to grow from the ground up, like a plant or a crystal. By tweaking a single line of code, they could shrink, enlarge, deform and twist their structures, and the buildings would grow in real time, in the blink of an eye. They explored worlds of architectural form and structure that were completely new, but rooted in the natural world. The final project was a "skyscraper engine", and the specific site for testing the structures was the former runway of Hong Kong's decommissioned Kai Tak Airport.

The results were intriguing – unique and functional, both inside and out. "Organicités" was invited as one of 20 selected international design studios to be exhibited at "Beyond Media," the 9th international festival for architecture and media in Florence in July 2009, and one of the main events worldwide dedicated to the most current visions on contemporary architecture. Students of the Organicités studio exhibited four human-scale (1:100) models of organic skyscrapers, accompanied by an interactive media installation.



JEFFREY HUANG :

"Using algorithms to generate architecture results in organic forms that are "logical" for a given context and set of requirements. Even so, you can never take out the human designer – at every level, subjective choices have to be made."

THE CITY AND ITS CITIZENS

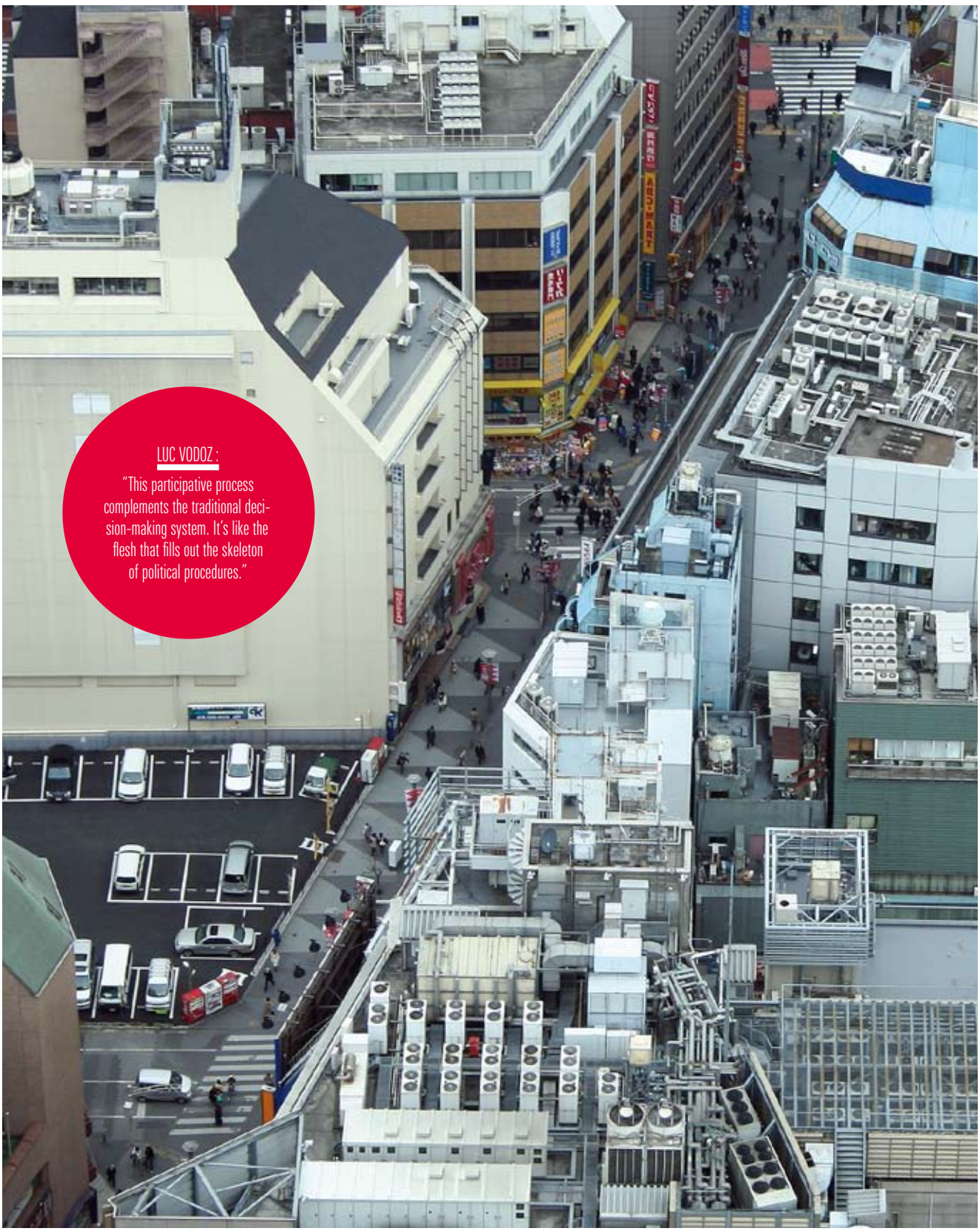
URBAN RENEWAL IS NOT JUST ABOUT BUILDING, RENOVATING AND IMPROVING TRAFFIC FLOW; IN CONTEMPORARY CITIES THE COMPLEX HUMAN DIMENSION MUST ALSO BE TAKEN INTO ACCOUNT IF REVITALIZATION PROJECTS ARE TO SUCCEED.

URBAN AND REGIONAL PLANNING COMMUNITY
http://ceat.epfl.ch

MARTIN SCHULER, Director

PROJET CLARENSEMBLE
http://www.clarensemble.ch


ゴルフコース


LUC VODOZ :
"This participative process complements the traditional decision-making system. It's like the flesh that fills out the skeleton of political procedures."

The "urban millennium" has arrived

According to the UN State of the World Population 2007 report, sometime in the middle of 2007, the majority of people worldwide were living in towns or cities, for the first time in history. This urbanization implies the planning and building of infrastructures to transport, house, educate, care for and employ ever increasing numbers of people. With the promise of access to jobs, education, and services, people are eager to move into cities to improve their standard of living. But as the riots in the Paris suburbs have shown, urbanization can also lead to cycles of negative social feedback, ultimately threatening the coherence of the community and reducing residents' quality of life.

Recognizing that urbanization is much more than just building infrastructure, the Swiss government has launched a three-year pilot program in three medium-sized Swiss cities – Montreux (Vaud), Pratteln (Basel), and Rorschach (St. Gallen) – to explore ways to combine urban planning and social integration. These communities are in need of urban renewal and are experiencing mounting social tensions. The funding is split between the federal government (50%), and the commune and canton (the remaining 50%). With over 30 years of urban and regional planning experience under its belt, ENAC's Urban and Regional Planning Community (CEAT), headed by professor Martin Schuler, was mandated by the commune of Montreux to provide expertise and coordinate the project in the Montreux area.

Montreux is made up of a number of distinct neighborhoods, one of which is Clarens, lying on the western edge of the city. Relative to Montreux proper, residents of Clarens are less well-off and less integrated culturally and socially, with a large percentage of immigrants. Most public housing projects in the city of Montreux are in Clarens. Over the years, the communal authorities have made a number of decisions – including selling an important tract of public space to a wealthy individual for the establishment of a factory – that have earned the lasting animosity of Clarens residents. The project aims to reverse this trend by involving residents in the decision-making process – empowering them to take the future of their neighborhood into their own hands. They will participate in number of steps that will make Clarens more attractive, both materially – by establishing public spaces, renovating buildings and re-structuring mobility in the area – and more abstractly, by mobilizing residents and encouraging social and cultural integration. The project's name "Clarensemble" is apt, as it marries the name of the neighborhood with the central goal of the project, to rebuild the connection between the political establishment and the community. Working together, decisions can be made for urbanization projects that will meet the needs of all the parties.

CEAT senior scientist Luc Vodoz is in charge of leading the project forward; he manages internal meetings with the Montreux authorities, acting as an advisor and mediator, and is responsible for organizing the entire public participation process. That process involves a number of community meetings, which Vodoz will facilitate. The first information meeting in June 2009 drew nearly 450 people, fully 5% of the population, a resounding success, because this is much larger than the 1% turnout that Vodoz says is more typical. He takes this as a good sign; the community is anxious to participate; they have an opinion about how they want their neighborhood to evolve.

Vodoz has three years to help the neighborhood of Clarens and the city of Montreux reconstruct a healthy, participative relationship as they work together on important urbanization projects, which include a "grand place" (public park), improved security and traffic circulation, and the construction of a neighborhood center. When social and participative aspects are thoughtfully included, Vodoz claims, urbanization can lead to successful integration of residents into the larger community, dispelling tensions and creating healthy communities along the way.

GOING UNDER

UNDERGROUND CITIES AREN'T JUST THE STUFF OF SCIENCE FICTION AND FAR-OFF PLANETS. ARCHITECTS AND ENGINEERS ARE DIGGING DOWN IN OUR CROWDED AND WARMING WORLD TO CONSTRUCT NEW KINDS OF ATTRACTIVE SPACES FOR LIVING AND WORKING.

ROCK MECHANICS LABORATORY
http://lmr.epfl.ch

JIAN ZHAO, Director

Cities strapped for buildable space are starting to look at a new frontier – the area beneath their feet. It certainly has far more potential than just for parking cars and storing excess stuff. Underground temperatures remain conveniently cool and constant year-round, a definite plus in a world threatened by global warming. These conditions are also ideal for artwork, as the Louvre museum's underground expansion has successfully demonstrated. Underground spaces are also more resistant than above-ground structures to unpleasant events such as explosions and earthquakes.

"The whole world is looking at getting more underground space in urban areas – it's a global problem," explains ENAC professor Jian Zhao, an expert in rock tunneling engineering.

Zhao points out that the issues involved in building a tunnel under a mountain for a train are quite different from designing and building large underground cavern spaces in which people willingly agree to work or live. It requires a wide range of expertise, from tunneling engineering to architecture and logistics. A multidisciplinary team in ENAC led by Professor Aurèle Parriaux studied these issues in detail in projects entitled "Deep City" and "Deep City China"

You must first pick a suitable location. Granite is best. Sedimentary rocks are possible, but require a lot more steel and concrete support. Second, you must choose a suitable construction technology, keeping in mind that the cavern cannot be too large or it will cave in. Concrete supports can be incorporated to guarantee structural stability. The world's largest unsupported underground rock cavern is a 60 m wide hockey stadium built in Norway for the 1994 winter Olympics, capable of seating 5,000 people. Third, you must find a way to make the space attractive and safe enough so that people agree to spend large quantities of their time underground. An underground stadium seating 10,000 people sounds like a good idea until you think about how they are going to get out of a limited number of aboveground access holes in the event of a fire. And lighting is crucial; most people won't willingly cut themselves off from natural sources of light and the diurnal cycle.

For his part, Zhao explores the effects of "hazards loading" – a term which encompasses earthquakes, construction vibrations, bombs, and explosives – on these kinds of underground structures. In fact we know very little about how seismic waves propagate through the ground and how they would affect an underground cavern far away from an earthquake epicenter. Given their rarity and unpredictability, it's difficult to field test using real earthquakes; explosions are easier to arrange, but still prohibitively expensive. So Zhao is studying seismic wave and energy propagation using a combination of experiments and numerical modeling. He is developing a tool to simulate and predict the effects of earthquake or explosion loading on underground structures, and will then use it to find a means of minimizing the effects of these events and thus protect the structures from destruction. "If you understand the kind of loading your structure will encounter, then you can always support it better," he explains. "In most cases, tunnels are safer in earthquakes, because they are moving with the ground. You might have cracks or shifts, but they don't generally collapse."

In most cases, tunnels are safer in earthquakes, because they are moving with the ground

JIAN ZHAO :

"Switzerland is the best country in the world at tunneling. We are making the world's longest tunnel right now — 2000 m deep and 57 km long, at the base of Alps. It's a true feat of engineering, a structure that can sustain the weight of an entire mountain bearing down on top of it."

A DOWN -TO- EARTH SOLUTION

IF THE RECIPE IS RIGHT, BACTERIA COULD PROVIDE THE SOLUTION TO A TENACIOUS ENVIRONMENTAL PROBLEM.

