

DESIGN & BUILD TOGETHER



FOREWORD

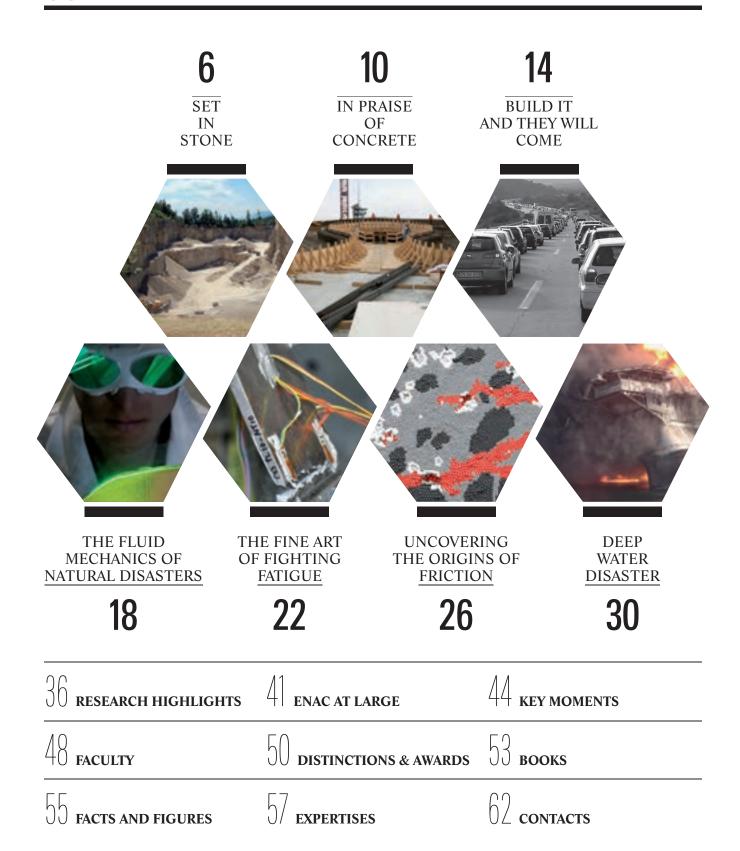
We are delighted to present the School of Architecture, Civil and Environmental Engineering's annual report for 2010. ENAC continues to be a leader in addressing engineering and architectural questions of major societal relevance. The Swiss Federal Office of Energy notes that the building sector consumes around 45% of the country's energy and mobility accounts for some 35%; both are topical areas of central interest in our school. Some of the topics discussed in this year's report directly touch on energyrelated research, including Samuel Arey's investigation into the Gulf of Mexico oil spill. Ongoing work in the built environment done in the laboratories of Luca Ortelli on construction with natural stone, Roberto Gargiani with concrete, Jean-Francois Molinari on the origins of friction and Alain Nussbaumer with steel structures is discussed in more detail. Vincent Kaufmann's advances in finding solutions to mobility problems and Christophe Ancey's work on particle transport in mountain regions are similarly highlighted. All the ENAC "indicators" are up; we've seen healthy increases in student numbers in our three BS-MS majors (Civil Engineering, Environmental Engineering and Sciences, and Architecture) as well as in the doctoral programs of Civil and Environmental Engineering, Architecture and the City and Mechanics. Important partnerships with industry continue to be established and the school's external funding keeps growing.

The recent appointments of Marilyne Andersen and Emmanuel Rey enhance architecture in our school and also strengthen links

to engineering of the built environment. The joint appointments of Janet Hering and Kristin Schirmer with EAWAG extend important ties in the EPF domain and the recent arrival of Fernando Porté-Agel brings research and teaching in wind energy, a field that is growing rapidly in importance globally and will become more directly relevant for Switzerland. We are happy to welcome Paolo Perona as Swiss Science Foundation Professor Boursier in hydroeconomics and alpine dynamics. I trust you will enjoy reading this new report and learning more about our vibrant and committed community of students, staff and researchers who continue to make a major impact around the world. We are always happy to meet and welcome you to ENAC. We look forward to hearing from you.

MARC PARLANGE, ENAC Dean

CONTENT







PHD STUDENT STEFANO ZERBI EXPLORES THE BUILDING POTENTIAL OF MASSIVE BLOCKS OF STONE.