ECOLOGICAL ENGINEERING LABORATORY
http://ecol.epfl.ch

D. ANDREW BARRY, Director

LABORATORY FOR ENVIRONMENTAL BIOTECHNOLOGY
http://lbe.epfl.ch

CHRISTOF HOLLIGER, Director

CHRISTOF HOLLIGER :

"Some naturally occuring bacteria respire with chlorinated solvents as we do with oxygen. Providing them with an ideal food source and creating optimal conditions will allow them to go about their natural business of degrading these toxic substances, protecting human health in the process."

D. ANDREW BARRY :

"Cleaning up chlorinated solvents is becoming more urgent as polluted urban areas are increasingly needed for development. Using advances in our physical and mathematical understanding of the heterogenous soil environment, we are developing models that can be used to control groundwater acidity so that bacteria can clean up these toxic solvents as quickly as possible."

Bacteria are masters of dismantling things

Professors D. Andrew Barry and Christof Holliger are experts in soil remediation, or cleaning up underground pollution. Toxic substances creep slowly downward over the years through the pores in the soil, ultimately ending up in the groundwater supply and causing health problems for humans and animals, including cancer. We've made progress encapsulating underground storage tanks so they don't leak, and many countries have passed regulations prohibiting the dumping of toxic substances such as cleaning fluids and motor oil. But huge swaths of land are still contaminated from past spills, uninhabitable and dangerous to those living nearby. Instead of taking the usual approaches – "dig and dump", in which the contaminated soils are just dumped in abandoned sites that don't pose groundwater issues, "cap and forget" in which the stuff is encapsulated so that it cannot enter the groundwater table, or "dilute and displace" in which the pollution is spread out over a larger area, reducing concentrations to acceptable levels – Barry and Holliger are confronting the problem, armed with the latest in twenty-first century technology: computers and bacteria.

Bacteria are masters of dismantling things. It's thanks to bacteria that garbage eventually enriches the soil. Their clever chemical machinations net them some carbon and result in various harmless by-products like hydrogen, carbon dioxide and water. They can transform the toxic chemicals in contaminated soil into other substances which, although not too palatable, are at least no longer toxic.

Holliger is perfecting a veritable bacterial armada that can tackle the nastiest and most carcinogenic substances of the lot, chlorinated solvents. Used in dry cleaning and as cleaning solvents, these chemicals are denser than water, so they tend to sink down to the bottom of the aquifer. It's hard to predict how they will travel through the soil. Because garden-variety bacteria need air to operate, they can't degrade these compounds. Other species that respire anaerobically can break up the chlorine-carbon bonds deep underwater, but they need a steady supply of hydrogen in order to function. This need can be met by adding organic matter to the water; other kinds of bacteria ferment it, producing hydrogen in the process. Unfortunately, though, one of the by-products of the chlorine-reducing reaction is hydrochloric acid, and the anaerobic bacteria have a limited acidity tolerance. Things get too acidic, and they go on strike. That can be handled, says Holliger, by adding a buffering agent. The soup is getting thick here. Are the solvents degrading?

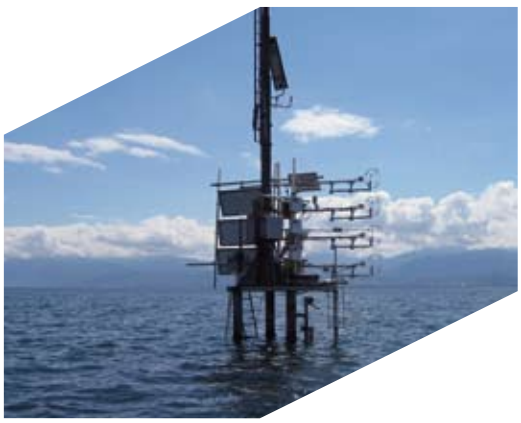
Well, yes and no. Things get a little complicated because the ground is not like a test tube. There are other species that compete with the anaerobic bacteria for the extra hydrogen. Would adding more biomass speed things up? What kind of buffer should be added to handle increasing acidity levels? Where and how should it be placed? A trial and error approach – tweaking the recipe to get the soup right – is not an efficient way to handle a real groundwater contamination problem. Enter Barry, who is an expert in modeling the physics and hydrology of soil and groundwater. In a project funded by the Swiss National Science Foundation, the researchers have put together a model that can handle all these interwoven factors in a simple way – the amount of biomass added, the fermentation situation, the species of bacteria involved and their rates of reaction, including the various competing species, and the interaction with various buffering agents. Together, Holliger and Barry are taking the test tube situation and turning it into a real aquifer model that may one day provide cleanup consultants with a real design-based tool for decontaminating soil and groundwater.

BRIDGING DISCIPLINES WITH ROBOTS AND BEYOND

DISTRIBUTED SYSTEMS AND ROBOTICS COULD REVOLUTIONIZE THE WAY THAT CIVIL AND ENVIRONMENTAL ENGINEERS TACKLE THEIR PROBLEMS.

DISTRIBUTED INTELLIGENT SYSTEMS AND ALGORITHMS LABORATORY
http://disal.epfl.ch

ALCHERIO MARTINOLI, Director



ALCHERIO MARTINOLI :

"There has been incredible progress in microcontrollers and embedded systems technology in general. This has to be leveraged. This is the challenge, and this is where we can contribute."

"I notice that all these articles are in the same format – problem/solution," comments Professor Alcherio Martinoli as we sit down to talk about his work. "I have to warn you, we don't work like that. We work on enabling technology. We can't afford to build ad-hoc solutions for a single application. We develop methodologies and recycle their resulting "solutions" as much as we can, applying the basic technology we've developed to a variety of problems."

Martinoli works with multi-robot systems and sensor/actuator networks– "mechatronic substrates", in his terminology. That means devices that involve mechanics, electronics and software. He is mainly interested in systems that are distributed in space, and that operate quickly, simultaneously, and flexibly. One of his projects involves fleets of 12cm robots equipped with odor detectors that wheel around sniffing out potential gas leaks or noxious chemicals. Once a robot gets a whiff of the desired odor, it quickly communicates its find to the rest of the robots, who then reorient themselves and refine their own searches accordingly.

In another project he contributes to the development of sensor networks that can record a range of environmental variables, in addition to adapting to the field under observation. "In the Swiss Experiment," he explains, "we essentially have a system of robots without wheels." These are the autonomous, networked meteorological stations developed in collaboration with ENAC's Environmental Fluid Mechanics and Hydrology Laboratory and two laboratories in the IC School (Profs. Vetterli and Aberer). Deployed en masse in mountain valleys, around campus, within cities – anywhere except under water, in fact – these tripod-based stations collect data on environmental variables, and then communicate between each other, bundling and "hopping" their data from one station to the next, down the chain to a "mother" station which assembles the lot and makes it instantaneously available over the internet. This is a far cry from typical atmospheric data collection and a real leap forward for environmental engineers. But Martinoli is already thinking about pushing the technology to the next level. "Now we could add mobile robotics technology to the picture. It could bring a lot of good information, but at a cost. You have to provide additional energy for self-locomotion. Could they fly? Hop? Float in the air?"

At first glance, Martinoli, who has been trained as electrical engineer and computer scientist, might seem out of his element in ENAC, working on complicated bundles of software, electronics and mechanical parts while surrounded by engineers and architects more obsessed with issues like construction projects, global warming and toxic waste removal. But the kinds of things he and his team can contribute at the application level are more than just interesting – they may open up possibilities that could revolutionize the way that civil and environmental engineers tackle their problems. And for his part, Martinoli enjoys the challenge of working on systems that operate in the very challenging conditions of the real world, instead of the typical laboratory settings electrical engineers and computer scientists are used to.

Martinoli is already thinking about pushing the technology to the next level

"Civil or environmental engineers typically use off-the-shelf modules and patch together equipment," Martinoli explains. "We go one design step below that, and buy off-the-shelf components, wire them together using printed circuit boards, and write our own firmware and software." It's not always easy to convince environmental and civil engineers that their way of doing things might be improved upon. But the possibilities are intriguing. Imagine a distributed fleet of floating robots equipped with sensors and actuators that, in the presence of a trigger – a pollutant spill, say – could join together in a chain, encircle the spill, and release remedial bacteria, for example. Or imagine a bridge that could adapt its shape to the force of the wind via a distributed network of sensor-equipped movable elements. These mechatronic challenges have to work in the real world and be cost-effective. And they also challenge ingrained ideas of what is possible and safe in engineering. Nonetheless, Martinoli firmly believes that interdisciplinary work like this can lead to breakthrough technologies in all the disciplines involved.


IN REVIEW

RESEARCH HIGHLIGHTS

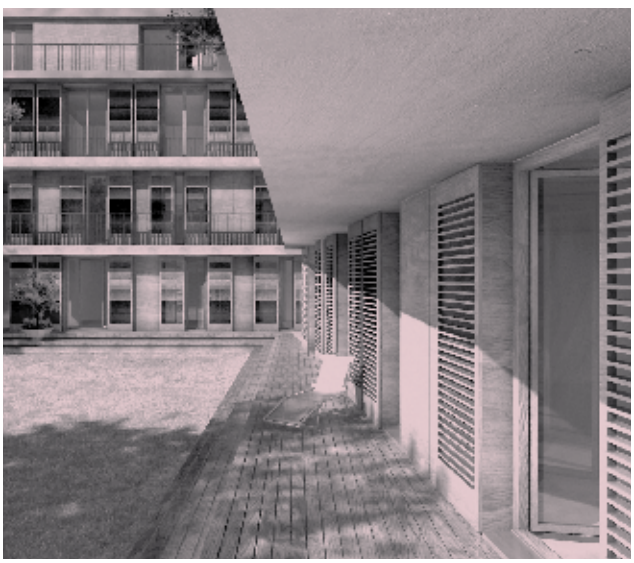
In our laboratories, some 70 investigators and their groups are advancing knowledge in the most challenging areas of architecture, civil engineering and environmental engineering research today. Highlighted here is a sampling of some of the research conducted in 2009. To learn more about the latest research by ENAC scientists, visit **http://enac.epfl.ch/research**

RETROSPECTIVE : HOUSING COMPETITIONS

The main goal of this research, conducted with the financial support of the Swiss National Science Foundation, is to study the extremely rich, almost unedited material generated from architectural competitions for collective housing that have been organized in Switzerland during the last ten years. We explore this unique platform of dialogue between the various actors in the housing market, and look at the latest architectural responses to the increasing social challenges generated by rapid changes in our living routines. We also look at the multiple implications of our contemporary notions of "shared" or "private" spaces in collective housing projects. A comparative analysis of selected projects was published in 2008, with a second edition in 2009. This work is at the top of best selling Swiss architectural books on Amazon.com.

B. Marchand - A. Katsakou
Concevoir des logements: concours en Suisse 2000-2005 2008, PPUR / ISBN-978-2-88074-553-0

Prof. Bruno Marchand
Theory and History of Architecture Laboratory 2 LTH2
http://ltha.epfl.ch/



THE FANTASTIC FORM

This architectural research and building project was undertaken by the students and collaborators of the "Digital Design and Production" course. The goal of the project was to experiment with digital production tools in the creation of a "mini-cinema" for the Centre D'Art Neuchâtel (CAN) at the Neuchâtel International Fantastic Film Festival (NIFFF). The pavilion's spiraling folded walls were designed using parametric programming to allow for fast production using the EPFL's computer-controlled fabrication machines. The material for the pavilion was provided by Alcan Composites, who encouraged the designers to play with their full range of colors and materials. Students then moved to Neuchâtel for one week to assemble and build the pavilion. The pavilion can be disassembled and will be used for future NIFFF events. The overall design was a collaboration between participants in the course, Localarchitecture, CAN, NIFFF and LAPA.

PARTICIPANTS: **N. Bauer - A. Bovet - L. Blosser - M. Buxton - Dorothee Fritzsche - T. Henry - E. Jonsson - V. Lucas - K. Marweld - L. Meyer - N. Otren - R. Perrinjaquet - S. Reymond - N. Riise**
ASSISTANTS: **H. Axelsson - L. Godet**
LECTURER: **R. Loveridge**
COLLABORATION: Localarchitecture, Centre D'Art Neuchâtel, Neuchâtel International Fantastic Film Festival
SPONSORS: Alcan Composites Switzerland, Logitech AG, Schilliger Holz AG

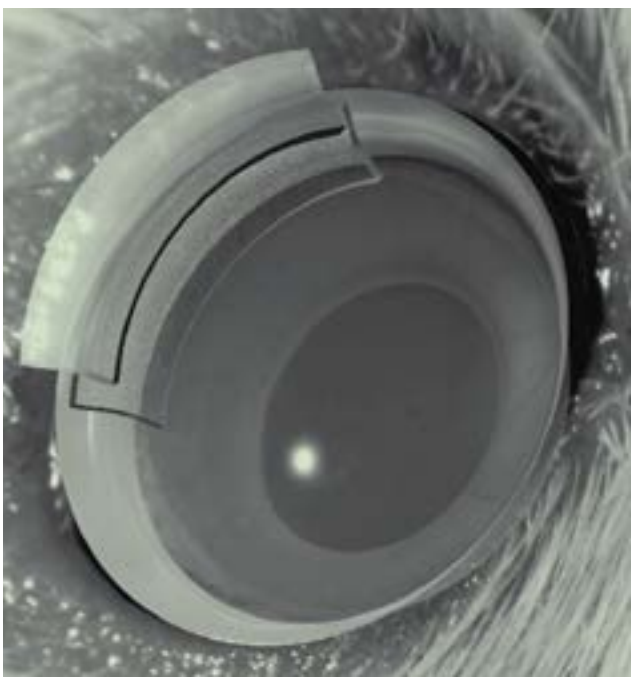
Prof. Harry Gugger
Laboratory for the production of architecture LAPA
http://lapa.epfl.ch

MODELING AND VISUALIZING STEM CELL DYNAMICS

To explain and understand the impact of physical constraints on stem cell dynamics in general, and in the cornea in particular, our lab contributed expertise in geometric modeling and visualization to the existing procedures and experiments in professor Yann Barrandon's laboratory in the School of Life Sciences. We developed models that became transdisciplinary repositories of data and fundamental collaborative research tools. This collaboration led to common thesis direction and to a publication. We also assembled a collaborative network to investigate how shape and physical environment affect stem cell behavior (and vice-versa) using a combination of state-of-the-art technologies from biology, optics, micro-engineering, architecture, civil engineering, photodynamic and signal processing in a project called Bio-architecture and Metrology.

F. Majo - A. Rochat - M. Nicolas - G. Abou Jaoudé - Y. Barrandon
Oligopotent stem cells are distributed throughout the ocular surface. Nature 456: 250-254. Epub 2008 Oct 1.
Research Highlights in Nature Reports Stem Cells Epub Oct 9 2008 release.

Prof. Georges Abou Jaoudé
Informatics and Visualization Laboratory LIV
http://liv.epfl.ch



HOW CAN WE GET CHINA AND INDIA TO ACCEPT SERIOUS CLIMATE MITIGATION?

The FP6 project TOCSIN, directed by the Economics and Environmental Management Laboratory (REME), evaluated climate change mitigation options in China and India. In particular, it investigated the strategic dimensions of cooperation in research, development and tech transfer, and the challenge of creating incentives to encourage developing countries to participate in post-2012 greenhouse gas emissions reductions. Simulations with a hybrid bottom-up/top-down model showed that increased energy R&D spending alone is not sufficient to meet a 3.5W/m2 radiative forcing target, as it provides no direct incentive for adopting new technologies and focuses on the longer term, missing near-term opportunities for cost-effective emissions reductions. A global carbon price signal would be a more effective incentive. Our simulations based on gaming logic showed that self-enforcing climate agreements can be reached with allocations of emission rights that can be traded between developing, newly industrialised and industrialised countries.

http://tocsin.epfl.ch

Prof. Philippe Thalmann
Economics and Environmental Management Laboratory REME
http://reme.epfl.ch

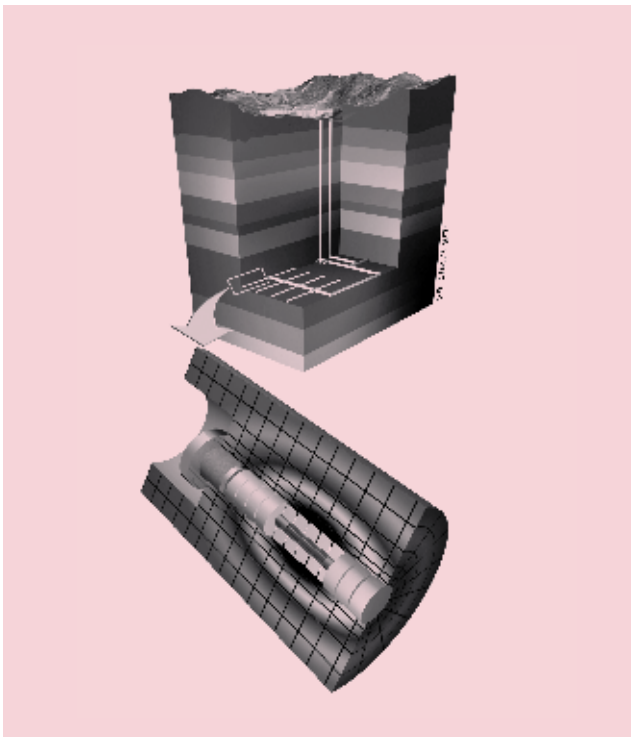
RESEARCH HIGHLIGHTS

PERFORMANCE OF CLAY BARRIERS IN GEOLOGICAL REPOSITORIES FOR RADIOACTIVE WASTE

Assessing the performance of deep geological repositories for heat-generating radioactive waste requires reliable numerical predictions of the thermo-hydro-mechanical behaviour of the clay barriers. The barriers represent an important element of the nuclear waste isolation system. Given the complexity of the involved phenomena, understanding the constitutive behaviour of clays and modeling their evolution is challenging. In the context of a European Euratom Research Programme, our group identified the fundamental behaviours of clay materials and proposed a deterministic model that is able to handle the main involved physical mechanisms in a comprehensive theoretical framework. This model is now applied to solve various engineering problems in the field of nuclear waste storage.

B. François - L. Laloui - C. Laurent
THM simulation of ATLAS in-situ large scale test in Boom Clay,
Computer and Geotechnics, vol 36, p 626-640, 2008.

Prof. Lyesse Laloui
Soil Mechanics Laboratory LMS
http://lms.epfl.ch



MODELING REINFORCED CONCRETE

The project encompasses several research activities in the Structural Concrete Laboratory (IBETON) in the field of the ultimate load capacity of concrete structures. It aims at accurately modeling the behavior of reinforced concrete structures using stress fields. On this basis, new paradigms have been developed both for the evaluation of the safety conditions of existing structures and for the design of new structures. The approach resulting from this research is used on a widespread basis, in undergraduate and graduate teaching, in research for the prediction of the ultimate load of lab specimens and in practical design applications. Visit the web site **http://i-concrete.epfl.ch** and explore several applets that allow users to investigate their own concrete structures.

N. Kostic
Topologie des champs de contraintes pour le dimensionnement des structures en béton armé,
EPFL Thesis N° 4414, 235 p., EPFL 2009

Prof. Aurelio Muttoni
Structural Concrete Laboratory IBETON
http://ibeton.epfl.ch

THERMAL BEHAVIOR OF POROUS ASPHALT IN WINTER CONDITIONS

Porous asphalts are road surface materials that are up to 22% void, which have the advantage of absorbing traffic noise and controlling surface runoff. The Federal Roads Agency does not recommend their use on bridges, due to thermal characteristics that influence winter maintenance. The Traffic Facilities Laboratory (LAVOC) was commissioned to evaluate the risk potential of using porous materials on bridges.Test sections were instrumented on the A5 and the A9 motorways to collect pertinent data on thermal behavior of different structural configurations. A finite element heat transfer model was developed to assess structures for which measurements were not available, as well to simulate extreme weather conditions. The model was calibrated with field data. Analysis of measurements and simulation results demonstrates that using porous asphalt on bridge sections does not increase operational risk compared to conventional materials, provided an adapted winter maintenance program is implemented.

M. Rodriguez - A.-G. Dumont

Applicabilité de l'enrobé drainant sur les ouvrages d'art du réseau des routes nationales ", 2008, Mandat de recherche N° AGB2004/002, Office fédéral des routes

Prof. André-Gilles Dumont
Traffic Facilities Laboratory LAVOC
http://lavoc.epfl.ch

SHELTERING FISH FROM HYDROPEAKING EVENTS

The rapid release of water from hydropower dams during peak production hours causes hydropeaking in the river down stream, threatening fish habitats. The goal of the research project is to design optimum fish shelters in riverbanks. In order to assess their attractiveness, systematic experiments were carried out in a flume with juvenile brown trout by producing hydropeaking conditions using natural water from a dam reservoir. The flume is equipped with a geometrically variable fish shelter. The best refuge configurations attracted more than 80% of the fish. The traveling trajectories of the fish were registered and correlated with flow velocity measurements in order to understand fish behavior in detail.

J.-M. Ribi - K. Steffen - J.-L. Boillat - A. Peter - A. J. Schleiss

(2009). "Influence of geometry of fish shelters in river banks on their attractiveness for fishes during hydropeaking" Proceedings of the 33rd Congress of IAHR, ISBN: 978-94-90365-01-1 Vancouver, Canada, 9.-14. August 2009, CD-Rom, pp. 6074-6081

Prof. Anton Schleiss
Hydraulic Constructions Laboratory LCH
http://lch.epfl.ch

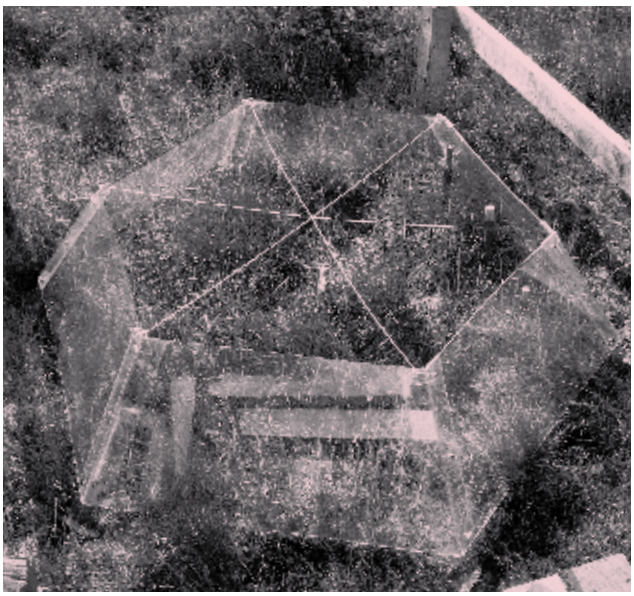
RESEARCH HIGHLIGHTS

HOW WILL GLOBAL WARMING AFFECT THE SOIL CARBON CYCLE?

The impact of climate change on terrestrial ecosystems is not straightforward: on the one hand, warming can reduce the soil organic carbon pool (SOC) by accelerating decomposition, on the other it can increase plant-derived carbon inputs to soils. Northern peatlands store approximately 30% of the global SOC, although they cover only 3-5% of the world's land area. In these ecosystems, although plant litter chemistry and anoxic soil conditions are the major factors enhancing SOC accumulation, temperature and precipitation are also important drivers. The contribution of the two main plant types, vascular plants and sphagnum mosses, to carbon accumulation and nutrient cycling differs notably. Vascular plant litter is much more decomposable than sphagnum litter, so any environmental change favoring vascular plants will reduce the rate of SOC accumulation. In addition, climate change is also expected to affect above- and below-ground soil microbe interactions, creating potentially serious feedbacks in the global carbon cycle.

L. Bragazza - A. Buttler - A. Siegenthaler - E. Mitchell
2009 Plant litter decomposition and nutrient release in peatlands. In: "Northern peatlands and carbon cycling"
Edited by: Baird A, Belyea L, Comas X, Reeve R, and Slater L. American Geophysical Union Monograph (in press).

Prof. Alexandre Buttler
Laboratory of Ecological Systems ECOS
http://ecos.epfl.ch/



USING TECHNOLOGY TO PROTECT MOUNTAIN POPULATIONS

Mountain villages concerned about the stability of hillsides and rock faces are benefiting from advanced cartographic technology. In collaboration with cantonal officials, a data-gathering platform made up of navigational and imaging devices is sent aloft in a helicopter. GPS, accelerometers and gyroscopes determine the position and orientation of the platform, which in turn defines the topographical position of the pixels in the digital images and the impact points from laser sweeps. This "direct geo-referencing" enables mapping in the absence of known reference points, as opposed to classic aerial mapping which requires a ground-based reference. The millions of data points from the laser and digital images allow engineers to model the zone in three dimensions, revealing characteristics that are important for risk analysis.