CONSTRUCTION AND CONSERVATION LABORATORY http://lcc.epfl.ch

LUCA ORTELLI. Director





In the push to build with materials that are energy-efficient, high-tech, and still esthetically pleasing, we often overlook the obvious because we are so bent on developing something new. Why should we look at yesterday's solutions? We're innovating! Well, sometimes the most sustainable solution is right under our noses, and has been there for a long, long time.

Once upon a time, buildings were made exclusively from local materials. In Switzerland, that meant wood and stone. Now most Swiss buildings are made with concrete, occasionally sporting a thin veneer of natural stone for esthetic purposes. For his EPFL master's project in architecture, Stefano Zerbi designed a building made with massive blocks of stone from a local quarry in his native canton of Ticino. The project, however, generated more questions than answers in his mind. Why wasn't local stone being used more often as a building material? And why were Switzerland's stone quarries languishing? Under the guidance of Professor Luca Ortelli, and with the collaboration of Professor Aurèle Parriaux from ENAC's Engineering and Environmental Geology Laboratory, Zerbi decided to pursue these questions further.

Local stone is a sustainable building material because it's tied to a region's resources, explains Ortelli. Unlike concrete or wood, massive blocks of stone hardly degrade or change over time, and they're fully recyclable. Stone doesn't have the embedded carbon footprint of concrete, particularly steel-reinforced concrete, and it is esthetically pleasing. In fact, many modern concretes try to imitate the look of natural stone. Zerbi and Ortelli suspected that architects didn't consider using massive blocks of stone because they simply weren't aware it was a viable option. Perhaps if they had access to more information about local sources, this could change.

With Swiss National Science Foundation (SNSF) funding in hand, Zerbi took to the road. He visited all of Switzerland's major stone quarries, taking an inventory of everything from the geological characteristics of stone produced to the quarries' exploitation statistics and contact information. He made illustrations of the extraction method used in each quarry and took photos, and then assembled all this information into a reference booklet for architects and builders.

Zerbi found that many of the larger quarries were not using all of the stone they extracted. An increased demand for large blocks of massive stone, which, unlike thin veneers, don't have to be homogeneous, would make it possible to exploit these quarries' resources more fully. We tend to think of natural stone as hugely expensive, but massive stone is much cheaper than veneer, says Zerbi. "When you reduce the number of cuts, the cost goes down."

Another important consideration is earthquake resistance. Could a building made with massive stone blocks stand up to a major tremblor? Ortelli and Zerbi knew they'd have to demonstrate this if they wanted to convince architects to build using stone. To clear his hurdle, Zerbi collaborated with Pierino Lestuzzi and Katrin Beyer in ENAC's Earthquake Engineering and Structural Dynamics Laboratory to test a simple mortar construction, a project that was incorporated pedagogically into the Master's Program in Civil Engineering. "Three weeks after the start of the test, it was in great shape," says Zerbi. "Every week, the pressure was increased and it performed remarkably well." Zerbi and Ortelli's meticulous interdisciplinary research makes the case: from the resource level to the building itself, massive stone is a good, solid, sustainable solution.



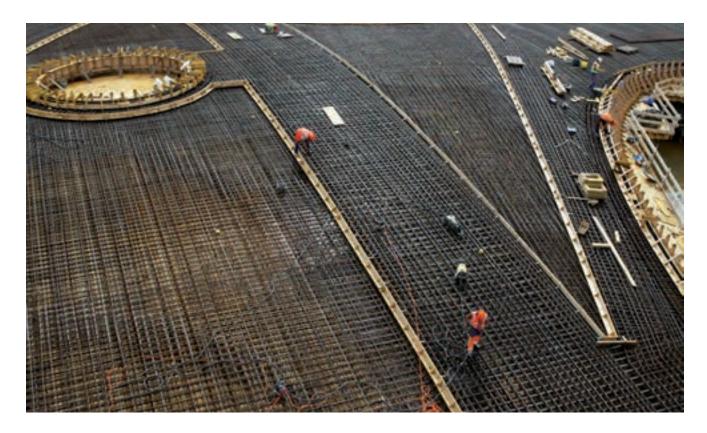




THEORY AND HISTORY OF ARCHITECTURE LABORATORY 3 http://ltha.epfl.ch

ROBERTO GARGIANI, Director





you're in Europe, chances are good you live ture Professor Roberto Gargiani, however, Romans used natural cementitious mateand work in concrete-based structures. and you'll never take this amazing material rials found in the soil, called pozzolans, to Concrete is to infrastructure what carbon is for granted again. It has a long and rich bind their concretes. Natural pozzolans are to life: intrinsic. Your water supply is chan-history, peopled with vibrant characters. forged in volcanoes, which explains why neled in concrete aqueducts. The bridges According to Gargiani, it provided the im- volcano-studded Italy was an important and sidewalks you cross every day on your petus for the scientific study of geology and reference point in the history of concrete. way to work are concrete. Concrete dams helped spawn the vast academic and indusprevent flooding and guarantee constant trial empire that is known as engineering. cipes were passed down from generation electricity for thousands of people. And, of And it's continuing to evolve today, the to generation. Naples was full of terraced course, you can sleep well at night knowing subject of intense scientific, engineering concrete houses. These structures were imthat the concrete in your basement fallout and architectural attention. shelter will shield you from radioactive fallout in the event of nuclear war. Nothing could be more commonplace. More, well, boring. Let's face it, concrete is about as sexy as nostril hair. It's there, it certainly serves an important purpose, but it's not always unequivocally appreciated.

Look around you. See any concrete? If Spend a few minutes talking with Architec- Concrete dates to prehistoric times. The

In the 20th century, concrete came out of the basement

Mixing concrete was an artisanal skill; repermeable to water, wind- and fire-proof, and earthquake resistant. When compared with wood, which regularly burnt, rotted, leaked, collapsed and/or succumbed to insects, it was the Holy Grail of building materials. But transporting pozzolans from Italy was prohibitively expensive, as was burning enough wood to attain the extremely high temperatures required to turn chalk into pozzolans artificially. "Geologic research was motivated by the interest in obtaining local sources of natural pozzolans," explains Gargiani. From there, geologists branched out to invent and rediscover the recipes for mixing concrete - transforming it from a traditional craft into a documented science.

Gargiani has received a 5-year grant from the European Research Council to continue his extensive research into the history of concrete. The first in a series of 10 books ("Le Corbusier, béton brut and ineffable space, 1940-1965," with Anna Rosellini) dedicated to the subject will be published in July 2011.

ROBERTO GARGIANI:

"Why don't architects have to do these kinds of reports now, so that their lessons can be learned by others?"

19th centuries, the French, English, and Dutch, among others, were interested in using concrete, particularly for military and naval infrastructures – ports, bunkers, a report had to be published and sent to plored concrete as a medium of expression; underground storage facilities and the like. the director, outlining the knowledge gai- colors, textures, embedded objects enrich The development of coal-fired kilns meant ned and problems encountered. Thus the the palette of possibilities. Technological that pozzolans could be cheaply produced grand French engineering tradition was innovations are producing "smart" (sensorfrom abundant sources of limestone and born - along with the pressure to publish! studded) and "green" (incorporating waste chalk. Concrete was here to stay.

In France, the Ecole des Ponts et Chaussées was established to train people to erect it was disguised to look like natural stone, As Europe industrialized in the 18th and bridges, dams, and other infrastructures all traces of molding painstakingly remoin concrete. With this institutionalized ved. The famous architect Le Corbusier approach, research into concrete became changed all that. He gave concrete its own very structured and organized. Every year, identity, and since then, architects have ex-- with concrete at its core.

It wasn't until the 20th century that concrete came out of the basement. Until then, whenever it showed its face aboveground materials) concretes. What's not to like?