Recent developments focus on an in-flight assessment of data quality. If data for part of the zone do not meet density and precision criteria, the operator is immediately informed. The pilot can go back to the critical zone, ideally from another angle. This way, the team is sure of gathering adequate data before landing.

FIGURE CAPTION: Scan2Map airborne laser system developed conjointly between the EPFL Topometry Laboratory and the company BSF Swissphoto

Prof. Bertrand Merminod
Geodetic Engineering Laboratory TOPO
http://topo.epfl.ch/

STAKING OUT URANIUM IN THE SWISS ALPS

High up in the Alps of Eastern Switzerland at an elevation of 1,400 m, the Dischma valley offers an idyllic setting where hikers and bikers enjoy the outdoors. Through routine monitoring, the Institute for Applied Radiophysics in Lausanne identified unusually high concentrations of naturally-occurring uranium in the soil of the valley. Using porewater and soil depth profiling, radiochemical characterization of the soil and state-of-the-art techniques such as X-ray Absorption Spectroscopy at the Swiss Light Source, it was possible to pinpoint the origin of the uranium, its mechanism of accumulation in the soil as well as the nature of its binding to the soil matrix. The Environmental Microbiology Laboratory determined that the uranium was present in its oxidized form despite the oxygen-poor conditions of the soil. Follow-up work will focus on evaluating the potential risk of catastrophic release of the uranium and determining whether the Dischma valley is unique or whether there are other examples of such uranium anomalies in the Swiss Alps.

Prof. Rizlan Bernier-Latmani
Environmental Microbiology Laboratory EML
http://eml.epfl.ch/

ENAC AT LARGE

Examples of Knowledge & Technology Transfer

ALUMNI NEWS

Elie Bou-Zeid, currently professor at Princeton University (New Jersey, USA), was awarded one of four University Latsis Prizes in 2009 for his exceptional contribution to the understanding of behavior of the atmospheric boundary layer. The numerical models that he developed and refined as a postdoctoral researcher at EPFL, under the supervision of Professor Marc Parlange in the Environmental Fluid Mechanics Laboratory, are already being used by several researchers around the world.

CAREER NEWS FOR FORMER PHD STUDENTS

Yu Bai
Lecturer
Monash University, Clayton, Australia

Ralitza Boteva
Senior Architect
Cesar Pelli Architects, New Haven, Connecticut, USA

Nikolaus Correll
Assistant Professor Tenure-track
University of Colorado, Boulder, USA

David Gerber
Assistant Professor
University of Southern California, California, USA

Surapong Lertsithichai
Associate Professor
Silpakorn University, Bangkok, Thailand

Pierre Roduit
Professor
University of Applied Sciences Western Switzerland, Sion

Thomas Schroepfer
Associate Professor
Harvard University Graduate School of Design, Massachusetts, USA

Ramesh Srinivasan
Assistant Professor
University of California, Los Angeles, California, USA

Beng-Kiang Tan
Assistant Professor
National University of Singapore

M. Viviani
Professor
HEIG, Yverdon

NORTH-SOUTH COOPERATION

The Cooperation@epfl group, otherwise known as the UNESCO Chair in Technologies for Development, coordinates and promotes research on the application of technologies adapted for developing countries in the Southern Hemisphere in collaboration with EPFL laboratories. More than half the research projects done in this context involve ENAC laboratories, primarily from the Institute of Urban and Regional Sciences (INTER) and the Institute for Environmental Engineering (IIE).

One of the current projects, Info4Dourou in Burkina Faso, is being done in collaboration with the Environmental Fluid Mechanics Laboratory under the direction of Professor Marc Parlange. In this project, the hydrologic cycle in the Dourou-Singou watershed is being studied using several environmental technologies including 15 SensorScope stations. These stations, which will measure rainfall, humidity and soil temperature, windspeed, solar and terrestrial radiation over a two-year period, will permit a better understanding of the consequences – positive and negative – of deforestation.

http://eflum.epfl.ch/research/burkina.en.php

COLOR-COATED SOLAR COLLECTOR

ENAC's Solar Energy and Building Physics Laboratory and the company Swiss INSO have signed a research and technology transfer agreement in the domain of solar energy. The goal is to commercialize color-coated thermal solar collectors that are made using a nanotechnology magnetron sputtering process. This revolutionary product will allow architects to use these collectors on large surfaces, such as walls of glass buildings, improving aesthetic appeal as well as the amount of solar energy the buildings can produce.

http://www.swissinso.com

HYDROLOGY FOR EVERYONE

Predicting river flow rates is increasingly important, not only for flood protection and managing hydroelectric installations, but also for sports fishermen and aquatic sports. With this in mind, a special software application has been developed by the engineering firm e-dric.ch (Epalinges) – most of whose employees are former students from the Laboratory of Hydraulic Constructions – that offers free access to the hydrological predictions of 4,000 sites distributed over the entirety of Switzerland's waterways. These data are available in real time online.

http://www.swissrivers.ch

REAL-TIME SPATIAL VISUALIZATION OF THE ENVIRONMENT

Monitoring or studying environmental parameters is common practice these days – for example to track pollution or to monitor local atmospheric conditions in various situations (for natural disasters, airshows, control of automatic irrigation systems, or in civil engineering for constructing "green" buildings etc.). To provide this information, Sensorscope Sàrl, an ENAC start-up founded in 2009, has developed an innovative and low-cost solution. It consists of two components: first, small weather stations that are wireless, robust, flexible, very simple to set up, and that self-organize into an intelligent spatial entity that monitors the environment, and second, a system called Climaps which stores measured data online and enables data sharing between users and real-time data verification over the Internet.

http://www.sensorscope.ch

PRESS REVIEW 2009

http://actualites.epfl.ch/presse

JANUARY

EPFL and Romande Energie construct Switzerland's largest solar park
Resolutely committed to the development of renewable energies, EPFL and Romande Energie are signing a partnership agreement to construct a 20,000 square-meter photovoltaic park on the EPFL campus. Integrating research and development functions, this solar park will be progressively put into operation starting in 2009 and will eventually provide more than 2 million kWh per year of electricity. ENAC's Solar Energy and Building Physics Laboratory is heavily involved in the more than 20-million Swiss franc project.

FEBRUARY

City living
Temperatures are higher in cities than outside them, a phenomenon known as the "heat island" effect. The research of Alain Clappier from the Institute of Environmental Engineering (IIE) and Darren Robinson, from ENAC'S Solar Energy and Building Physics Laboratory, aims to reduce energy use in order to regulate heat in buildings and homes. Their work was presented in the magazine "tec21" as well as research from the Urban Architecture and Mobility Laboratory on urban railway wastelands and research from the Urban Sociology Laboratory on the choice of housing in the greater Lausanne and Bern areas.

Neuchâtel saves energy
EPFL and ENAC's Solar Energy and Building Physics Laboratory are studying the city of Neuchâtel, particularly the heating, cooling and lighting needs of its buildings. Objective: reduce non-renewable energy consumption.

MARCH

The beach at Préverenges gets a makeover
The reconstruction project for the beach at Préverenges is in full swing, conducted on the basis of analyses done by the Hydraulic Constructions Laboratory, who proposed several reconstruction variants. The renewed stretch of sand - one of the most attractive on the lake shore – will be accessible to the public starting at the end of April.

Tracking ski performance
A new method of GPS trajectory recently developed in ENAC's Topometry Laboratory makes it possible to analyze a skier's performance over an entire descent. There are many applications expected from this technology, particularly for comparative evaluation of athletic performance or for better understanding how equipment is performing.

Models on display
Seven hundred architectural models from EPFL's archives will eventually be exhibited in Rossinière, near Gruyères. The village will soon announce the purchase of the Montreux-Oberland railway building, and it is there that the miniature buildings, a veritable tour of architectural expression, will find a home. This project was initiated by Pierre Frey, art historian and ENAC professor.

APRIL

EPFL professor's project in the heart of Paris
A project proposed by Patrick Berger, ENAC professor, and Jacques Anziutti, was chosed for the renovation of the Forum des Halles in Paris. Construction will take place from 2013 to 2016 and cost 760 million euros. It's a complex operation, because it's essentially a reconstruction of the heart of Paris.

Windows that follow weather's moods
ENAC's Solar Energy and Building Physics Laboratory is developing new "intelligent" windows capable of adapting to surrounding conditions. The Laboratory's building is itself equipped with inclined elements that capture and direct light. "During the daytime, we could eliminate all artificial lighting," says Nicolas Morel.

Living in hazardous areas
Valérie November, director of the Study Group on the Spatiality of Risk in ENAC, comments on the necessity to reinvent our relationship with risks that is adapted to contemporary society. New tools for thinking about the multidimensionality of risk as well as their spatial dynamics must be developed. A challenge that will be put forward on the special day dedicated to this study that she is organizing later in the month.

MAY

The wisdom of crowds
According to Philippe Thalmann, director of ENAC's Institute of Urban and Regional Sciences, rankings of large urban areas are continuing but differ greatly depending on the criteria taken into account. This individualized ranking is based on the principle of the "wisdom of crowds".

Social realities
ENAC's Urban and Regional Planning Community has put together a statistical atlas of Western Switzerland that is not like any other. Based on the 2000 Federal Census data, this 25-map atlas updates social realities that could have political consequences. For example, the authors note, "despite talk of equality, reality shows that educational level is the most discriminating factor in urban Swiss society." This brochure was done at the invitation of the Forum des 100, organized each year by the magazine l'Hebdo.

JULY

Ouchy as lakeport
For her Master's project in architecture at EPFL, Sophie von Büren designed a lakeside train station that improved connections between lake and land-based transportation systems. The proejct, which aroused interest in the CGN and the city of Lausanne, proposed among other things a new port of entry to the city on the lake, in Ouchy.

Folded chapel wins a prize
The temporary chapel designed by a group of local architects based on a research project from ENAC's Timber Constructions Laboratory was one of four projects awarded the Lignum Prize. It's unusual form is inspired by origami, the Japanese art of paper folding. The building was selected by a jury of specialists from more than 427 objects from five regions of the canton.

AUGUST

Sun in the city
Installing solar collectors in older parts of a city can be a real headache. Houses are often attached to one another and facades offer very little space for panels. ENAC's Solar Energy and Building Physics Laboratory has undertaken a project to optimize the use of this energy in the urban setting. The tools developed in the project will be used in an experiment done in Zurich.

Feeling climate change
An article talks about SensorScope - weather stations placed all over the country whose measurements allow us to "advance our understanding of global climatic phenomena" says Martine Rebetez, Climatologist in EPFL's Institute of Environmental Engineering.

OCTOBER

Radar captures rainfall rates
Measuring and quantifying rainfall in the Alps: this is the goal of the new radar installed at Davos by ENAC's Remote Sensing Laboratory. This instrument will let us know more precisely where, how and when raindrops or snowflakes fall. The goal is to be able to improve weather predictions and avalanche bulletins, as well as to get a better picture of the overall state of water reserves.

Poetic construction
"A space for exchange and creativity, completely open to its environment," describes the future Maison de l'écriture whose groundbreaking ceremony took place recently. The "light, airy and innovative" building, under construction in Montricher, was designed by Vincent Mangeat, emeritus professor in ENAC.

The Zermatt panorama from a different point of view
At 2500 meters altitude, not far from Zermatt and the Matterhorn, "Evolver" allows visitors to discover a breathtaking panorama through a wooden structure, in an uninterrupted movement of 720 degrees. Twenty-four frames and 3500 pieces of wood were glued and screwed together to construct this astonishing structure designed by the students of the EPFL architecture studio led be Dieter Dietz.

NOVEMBER

Bern's better public transport
Research done by Marie-Paule Thomas, who is doing her thesis in ENAC's Urban Sociology laboratory, attracted the attention of the media. This engineer studied lifestyles in Bern and Lausanne. She found that Bern is better served by public transport policies and thus its city center is more accessible.