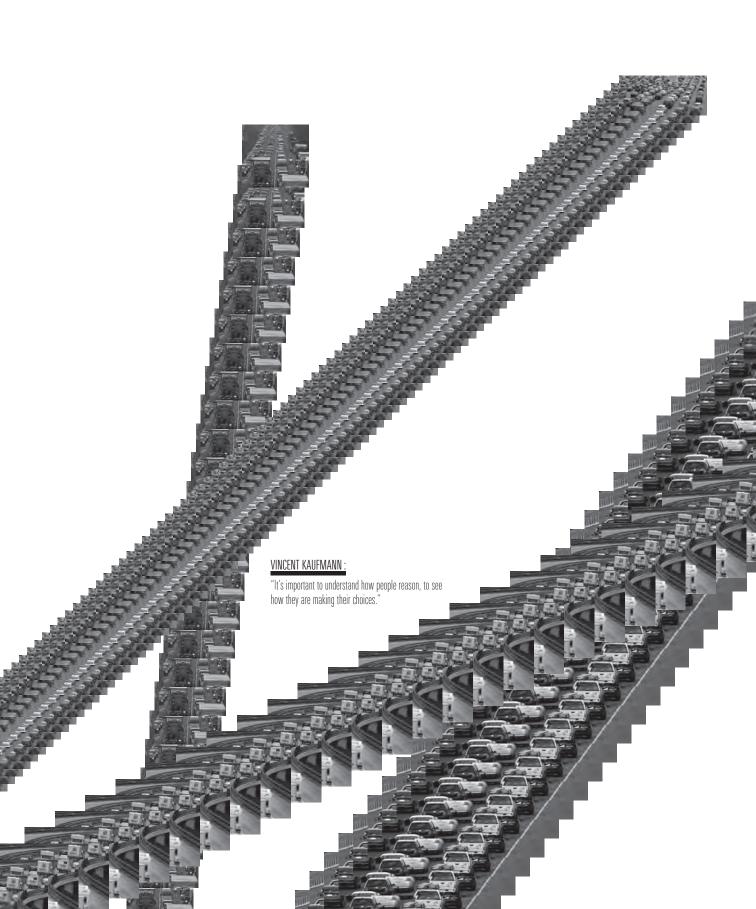


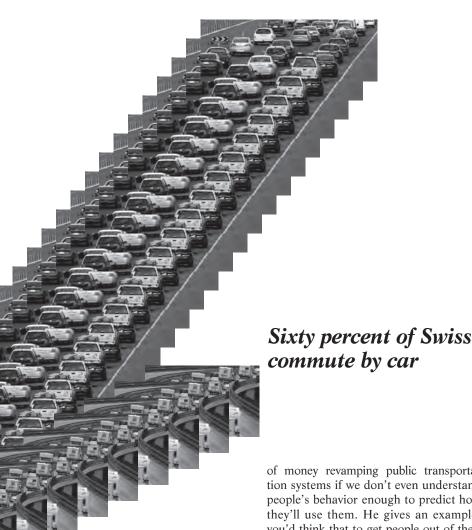
FINDING SOLUTIONS FOR COMMUTERS IS INCREASINGLY IMPORTANT IN A MOBILE SOCIETY.

URBAN SOCIOLOGY LABORATORY http://lasur.epfl.ch

VINCENT KAUFMANN. Director







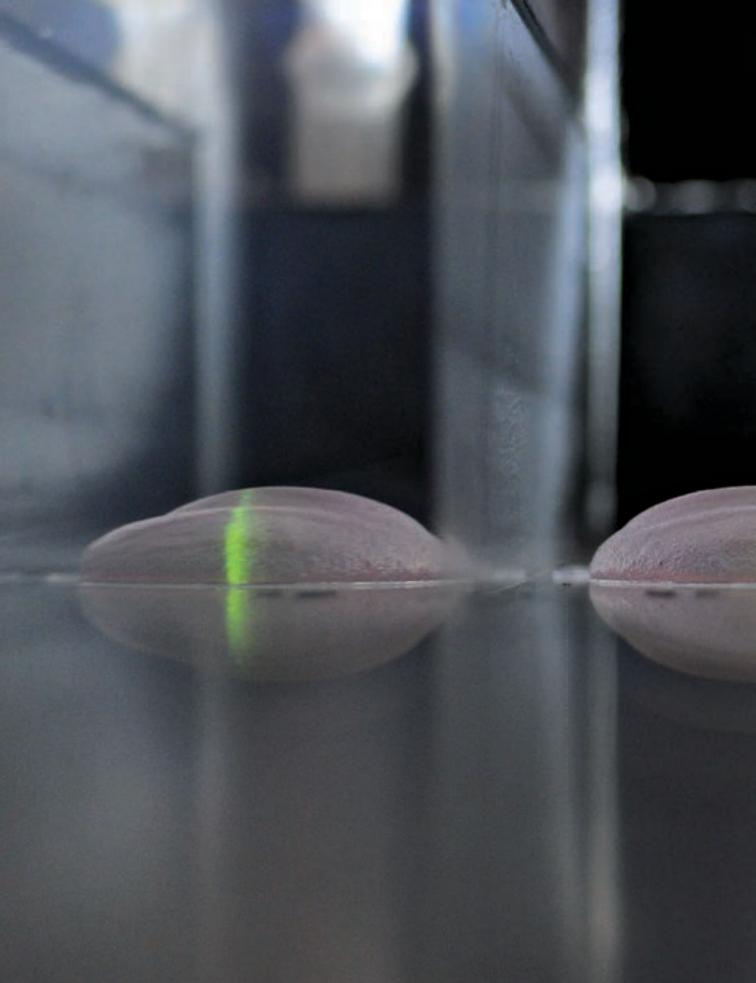
of money revamping public transportation systems if we don't even understand they'll use them. He gives an example: loped, and which let go. you'd think that to get people out of their most important one.