KEY MOMENTS

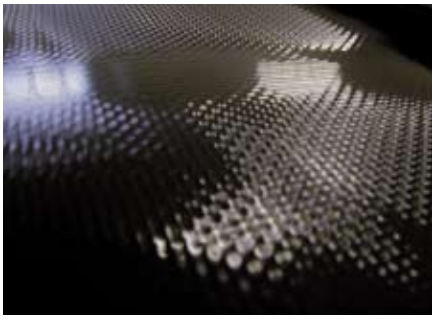
ARCHIZOOM

ARCHIZOOM, ENAC'S PERMANENT EXHIBITION GALLERY,
IS DEDICATED TO THEMED PUBLIC EXHIBITIONS OF RESEARCH AND PROJECTS ACCOMPANIED BY SEMINAR SERIES,
WITH THE GOAL OF ILLUSTRATING THE MULTIDISCIPLINARY ASPECTS OF ARCHITECTURE.

In Spring 2009, "Forms of Inquiry: the architecture of critical graphic design", produced by the Architectural Association of London, presented the increasingly productive links between graphic design and architecture. Architects were inspired by the ways in which designers present architecture as a living medium. The exhibition encouraged designers to consider how their work is making inroads in the fields of architecture and urban planning. Designers Urs Lehni, Will Holder, David Keshavjee & Julien Tavelli, Rafael Koch & Urs Hofer, Jeremy Schorderet & Cem Sever were joined by British architect Sam Jacob for demonstrations and a roundtable discussion.

In September, "Best of Architecture 2008-2009" presented the best student projects from laboratories in EPFL's Institute of Architecture. Reflecting the wide diversity of current architectural research, this collection bore witness to the curiosity and creativity of students and professors and captured the spirit of emerging architectural design.

In the fall semester 2009, "Corps Sonore" addressed the somewhat neglected issue of sound in architecture. The Archizoom gallery was transformed into a vast echo chamber, and visitors were treated to a promenade made up of "acoustic phenomena". The exhibit made the case for using sound almost like a construction material. A seminar series included architects François Wunschel & Pier Schneider, sociologist Joël Vacheron, and acoustician Eckhard Kahle. Dr. Hervé Lissek invited architects to his acoustics lab to explore the potential uses of current knowledge in acoustics.



ARCHIZOOM

EPFL - Building SG - Station 15
1015 Lausanne/Ecublens
Entry free
+41 (0) 21 693 32 31
http://archizoom.epfl.ch
Events since 1974 : http://archizoom.epfl.ch/archives

LANDOLT & CIE CHAIR

INNOVATIVE STRATEGIES FOR A SUSTAINABLE FUTURE

The first holder of the Chair, Professor Amilcare Porporato from Duke University in the US, was at EPFL until August 2009. He created an introductory course in Ecohydrology, taken by 30 Masters and PhD students.

In November 2009, we welcomed Professor Anne Nolin from Oregon State University, a specialist in snow and glacier research. She is offering a graduate level course on snow hydrology in Spring semester 2010.

THREE PUBLIC TALKS WERE HELD IN THE PAST YEAR

Food production and environmental sustainability: the question of water, by Prof. Malin Falkenmark, of the Stockholm International Water Institute (SIWI) – March 3, 2009. The speaker emphasized the importance of "green" water (in the soil and plants) in global food production, as opposed to the already deficient "blue" water (in rivers and lakes), which is used for irrigation.

"Flying Rivers", by M. Gérard Moss, Brasilia – April 23, 2009. The speaker showed how air currents that carry water vapor from Amazonia influence rainfall in southern and south-eastern Brazil, major urban and agricultural areas. Moss, a Swiss pilot, flies over these atmospheric rivers making measurements which are analyzed for the water's properties and origin.

Hydrology and biodiversity, by Prof. Ignacio Rodriguez-Iturbe, Princeton University – November 5, 2009. The speaker showed how hydrologic variables such as rainfall, and flow rates influence biodiversity, using the variety of fish populations in Mississippi river basin and the variety of vegetation in Florida as examples.

INNOVATIONS FOR A SUSTAINABLE FUTURE

EPFL - Building GC - Station 18
1015 Lausanne/Ecublens
+41 (0) 21 693 20 44
http://chaire-landoltetcie.epfl.ch

KEY MOMENTS

ENAC's public relations activities promote the School's research and teaching activities to the outside world, and bring valuable feedback from institutions, future students, lecturers, researchers, political bodies and professional associations.

INAUGURATION OF THE TRACE TRANSPORTATION CENTER @ EPFL

There is a constant and pressing need to improve our ability to move people, goods and information. To meet this challenge, it is critical to undertake cutting-edge interdisciplinary research. With this in mind, EPFL inaugurated the Transportation Center @ EPFL on April 27, 2009. Housed in the ENAC School, the new center brings together all the key expertise in EPFL in the field of transportation. TraCE will promote research and teaching in transportation, but will also serve as an interface with the international scientific community, professionals and the public.

http://transport.epfl.ch

CISBAT 2009 INTERNATIONAL SCIENTIFIC CONFERENCE

RENEWABLES IN A CHANGING CLIMATE – FROM NANO TO URBAN SCALE

The building sector is one of the largest consumers of energy and efforts must still be made to reduce its impact on the environment. New techniques such as nanotechnologies, the idea of building or land metabolism may play an essential role in a drastic reduction of our dependence on fossil fuels. Recent research and development in these areas were discussed in the international CISBAT 2009 conference, organized by the Solar Energy and Building Physics Laboratory, bringing together many specialists from academic, public and private organizations.

http://cisbat.epfl.ch

COST ACTION 859 - PHYTO2009

FINAL INTERNATIONAL CONFERENCE ON "PHYTOTECHNOLOGIES TO PROMOTE SUSTAINABLE LAND USE AND IMPROVE FOOD SAFETY"

The Phyto2009 conference, organized by the Laboratory of Environmental Biotechnology, brought 5 years of research to a close in the context of the Action COST 859. The objective of this Action was the understanding of the mechanisms of absorption/exclusion, translocation, storage/elimination of organic nutritive substances or pollutants in plants – an understanding that is necessary for better usage of plants in sustainable development and restoration of polluted sites.

http://www.phyto2009.ch

JUWI 2009 LAUSANNE

11. TREFFEN JUNGER WISSENSCHAFTLERINNEN UND WISSENSCHAFTLER AN WASSERBAUINSTITUTEN

Hydropower as a renewable energy source, flood prediction, the importance of water in environmental management - these are a few of the subjects associated with hydraulic constructions, and particularly important in the light of climate change. In 2009, the 11th annual meeting of young scientists from German-speaking hydraulics institutes was held at EPFL, under the aegis of ENAC's Hydraulic Constructions Laboratory. Participants presented and discussed their various research areas, as well as other projects underway in their respective institutions.

http://lch.epfl.ch

EPFL FORUM 2009

The EPFL Forum, an annual job fair held on campus, was the subject of a reflection into its environmental impact. The organizing committee, made up of students from various EPFL sections, including environmental engineering and science from ENAC, put together an environmental management plan that will eventually allow the Forum to obtain ISO 14 001 certification. The plan will be put in place with the help of the Economics and Environmental Management Laboratory.

http://forum.epfl.ch/index-19.html

4TH EPFL INNOVATION DAY

Corporate professionals, researchers, construction specialists and the EPFL community came together in November 2009 on the occasion of the 4th EPFL innovation day. ENAC, in the spotlight this year, showcased the diversity of innovations resulting from research done in its laboratories, notably in the areas of architecture, "green" construction and new structural construction techniques. Three professors, each one representing a section of ENAC, presented a perspective: Inès Lamunière, Jean-Louis Scartezzini and Eugen Brühwiler.

FIELD TRIP TO BAHRAIN

From December 5-18, 2009, twenty EPFL architecture students went on a field trip to the Kingdom of Bahrain. The goal of the trip was to draw up urban development projects in the areas of urbanism, transportation, environment, education and tourism, then to combine the projects to come up with an urbanization plan – a Cultural Master Plan (CMP) – for the kingdom. This field exercise was the result of a collaboration between the Architectural Production Laboratory, the Ministry of Culture and Communication and the department of Civil Engineering and Architecture at the University of Bahrain.

http://wiki.epfl.ch/lapa-students-bahrain

SAMPLING OF INTERNATIONAL EVENTS ORGANIZED BY OUR SCHOOL'S LABORATORIES

08+30/01/2009
Workshops "Le territoire sécurisé des grandes manifestations, le cas de l'Euro 2008 de football à Genève" – Study Group on the Spatiality of Risks & Urban Sociology Laboratory

18-22/01/2009
Spring Seminar of the "3ème cycle romand de Recherche Opérationnelle" – Transportation and Mobility Laboratory

24-28/03/2009
Discrete Choice Analysis: Predicting Demand and Market Shares – Transportation and Mobility Laboratory

30/04/2009
International workshop "Habiter les territoires à risques" – Study Group on the Spatiality of Risks

30/04/2009
Colloquium "Prévisions de débit des rivières suisses: hier, demain et aujourd'hui" – Hydraulic Constructions Laboratory

17-19/06/2009
International Society for Rock Mechanics, ISRM-CRD Workshop on Rock Dynamics – Rock Mechanics Laboratory

21-26/06/2009
Mountain risks intensive course "Multi-technique landslide investigation for hazard assessment" – Soil Mechanics Laboratory

16/07/2009
16th Assembly, European Group for Intelligent Computing in Engineering – Applied Computing and Mechanics Laboratory

26-29/08/2009
11. Treffen Junger Wissenschafterinnen und Wissenschafter an Wasserbauinstituten – Hydraulic Constructions Laboratory

27-29/08/2009
Fifth Workshop on Discrete Choice Models – Transportation and Mobility Laboratory

02-03/09/2009
CISBAT 2009 International Scientific Conference, Renewables in a Changing Climate – From Nano to Urban Scale – Solar Energy and Building Physics Laboratory

03-04/09/2009
Seventh Joint Operations Research Days – Transportation and Mobility Laboratory

09-11/09/2009
Swiss Transport Research Conference – Transportation and Mobility Laboratory, Traffic Facilities Laboratory, Intermodality and Transport Planning Group

14-16/09/2009
R'09 Twin World Congress & World Resources Forum – EPFL-PSI Joint Professorship on Solid Waste Treatment

08-09/10/2009
19th Ph.D. Workshop on International Climate Policy – Economics and Environmental Management Laboratory

08-09/10/2009
3ème école "Sustainability, so what? Retour critique sur les promesses du développement urbain durable" – Urban Sociology Laboratory

12/10/2009
Final conference of the FP6 TOCSIN project – Economics and Environmental Management Laboratory

12-16/10/2009
COST Action 859 - Phyto2009, Final International Conference on "Phytotechnologies to promote sustainable land use and improve food safety" – Laboratory for Environmental Biotechnology

15/10/2009
Workshop "Mesurer la performance des structures" – Applied Computing and Mechanics Laboratory

15-17/10/2009
ALERT European Doctoral School "Geomaterials on Failure in multiphase materials" – Soil Mechanics Laboratory

20-27/10/2009
"From Borromini to Botta: history, heritage and new technologies", Lebanese American University, Beyrouth – Informatics and Visualization Laboratory

22-25/10/2009
Association for Computer Aided Design In Architecture, ACADIA 09: reForm() – Laboratory for the production of architecture

30/11/2009
Symposium "Nanotechnologies: potentialités et risques pour l'homme et l'environnement" – Laboratory for Environmental Biotechnology, Environmental Biophysical Chemistry Group

FACULTY

NEW PROFESSORS APPOINTED AT ENAC IN 2009

Katrin Beyer

Tenure-track Assistant Professor of structural engineering

Katrin Beyer is a high-level experimentalist in seismic engineering. She converts experimental results into original modeling to develop modern engineering methods. She will work in close cooperation with Swiss professionals, as is encouraged at ENAC.
Katrin Beyer was born on February 28, 1977 in Stuttgart and is a German citizen. She completed her master of sciences in civil engineering in February 2001, and was awarded a medal for the superlative quality of her master's thesis project. In December 2007, she earned her doctorate at the University of Pavia (Rose School) for her work on the seismic design of structures. Since January 2008, she has held a postdoctoral position in the Department of Civil Engineering at the Swiss Federal Institute of Technology in Zurich (ETHZ).
Assistant Professor Beyer has received seven honors, including the following most recent: a scholarship from the Swiss Society for Earthquake Engineering and Structural Dynamics (SGEB); the Willi Studer Award for the best degree in Civil Engineering; and the ETHZ medal for the best final thesis in Civil Engineering.