Ninety-seven percent of Americans commute by car. In Switzerland, the number is One of LASUR's current projects is a good bile," he says. "We often confuse mobility smaller, at 60%, but it's still alarming: with illustration of this. The Post Office has with travel. It's not the same thing." Peoaging infrastructures, global warming, and commissioned Kaufmann to conduct a user ple are willing to commute long distances diminishing fossil fuel reserves these kinds survey that will help it optimize Postbus to a new job, but very unwilling to move of habits are clearly unsustainable. But service in the Pied de Jura region. (The legenout of their established communities or what is the solution? Will people decide to dary Postbus system - considered almost change ingrained habits. Providing fast, live closer to where they work? Will they a basic amenity, like water and electricity, efficient, cheap public transportation is not use public transport? Will everyone even- in Switzerland – makes it possible to get necessarily a good thing, he says, because tually telecommute? The most important to almost any village in the country.) To it will just reinforce this mindset, and the thing Vincent Kaufmann, head of ENAC's conduct the survey, Kaufmann first did a environment will pay the price. Remember, Urban Sociology Laboratory (LASUR), basic behavioral study, using a GPS system trains and buses use fuel too; driving 4 km has learned in his years investigating these to track the travel habits of a group of people in a car is actually much less polluting than issues is that our assumptions about what living in the region. He found a basic duality riding 300km in a train. Think about that drives human behavior are usually wrong. in their travel habits; some people regularly as you calculate the carbon footprint of It doesn't make sense to spend vast sums took the same route to the same destina- your next commute...

tion every day (actual or potential Postbus riders), whereas others' travel patterns were completely unpredictable (not potential Postbus riders). The investigation allowed him to develop a questionnaire that was then given to a larger population.

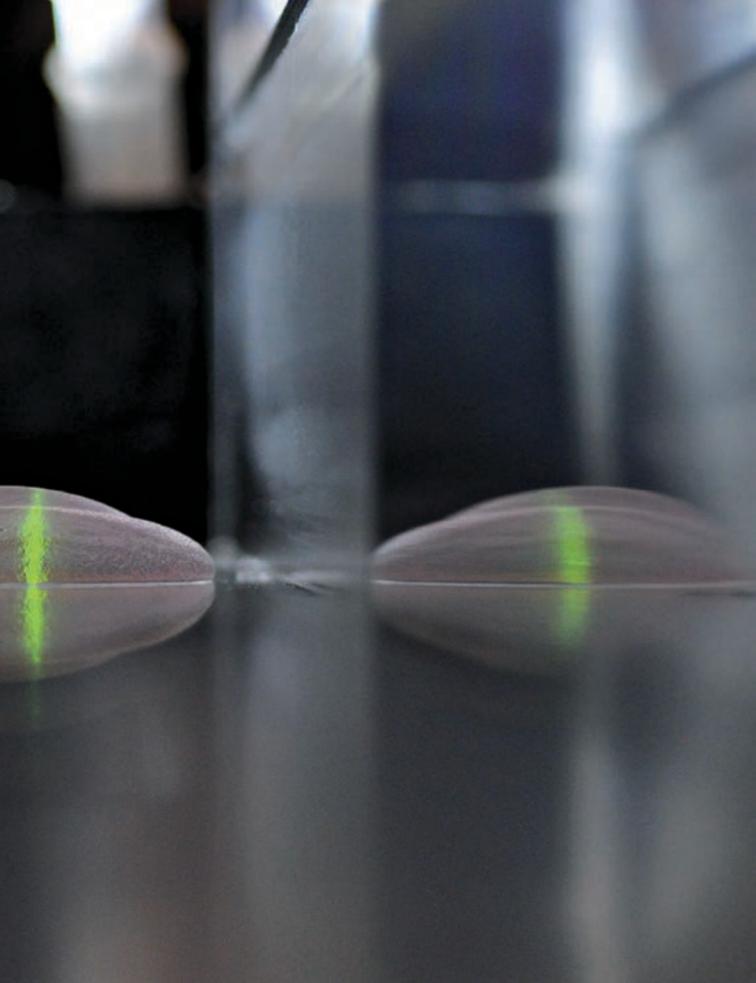
Kaufmann's group ran a mathematical model based on the results, and found that when there are more than thirteen buses stopping at a given Postbus stop every day, people will opt to take the bus. "Under that threshold, people stick to their cars," he explains. Based on this evidence, he argues that it would be more useful for the Postbus to consolidate its line and provide more frequent service in a reduced network, than to send buses out to every little hamlet in the countryside. Kaufmann's next challenge is to help the Post Office determine which of people's behavior enough to predict how the existing routes should be further deve-

cars, all you need to do is provide an equal- The study highlights a pattern that has bely rapid transportation alternative. It turns come familiar to Kaufmann: despite a job out that this is only one of many factors market that demands increasing flexibility involved in the decision – and not even the on the part of employees, people are very reluctant to change their lifestyles. "Contrary to popular belief, the Swiss aren't very mo-



PROF. CHRISTOPHE ANCEY STUDIES THE MYSTERIES OF FLOWING DEBRIS AND SNOW, IN HOPES OF LIMITING THE DAMAGES FROM NATURAL DISASTERS.

ENVIRONMENTAL HYDRAULICS LABORATORY http://lhe.epfl.ch



Although we've managed to tame large portions of the Earth's surface over the last couple of millennia, there are still some forces of Nature that elude us. We eat humble pie when faced with avalanches, tsunamis, earthquakes, landslides, hurricanes and severe storms. At best, we manage to get out of the way and then pick up the pieces once the damage is done. At worst, hundreds, even thousands of people perish and billions of dollars' worth of property is destroyed. We're constantly reminded of our vulnerability; just this past January mudslides and flash floods in Brazil caused at least 700 deaths and left 14,000 others homeless. The best strategy is to avoid putting ourselves in their path in the first place. It is thus more important than ever to understand where, when and how these catastrophic natural events occur. Professor Christophe Ancey, head of ENAC's Environmental Hydraulics Laboratory, studies natural flows - snow, debris, and mud – in an effort to contribute to this understanding.

In the mountains, these phenomena are more complicated

In Switzerland and elsewhere in Europe, authorities manage territory - deciding where things can be built and where they can't - based on the degree of danger each area presents. They typically estimate the intensity and frequency of catastrophic natural events by extrapolating from historical databases. "This works well if you have a lot of data," notes Ancey. "But it doesn't work well in areas that are less populated." Switzerland has the added difficulty of mountainous terrain, which poses its own set of problems. "Hazards encountered on the plain - flooding, earthquakes and severe storms – are relatively well understood. But in the mountains these phenomena are more complicated." For several years, Ancey's lab has been developing tools that will help create a physical basis for understanding the fluid dynamics of snow, debris and mud flows in mountainous terrain, and predicting the environmental conditions that will set off these kinds of catastrophic events.

In natural debris flow and avalanches, a phenomenon known as "self-channeling" often occurs. Large chunks of debris pile up at the edges, channeling the rest of the flow into a narrow tongue that then travels long distances. Ancey explains that this is caused by a segregation of particles in the flow; as the large particles rise to the top and the smaller ones sink, energy