Fernando Porté-Agel

Full Professor of environmental systems

Fernando Porté-Agel has made major, internationally-recognized contributions to understanding physicochemical transport and transformation processes that occur across a broad spectrum of space-time scales within complex environmental systems. He developed an innovative parameterization scheme (large-eddy simulation closure) that has considerably improved the quality of numerical simulations of flows at air/ground interfaces. He continued this development by incorporating the physical effects of the turbulent energy cascade in the surface layer of the atmosphere. He also has suggested an approach based on a multifractal closure scheme.
Professor Porté-Agel was born in 1968 and is a Spanish citizen. He completed his engineering degree in 1992, followed by a master of science in hydrology from the Institute of Hydraulic Engineering at UNESCO-IHE (Institute for Water Education) in Delft (Netherlands) in 1995. He then moved on to Johns Hopkins University to earn a master's degree in environmental engineering in 1998 and a doctorate in the same discipline in 1999. During his academic training, he also held various jobs as an engineer in Kenya and a research assistant in Spain, Holland, and California.
In 2000, he was hired as an assistant professor by the University of Minnesota's Department of Civil Engineering, where he was selected as the McKnight Land-Grant professor, then promoted to associate professor in 2006. In 2004-2005, he was a visiting professor at ENAC. Since 2005, he has held an associate professorship in the University of Minnesota's Department of Civil Engineering.
Professor Porté-Agel has received eight academic distinctions in the form of prizes, honors and grants. Among these are the NASA New Investigator Award, the National Science Foundation CAREER Award, the McKnight Land-Grant Professorship, and the McKnight Presidential Fellowship.

Nikolas Geroliminis

Tenure-track Assistant Professor of transportation engineering

Most of Nikolas Geroliminis' research focuses on traffic operations and urban systems. He helped to develop an incident management system to provide roadside assistance for vehicle breakdowns and prevent traffic jams during rush hours. He also designed a model for locating vehicles experiencing emergencies in urban networks. This research was the basis on which an analytical tool for the California Freeway Service Patrol was created.
A Greek citizen, Nikolas Geroliminis was born in 1980. He earned a bachelor's degree with a major in transportation engineering from the National Technical University of Athens. Following a master's degree in civil and environmental engineering, he completed a doctorate at University of California at Berkeley. Since that time, he has been a tenure-track assistant professor in the University of Minnesota's Department of Civil Engineering.

PROMOTIONS

Full Professor
Bruno Marchand

Senior Scientists
Pierino Lestuzzi
Jan Skaloud

Research and Teaching Associates
Erik Bollaert
Luca Rossi

DEPARTURES

Prof. Isabelle Bey
Prof. Pierre Chuard

ENAC FACULTY MEMBERS APPOINTED OUTSIDE EPFL

Dr. Darren Robinson
Visiting Professor
VTT Technical Research Centre of Finland

Prof. Lyesse Laloui
Adjunct professor
School of Civil and Environmental Engineering,
Duke University, Durham, USA

Prof. André Mermoud
Associate Professor
Institut International d'Ingénierie de l'Eau et de l'Environnement (2iE),
Ouagadougou, Burkina Faso

VISITING PROFESSORS AND ACADEMIC HOSTS 2009

Architecture
Jean-Pierre Adam - Marco Bakker - Alexandre Blanc - Andreas Bründler - Daniel Buchner - Bernard Cache - Bernard Delefortrie - Stylianos Dritsas - Bill Dunster - Laurent Geninasca - Christian Gilot - Jean-Paul Jaccaud - Bernard Khoury - Uli Kirchhoff - Franco La Cecla Pier - Nicola Pagliara - Camilo Rebelo - Deborah Saunt - Stephen Taylor - Han Tumertekin - Bernard Zurbuchen - Maria Zurbuchen-Henz

Civil Engineering
William Annable - Sergio Brena Flores - Antonio Cardoso - Carlos Carranza - William Curtin - Paulo De Sousa Cruz - Roger Denlinger - George Exadaktylos - Pierre Gosselet - John Mark Gray Peer Haller - Alfred Hatt - Tomasz Hueckel - Raul Radovitzky - Chunan Tang - Stephen Wittkopf

Environmental Engineering
Keith Beven - Wilfried Brutsaert - Ronald Calhoun - Elena Comino - Colin Cunningham - Irineu Da silva - Stephen Drake - Lyatt Jaeglé - Dorothy Parker - Lubomir Pavlov - Sjoerd Van der Zee

Urban & Regional Planning
Wieslaw Kubiak - Jill Litt - Datta Madamwar - Ashok Pandey - Carlos Soccol

ENAC
Anne Nolin - Amilcare Porporato

DISTINCTIONS & AWARDS

Our School has made an impact in the world: here is a sampling of some awards received in 2009

EUROPEAN RESEARCH COUNCIL STARTING INDEPENDENT RESEARCHER GRANT

The European Research Council (ERC) Starting Independent Researcher Grants target promising researchers who have the proven potential of becoming independent research leaders. Of up to 2 millions for 5 years, these grants aim to allow them to establish or consolidate a proper research team and to start conducting independent pioneering frontier research in any field of science, engineering and scholarship.

Professor Jean-François Molinari, director of the Computational Solid Mechanics Laboratory, is winner of the ERC Starting Grant competition in the domain of Physical Sciences and Engineering with a project entitled "Uncovering the Origins of Friction".

http://lsms.epfl.ch

L'ORÉAL SUISSE FELLOWSHIP "FOR WOMEN IN SCIENCE"

L'Oréal Suisse's fellowship program, established in cooperation with the Swiss Commission for UNESCO and the Swiss Academy of Sciences, aims to encourage more women to undertake scientific research careers and to promote excellence. Every two years, fellowships of 160,000 Swiss francs are awarded. Barbara Morasch, staff scientist in ENAC's Environmental Chemistry Laboratory, won one of the three l'Oréal Suisse fellowships for 2009. This funding will support a research project entitled "Presence, dynamics and destiny of micropollutants in a karst aquifer (Yverdon-les-Bains, Switzerland)".

http://lce.epfl.ch

UNIVERSITY ORGANIZATION FOR SUSTAINABLE DEVELOPMENT PRIZE (OUI-DD)

The OUI-DD Prize recognizes students who have undertaken projects in sustainable development. This means that the research projects, no matter what field of specialty, must include in its approach the economic, social and environmental implications of the subject treated. In 2009, three of four awards were for projects done in ENAC:

"The use of local materials in school buildings in Mali" and "A professional training center for stonemasons in Bamako-Mali" by Claire Bufflier (Architecture section).

"Development of a methodology to determine the most sustainable option for treating agricultural waste in a medium-sized African subsaharan village. Application in the town of Sokodé, in Togo", by Philippe Reymond (Environmental Engineering and Sciences section).

"Development of a reference for sustainable usage of construction materials in Geneva. Application for gravel and construction timber" by Roman Nägeli (Civil Engineering section).

Teaching and Research Awards

Arey, Samuel
Prix Polysphère 2008-2009 for the best teacher of ENAC School EPFL Lausanne

Blunier, Pascal
CHGEOL Award 2009 for his PhD Thesis, Swiss Association of Geologists

Bou-Zeid, Elie
"Prix Latsis universitaire 2009" Genève

Brühwiler, Eugen - Menétrey, Philippe
2008 International Association for Bridge and Structural Engineering (IABSE) Outstanding Paper Award, 33rd IABSE Symposium, Bangkok, Thailand

Collins, Pamela
Young Scientist Meeting poster prize, PAGES 3rd Open Science Meeting, Corvallis, USA

Costanza, Enrico - Huang, Jeffrey
Honorable Mention Paper Award by the Association for Computing Machinery, annual conference on Computer-Human Interaction CHI 2009, Boston, Massachusetts, USA

Dietz, Dieter - Egg, Urs - Meili, Christian - Baur, Raffael - Vischer, Dieter / UNDEND Architecture AG Zurich
Invited competition "Neubau Life Sciences", Universität Basel, Basel
2nd prize "Ersatzneubau Kinderkrippe", Kinderhaus Entlisberg, Zurich
Invited competition "Studienwettbewerb" Park Altenrhein, St. Gallen

Di Loreto, Giovanna / Gherardelli & Di Loreto
4th prize Concours pour l'agrandissement et la transformation de l'espace de vie enfantine du Pinchat, Carouge, Genève

François, Bertrand
ALERT Geomaterials PhD Prize 2009

Frejinger, Emma
2008 Eric Pas Dissertation Prize from the International Association for Travel Behaviour Research (IATBR)

Haldi, Frédéric
Best Student Paper Award, 11th International Building Performance Simulation Association Conference and Exhibition, Glasgow, UK

Haldi, Frédéric - Robinson, Darren
Building and Environment Journal 2009 Best Paper Award

Heger, Thierry
Second best poster award, Biosyst EU meeting, Leiden, Netherlands

Hurtubia, Ricardo et al.
Ranked 3 in the top 25 hottest articles of the Journal Transportation Research Part B for the period January-March 2009

Kaufmann, Vincent
Prix APERAU 2009 de l'Association pour la Promotion de l'Enseignement et de la Recherche en Aménagement et Urbanisme, Paris, France

Labelle, Guillaume - Nembrini, Julien - Huang, Jeffrey
Best Presentation Award, 12th International CAAD Futures Conference, Montréal, Canada

Laloui, Lyesse
"Fondazione Cassa di Risparmio di Padova e Rovigo" award for Visiting Professorship, Doctoral School in Civil and Environmental Engineering, University of Padova, Italy

Lochmatter, Thomas
Best Poster Prize in the category Mobile and Distributed Robotics, EPFL research day, Lausanne

Ludwig, Christian et al.
1st best poster prize, Colloquium Analytische Atomspektroskopie, Freiberg, Germany / 2nd best poster prize, European Winter Conference on Plasma Spectrochemistry, Graz, Austria

Mestelan, Patrick / Bureau Patrick Mestelan & Bernard Gachet
4th prize and selected for the runoff, "Concours pour la construction d'un établissement de détention pour mineurs à Palézieux", Vaud
7th prize "Concours pour la réalisation d'un collège et d'un P+R à Frontenex", Genève

Molinari, Jean-François
ERC Starting Independent Researcher Grant

Morasch, Barbara
Bourse L'Oréal Suisse "For Women in Science", Berne/Genève

Nuth, Mathieu
Dimitris N. Chorafas Foundation Research Award in the category "Sustainable development" for his PhD Thesis, EPFL Lausanne

Nuth, Mathieu - Laloui, Lyesse
Top most-cited article in the International Journal for Numerical and Analytical Methods in Geomechanics

Obrzud, Rafal
EPFL doctorate award, EPFL Lausanne

Parlange, Marc
AGU 2009 Hydrologic Science Award, San Francisco, USA

Robin, Thomas - Antonini, Gianluca - Bierlaire, Michel - Cruz Javier
Ranked 1 in the top 25 hottest articles of the Journal Transportation Research Part B for the period January-March 2009

Schär, Philippe
Best presentation award, Intitute of Navigation, Satellite Division Technical Meeting 2009, Savannah, Georgia, USA

Skaloud, Jan
Nominated as one of the 50 world's most influential scientists in the field of satellite navigation by the GPS World Journal

Smith, Ian et al.
Journal of Computing in Civil Engineering 2008 Best Paper Award

Staufer, Astrid - Hasler, Thomas / Staufer & Hasler Architekten AG
1st prize "Hauptpost Frauenfeld, Neubau und Sanierung", Thurgovie 1st prize "Kantonsspital Münsterlingen, Umbau und Erweiterung", Thurgovie

Steubing, Bernhard
Best Poster Award, International Workshop on Coping with Crises in Complex Socio-Economic Systems, ETH Zurich

Stoos, Maja Christina / Stoosarchitekten
1st prize "Erweiterung Alterswohnzentrum Gässlacker", Obersiggenthal, Argovie / 2nd prize "Alters- und Pflegeheim Würenlingen", Argovie

Suàrez, Guillaume - Slaveykova, Vera et al.
Best poster presentation, Fall Meeting of the Swiss Chemical Society, EPFL Lausanne

Weinand, Yves
Nominated as one of the "100 personnalités qui font la Suisse romande" by the Newspaper "L'Hebdo"

Weinand, Yves / Bureau d'études Weinand
Prix Lignum 2009 région ouest pour la Chapelle provisoire de Saint-Loup, PROHOLZ Lignum, Luzern / Winner of concours pour le nouveau bâtiment du parlement à Lausanne (pour la partie génie civil)

DISTINCTIONS & AWARDS

Bs/Ms student awards

PRIX A3-EPFL - ARCHITECTURE
Chrisoph Schwander / Architecture

PRIX ARDITI
Lorraine Beaudoin / Architecture
Christophe Joud / Architecture

ASEA BROWN BOVERI LTD. (ABB) AWARD
Nathanaël Chollet / Architecture
Yann Gramegna / Architecture

PRIX DE L'ASSOCIATION INGÉNIEURS GÉOMÈTRES DE SUISSE OCCIDENTALE
Hugues Fournier / Environmental Engineering
Timothée Produit / Environmental Engineering

PRIX BCV
Julien Charmion-Henry / Architecture
Antoine Costa / Architecture
Cyrille Deshusses / Architecture
Marie Dougoud / Architecture
Charlotte Glatt / Architecture
Aline Juon / Architecture
Olga Kirikova / Architecture
Youri Kravtchenko / Architecture
Dany Maroonian / Architecture
Jérémie Waechter / Architecture

PRIX BETON HOLCIM
Léonard De Rham / Architecture
Albert Schrurs / Architecture

PRIX BG INGÉNIEURS-CONSEILS: CONSTRUCTION ET DEVELOPPEMENT DURABLE
Isabelle Dorsaz / Architecture

PRIX BG INGÉNIEURS-CONSEILS: SYSTÈMES ET DÉVELOPPEMEMT DURABLE
Magali Bassan / Environmental Engineering

PRIX DE LA COMMUNE DE CHAVANNES
Alexandre Monnin / Civil Engineering

CSD AWARD
Dorothéa Spuhler / Environmental Engineering

PRIX DE LA COMMUNE D'ECUBLENS
Khuê Tran / Architecture

DISTINCTION GCO (GROUPE SPÉCIALISÉ POUR LA CONSERVATION DES OUVRAGES SIA)
Nikolaos Sofras / Architecture
Bruno Duarte / Architecture
Manuel Potterat / Architecture

PRIX GEOSUISSE - SOCIÉTÉ SUISSE DE GÉOMATIQUE ET DE GESTION DU TERRITOIRE
Paul Miguet / Environmental Engineering

LUCE GRIVAT AWARDS
Bastien Etter / Environmental Engineering

PRIX JACQUES MARTIN-ZWAHLEN & MAYR
Christoph Berger / Civil Engineering
Eric Lattion / Civil Engineering

PRIX MAURHOFER
Germaine de Bazelaire de Boucheporn / Architecture
Elodie Roy / Architecture

MERIT PRIZE EPFL
Thomas Austerveil / Architecture

ORBEL 2009 AWARD OF THE BELGIAN OPERATIONS RESEARCH SOCIETY
Arnaud Vandaele / Civil Engineering

PRIX ORLANDO LAUTI
Lorraine Beaudoin / Architecture

PRIX DE L'ORGANISATION UNIVERSITAIRE INTERFACULTAIRE POUR LE DÉVELOPPEMENT DURABLE (OUI-DD)
Claire Bufflier / Architecture
Roman Nägeli / Civil Engineering
Philippe Reymond / Environmental Engineering

PRIX SIA SECTION VAUDOISE
Xavier Apotheker / Architecture
Antoine Costa / Architecture
Gaëtan Evéquoz / Architecture
Martin Latham / Architecture
Micaela Lepori / Architecture
Christoph Schwander / Architecture

PRIX SGEB - SOCIÉTÉ SUISSE DU GÉNIE PARASISMIQUE
Christoph Berger / Civil Engineering
Eric Lattion / Civil Engineering

PRIX SHS
Nicolas Badin / Architecture
Lorraine Beaudoin / Architecture
Christophe Joud / Architecture

PRIX STÜCKY
Lee Franck / Civil Engineering

PRIX UPIAV - UNION PATRONALE DES INGÉNIEURS ET ARCHITECTES VAUDOIS
Elsa Beniada / Architecture
Gaëlle Jenni / Architecture
Noémie Jeunet / Architecture
Lukas Manz / Architecture
Thibaud Meynet / Civil Engineering
Alexandria Ming Aerni / Architecture

PRIX ZANELLI
Thibaud Meynet / Civil Engineering

BOOKS

The full list of ENAC's scientific output is available online:
http://infoscience

XX^{e} – UN SIÈCLE D'ARCHITECTURES À GENÈVE

Promenades
Catherine Courtiau - Isabelle Claden - Christian Bischoff
Infolio Editions, Gollion 2009 - ISBN 978-2-88474-078-4

QUELQUES RUES D'AFRIQUE

Observation et gestion de l'espace public à Abidjan, Dakar et Nouakchott
Jérôme Chenal - Yves Pedrazzini - Gueladio Cisse - Vincent Kaufmann
Les éditions du Lasur, Lausanne 2009 - ISBN 978-2-9700357-6-3

LES EXPERTS DE LA RECONSTRUCTION

Figures et stratégies de l'élite technique dans l'Europe de l'après-guerre
Gli esperti della Ricostruzione, Figure e strategie dell'élite tecnica nell'Europa del dopoguerra
Elena Cogato Lanza - Patrizia Bonifazio
Edition MétisPresses, Genève 2009 - ISBN 978-2-940406-15-9

LE DESSIN COMME LANGAGE

Charles Duboux
Presses Polytechniques et Universitaires Romandes, Lausanne 2009
ISBN 978-2-88074-844-9

GÉOPOSITIONNEMENT ET MOBILITÉS

GPS, Egnos et Galileo...
Maxime Wack - Ahmed Nait-Sidi-Moh - Jaafar Gaber - Pierre-Yves Gilliéron Yves Alexandre
Pôle éditorial multimédia UTBM, Belfort 2009 - ISBN 2-914279-40-X

L'ISTITUTO MARCHIONDI SPAGLIARDI DI VITTORIANO VIGANO

Franz Graf - Letizia Tedeschi
Mendrisio Academy Press, Mendrisio 2009 - ISBN 978-888762443-4

STAUFER & HASLER ARCHITECTS

Thesis, Methods, Buildings
Astrid Staufer - Thomas Hasler - Gian-Marco Jenatsch
Verlag Niggli AG, Sulgen - ISBN 978-3-72120-661-6

INTERACTIVE ARTIFACTS AND FURNITURE SUPPORTING

Collaborative Work and Learning
Pierre Dillenbourg - Jeffrey Huang - Mauro Cherubini
Springer, Berlin 2009 - ISBN 978-0-387-77233-2

PONTS EN ACIER

TGC vol12, Conception et dimensionnement des ponts métalliques et mixtes acier-béton
Jean-Paul Lebet - Manfred A. Hirt
Presses Polytechniques et Universitaires Romandes, Lausanne 2009, ISBN 978-2-88074-765-7

ANALYSE ET DIMENSIONNEMENT SISMIQUES

Comportement sismique, dimensionnement en capacité, construction parasismique
Pierino Lestuzzi
TECHNOSUP Ellipses, Paris 2009 - ISBN 978-2-7298-4143-0

COMPOSITION NON-COMPOSITION

Architecture et théories, XIXe - XXe siècles
Jacques Lucan
Presses Polytechniques et Universitaires Romandes, Lausanne 2009, ISBN 978-2-88074-789-3

MOBILITIES AND INEQUALITY

Timo Ohnmacht - Hanja Maksim - Manfred Max Bergman
Ashgate, London 2009 - ISBN 978-0-7546-7495-5

QUARTIER ECOPARK / ECOPARC QUARTER

Bauart #2
Bruno Marchand
Birkhäuser, Basel 2009 - ISBN 978-3-7643-9945-0

BOOKS

FRANÇOIS MAURICE / ARCHITECTE

Bruno Marchand

Infolio Editions, Gollion 2009 - ISBN 978-2-88474-149-1

UN MONUMENT HISTORIQUE CONTROVERSE

La Caisse d'allocations familiales à Paris 1953-2008

Giulia Marino

Editions Picard, Paris 2009 - ISBN 978-2-7084-0846-3

GEOLOGY - BASICS FOR ENGINEERS

Aurèle Parriaux

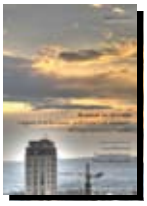
Taylor & Francis, London 2009 - ISBN 978-0-415-46165-8

HABITAT EN DEVENIR

Enjeux territoriaux, politiques et sociaux du logement en Suisse

Luca Pattaroni - Vincent Kaufmann - Adriana Rabinovich

Presses Polytechniques et Universitaires Romandes, Lausanne 2009, ISBN 978-2-88074-785-5



SENSIBILITES PRAGMATIQUES

Enquêter sur l'action publique

Fabrizio Cantelli - Marta Roca i Escoda - Joan Stavo-Debauge - Luca Pattaroni

Peter Lang AG, International Academic Publishers, Bern 2009
ISBN 978-90-5201-571-2

LE ALPI SOTTO SERRA

L'esempio della Svizzera di fronte ai cambiamenti climatici

Martine Rebetez

Edizioni Casagrande, Bellinzona, 2009 - ISBN 978-8-87713-554-4

IL GOVERNO DELL'ACQUA

Ambiente naturale e ambiente costruito

Andrea Rinaldo

Marsilio Editori S.p.A., Venezia 2009 - ISBN 978-88-317-9833-4

DATA MINING : APPLICATIONS IN CIVIL ENGINEERING

Sandro Saitta - Raphael Benny - Ian Smith

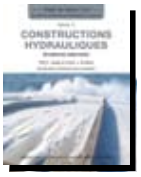
VDM Verlag Dr. Müller, Saarbrücken 2009 - ISBN 978-3-639-20756-9

CONSTRUCTIONS HYDRAULIQUES : ÉCOULEMENTS STATIONNAIRES

TGC vol12 / Nouvelle édition entièrement revue et augmentée

Willy H. Hager - Anton J. Schleiss

Presses Polytechniques et Universitaires Romandes, Lausanne 2009 - ISBN 978-2-88074-746-6



REMOTE SYNCHRONIZATION METHOD FOR THE QUASI-ZENITH SATELLITE SYSTEM

Fabrizio Tappero

VDM Verlag Dr. Müller, Saarbrücken 2009 - ISBN 978-3-639-16004-8

YVES WEINAND, ARCHITECTE + DAMIEN DARCIS, PHILOSOPHE

Yves Weinand - Damien Darcis

Fourre-Tout Editions, Liège 2009 - ISBN 978-2-930525-04-4

DEGRADATION PROCESSES OF RAILWAY SWITCHES & CROSSINGS

Willem-Jan Zwanenburg

Suedwestdeutscher Verlag fuer Hochschulschriften
Saarbruecken 2009 - ISBN 978-3-8381-0516-1

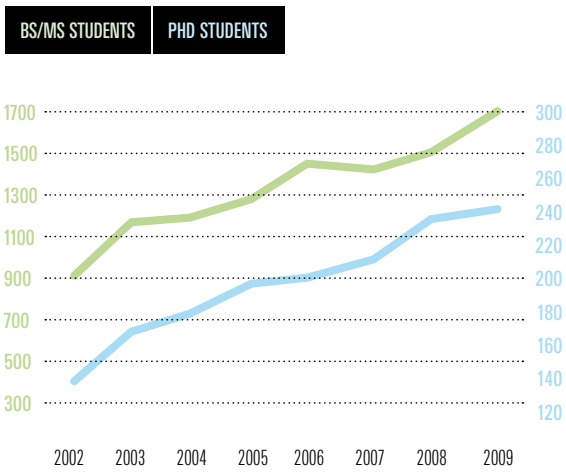
FACTS & FIGURES

1944 students, including 242 PhD students who contribute to ENAC's long-term research
619 collaborators, or 488 full-time equivalent positions
74 million CHF — total budget of ENAC
63 % of staff between 20 and 40 years old
58 nationalities
69 research and technology transfer agreements, for an amount of 8.4 millions CHF