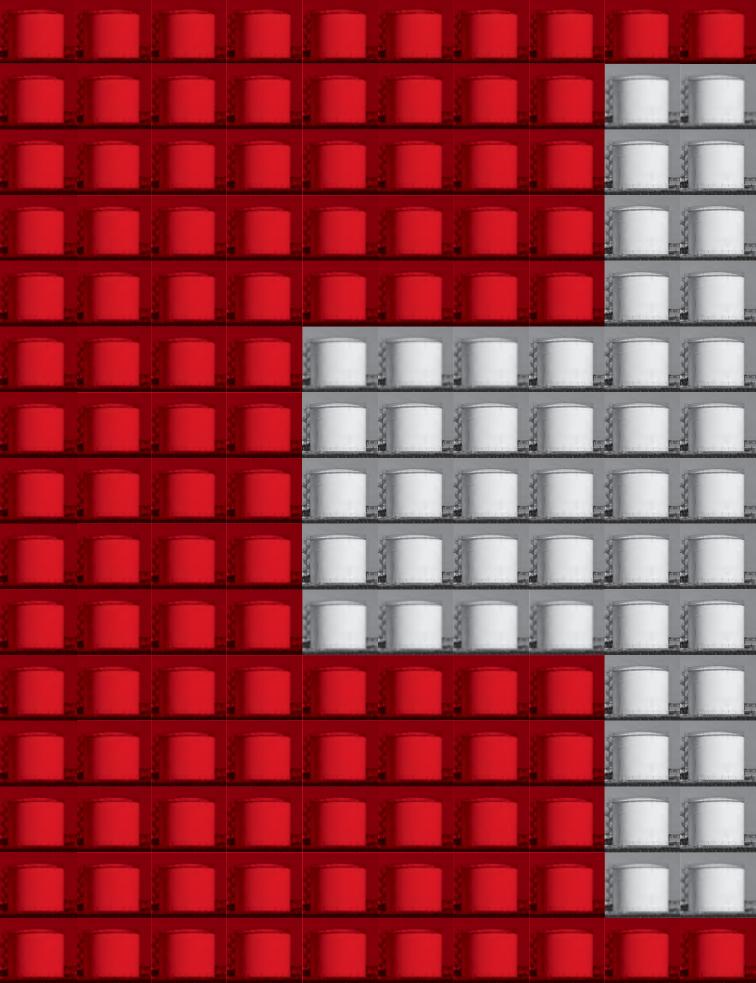
dissipation is reduced and the runout distance increases by as much as a factor of ten. The smaller particles act as a kind of conveyor belt, keeping everything in motion. Ancey runs scaled down experiments in his lab, simulating flow with a viscous blue mass of goo, taking measurements to see the rate at which the particles are segregating in the various layers within the flow. He's also collaborating with the United States Geological Survey (USGS) in an experiment in Oregon in which debris is launched down a 100-meter flume.

We often assume that these phenomena only occur on steep slopes, but in fact they can also occur on gently sloping terrain, stopping and starting repeatedly over a long period of time. Ancey shows me a video clip from a mudslide that occurred in a small town in southern Italy (http:// wn.com/Italian Landslide Feb 2010). He interested in studying the factors involved in initiating debris flow such as this. What starts the ground moving? What are the relative roles played by soil type, water load and slope? And once it's moving, what are the forces that keep it in motion? In the video, this element is dramatic; just when you think the ground has come to a stop, the entire hillside starts flowing again. With an improved understanding of these phenomena, explains Ancey, hazard maps could be established for regions - inhabited or not - that would prevent this kind of catastrophic loss of life and property. Because when these kinds of natural forces are at work, the best strategy is to just stay out of the way.



CHRISTOPHE ANCEY:

"We're developing tools to calculate the hydraulic properties of debris flow — in order to predict the speed and spatial distribution of the flow."

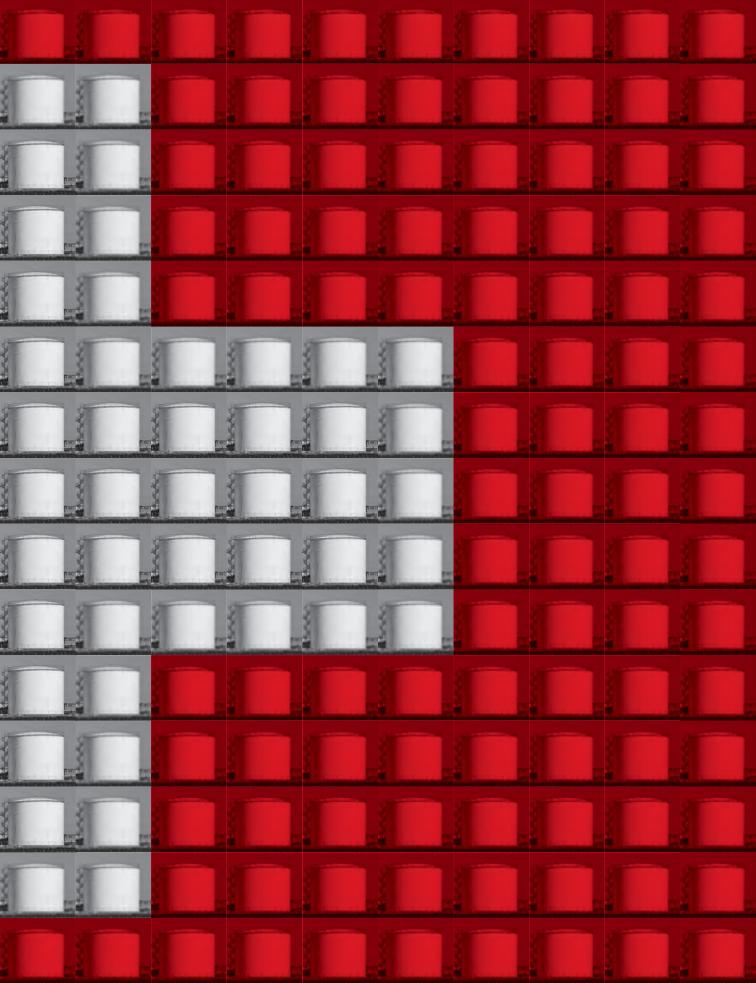




ENAC'S STEEL STRUCTURES LABORATORY TAKES A LOOK AT EUROPEAN EARTHQUAKE CODES FOR HYDROCARBON RESERVOIRS.