PEOPLE 31.12.2009

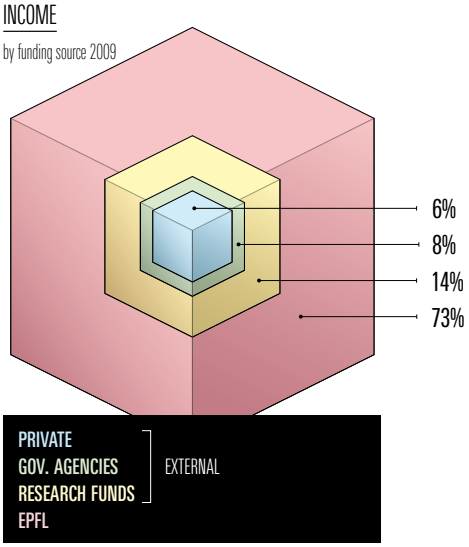
	No.	% WOMEN	% FOREIGNERS
PROFESSORS	47	13%	43%
ADJUNCT PROFESSORS & SENIOR SCIENTISTS	17	6%	47%
SCIENTIFIC COLLABORATORS	405	33%	57%
TECHNICAL & ADMINISTRATIVE STAFF	150	51%	11%
BS/MS STUDENTS	1655	38%	32%
PHD STUDENTS	242	35%	64%

STUDENT NUMBERS

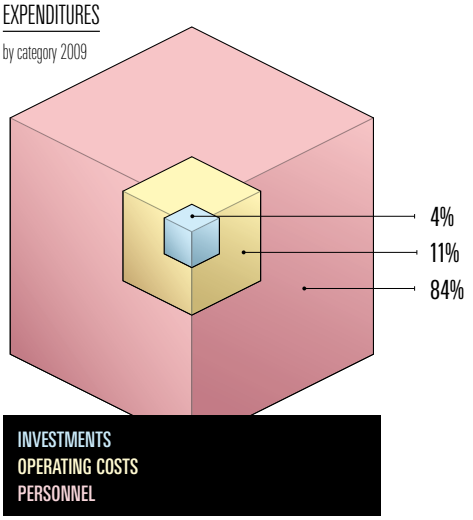


FINANCES

INCOME
by funding source 2009



EXPENDITURES
by category 2009



INCOME BY FUNDING SOURCE 2002-2009 In Mio CHF rounded up

	2002	2003	2004	2005	2006	2007	2008	2009
EPFL	51	49	48	51	50	53	50	53
EXTERNAL	24	24	21	22	17	20	20	20
TOTAL	75	73	69	73	67	73	70	73

EXPENDITURES BY CATEGORY 2002-2009 In Mio CHF rounded up

	2002	2003	2004	2005	2006	2007	2008	2009
PERSONNEL	63	59	58	59	57	59	60	62
OPERATING C.	10	11	9	11	8	10	8	8
INVESTMENTS	2	2	1	3	2	3	2	3
TOTAL	75	73	69	73	67	73	70	73

CREDITS

PROJECT SUPERVISORS

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Jean-Denis Bourquin
Cyril Veillon

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Aurelio Muttoni
André-Gilles Dumont
Anton Schleiss
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Rizlan Bernier-Latmani

DESIGN

Basile Geiser

PHOTOGRAPHS

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Alain Herzog / p. 1, 5.2, 11-12, 12-13, 28.1, 30-31, 57
Hendrik Huwald / p. 5.6, 28.2, 28.3
Alptransit / p. 5.4, 21
Joël Tettamanti / p. 8
Jacques Martinet / p. 28.4
Olivier Couach / p. 38
Margi Moss / p. 41
Thomas Mohringer / p. 42
Russell Loveridge / p. 43

PRINTING

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Dynamic list on the web: **http://enac.epfl.ch/faculty**

ENAC FACULTY

A

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EXPERTISE
The architectural model and the digital model as representation of the project, Photogaphy and digital photo architecture and hyperreality of the domain of computer science

ANCEY Christophe
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EXPERTISE
Rheology & fluid dynamics of geophysical flow and the resulting hazards, Modeling of natural hazards induced by water and avalanches, Physics of bed load transport

AREY J. Samuel
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EXPERTISE
Environmental chemical processes affecting organic pollutants, Computational quantum chemistry and thermodynamics, Phase partitioning and sorption models, Oil spills Two-dimensional gas chromatography GCxGC

B

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EXPERTISE
Water quality, Contaminated land/soils, Numerical modelling, Constructed wetlands

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EXPERTISE
Urban project, Construction technologies, Energy considerations for building

BERGER Patrick
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EXPERTISE
Understanding and representation of the natural and built environment, Project at different scales of environment and architecture

BERNE Alexis
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EXPERTISE
Remote sensing (radar, microwave,...), Hydrometeorology, Geostatistics

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EXPERTISE
Metal-microbe interactions, metal bioremediation, gene expression, Biogenic nanoparticles, geobiology

BEYER Katrin
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EXPERTISE
Performance-based seismic design and assessment of structures, Displacement-based design, Seismic behaviour of reinforced concrete and unreinforced masonry structures Large-scale testing, Structural dynamics

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EXPERTISE
Transportation analysis, Operations research, Discrete choice models, Nonlinear optimization

BOLAY Jean-Claude
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EXPERTISE
Social practices in urban societies, Rural-urban Interface, Urban environment and social disparities, Director a.i. for International Cooperation

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EXPERTISE
Safety and reliability of existing structures, Durability of reinforced concrete structures, Ultra-high performance fibre reinforced concrete for the rehabilitation of structures

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EXPERTISE
Ecology, quantitative methods, Ecosystem and landscape restoration and management Biodiversity, Biogeochemical cycles, Wetlands, pasture woodlands, invasions

C

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EXPERTISE
Architectural drawing, Graphical expression

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EXPERTISE
Theory of urban and territorial design, History of urbanism

D

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EXPERTISE
Analytical chemistry of environmental trace pollutants, Fate and impact of contaminants in the ecosystem, Water quality, Scientific cooperation with developing countries

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EXPERTISE
Rehabilitation of reinforced concrete structures, Enginneering and applications of Ultra High Performance Fibre Reinforced Concretes, Time dependent response of cementitious materials

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DESIGN STUDIO ON THE CONCEPTION OF SPACE ALICE
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EXPERTISE
Processual knowledge in architectural training, Cultural analysis at the interface between the theory and practice of a project

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EXPERTISE
Law, Environmental and construction law

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EXPERTISE
Design of traffic facilities and transport infrastructures, Transport and telematic, Infrastructure maintenance management

F

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EXPERTISE
History of Architecure, Archiving and recording of projects in architecture and civil engineering

G

GARGIANI Roberto
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EXPERTISE
Theory and history of techniques, materials, working processes, structural systems Analysis of constructive aspects of buildings

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EXPERTISE
Traffic Flow and Control, Transport Analysis, Transport Operations

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EXPERTISE
Integrated energy planning, Vulnerability of energy supply, Life-cycle analysis of energy systems, Sustainability of renerwable energies (incl. bio-energy)

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EXPERTISE
GIS application design, Spatial Decision Support Systems, Geospatial data infrastructures, GIS for environmental management and for urban studies and design

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EXPERTISE
Building and comfort technologies, Preservation and reuse project of the modern architecture

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EXPERTISE
Architectural Design, Urban planning, Project management, construction management, Research in teaching methods, research in architectural production

H

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EXPERTISE
Theory and History of Architecture, Project Design

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EXPERTISE
Bio treatment of gas, wastewater and waste, Microbial remediation of contaminated soils, Molecular caracterization of microbial communities

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EXPERTISE
Design Thinking, Interactive Space Smart Buildings, Digital Architecture

K

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EXPERTISE
Climate change and global biogeochemical cycles, Earth system modeling, Land-atmosphere interactions, Evolution of agriculture, technology, and civilizations, Paleoclimate and paleoenvironmental change

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EXPERTISE
Mobility, Habitat and residential history, Violence and security, Urban sprawl and gentrification Commuting

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EXPERTISE
Industrial Design

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EXPERTISE
Degradation and elimination of chemical pollutants, Solar disinfection of viruses, Low-cost water treatment

L

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EXPERTISE
Cliff instabilities, Design of deep tunnels, Mechanical behaviour of poor rocks, Foundation engineering

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EXPERTISE
Geomechanics, Geotechnical and environmental engineering, Mechanics of multiphase porous materials

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EXPERTISE
Architectural history in urban environments, New typologies of buildings, Contemporary re-qualifications of the notion of "city"

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EXPERTISE
Design evaluation of structures, Failures analyses, Steel-concrete composite bridge behaviour, Steel-concrete composite columns and beams

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EXPERTISE
Seismic behavior of reinforced concrete and masonry structures, Seismic evaluation of existing structures, Seismic vulnerability of cultural heritage buildings

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EXPERTISE
Urbanism, Land use planning and territorail development, Globalization, Political space, Epistemology of social science

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EXPERTISE
Theory of architecture, History of the theories of composition

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EXPERTISE
Waste processing, Materials cycles and resourcerecovery,Thermochemical processes, Trace compounds in hot process gases, Chemistry at the solid/water interface

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EXPERTISE
Theory of architecture, Rational architecture, Relationships between public spaces and collective housing

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EXPERTISE
Acquisition of topographical data, Geodesy, satellite positionning, Pedestrian navigation, indoor positioning, Least squares estimation, Kalman filtering

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EXPERTISE
Hydro-agro-meteorology, Soil physics and transfer processes, Water management, Water system equipment

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Theory and Critic of architectural and urban Design, The Institution and the public Space

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EXPERTISE
Damage mechanisms in materials and structures, Contact Mechanics, Multiscale modeling : from atoms to continuum, Scientific computing

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Conceptual desing and dimensioning of structures, Mechanical behavior of ultra-high performance concrete elements and soil-structure interaction

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EXPERTISE
Urban, social and environmental risks, Risk assessment and management, the role of stakeholders, Vulnerability of urban infrastructures

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EXPERTISE
Structural design of steel and steel-concrete composite structures, Tubular structures and bridges, Fatigue and fracture of new and existing steel and aluminum structures, Probabilistic fracture mechanics and size effects

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EXPERTISE
Architectural Design within historic contexts, Re-use and transformation of existing buildings, Housing as urban project

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EXPERTISE
Land-atmosphere exchange, Large Eddy, Simulation (LES), Evaporation, snow physics, Atmospheric boundary layer

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EXPERTISE
Hydrogeology of unstable slopes, Geological hazards, Behaviour of cataclastic rocks in civil engineering underground works, Management of underground water

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Fluid Dynamics (environmental and computational), Wind Energy, Hydrokinetic Energy, Large-Eddy Simulation, Turbulence

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Development of new speckle techniques, Development of new holographic techniques, Fringe analysis using phase shifting techniques

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EXPERTISE
Groundwater and surface hydrology, Solute transport processes, Fluvial geomorphology, Ecohydrology

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Urban resource flow modelling (energy/water/waste), Urban microclimate, Solar radiation and daylight modelling, Building simulation (thermal/airflow/lighting), Thermal comfort

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Law, Environmental and construction law

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Hydraulic engineering and design of hydraulic structures and schemes, Interaction hydraulic structures with water, air, sediments and rock, Numerical and physical modeling, Flood modeling and forecast

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Territorial development and town planning, Urban planning, mobility and environment

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EXPERTISE
Kinematic positioning and attitude estimation mobile mapping, Satellite and inertial navigation, Sensor integration and calibration, Direct georeferencing

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EXPERTISE
Chemical speciation and trace element analysis, Bioavailability and impact of toxic trace elements on phytoplankton, Characterisation of aquatic colloids, Water quality

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Active structures,, Structural identification, Sensor network design, Computer-aided engineering, Engineer-computer interaction

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EXPERTISE
Theory and History of Architecture, Project Design

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EXPERTISE
Design and testing of geostructures Constitutive modeling, elasto-visco-plasticity, numerical modeling, Natural hazards: risk management

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EXPERTISE
Composite frames of wood and glass, Timber rib shells, Origami, Fractal geometry, Wood welding, Stability of ribbed wooden shells

Z

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EXPERTISE
Rock dynamics, TBM excavation, Rock engineering of tunnels: slope and foundation, testing characterisation and monitoring, earthquake and blast protection

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