STEEL STRUCTURES LABORATORY http://icom.epfl.ch

IEAN-PAUL LEBET, Director

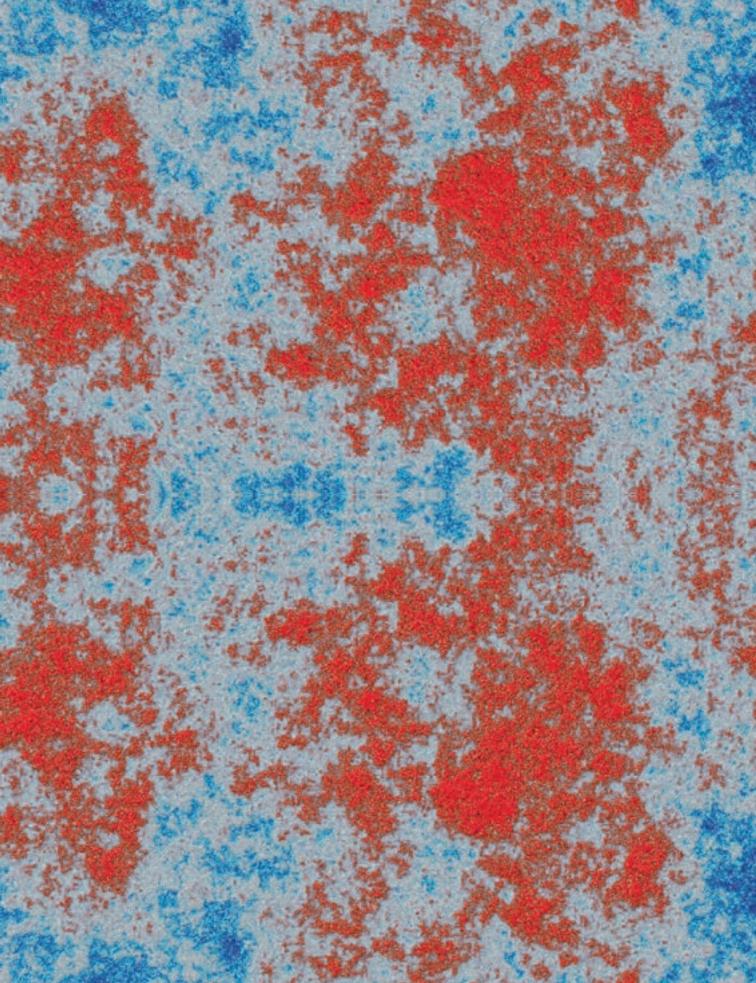


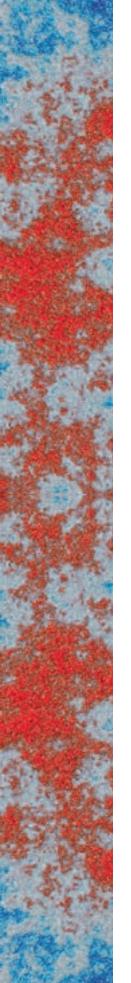


In humans, load-bearing joints that are used repetitively, such as knees and hips, tend to give us grief after a certain number of years. Structures like bridges, cables, and windmills, whose joints are made of materials other than living bone, also wear out. After a certain number of loading cycles, tiny cracks start to appear in the structure. Eventually, these cracks propagate into the material, and then the cracked element will suddenly, catastrophically break. From an economic viewpoint it's important to keep a structure in service as long as possible. Thus, for public safety reasons, the structures must have regular check-ups, and be repaired or replaced well before they reach the breaking point. Striking an optimal balance between these competing demands is tricky. Engineers generally adhere to codes prescribed by regulatory bodies that specify things like the typical loading experienced by the structure, the design of the structure, its joints, and its material properties.

Switzerland's hydrocarbon reservoirs can withstand whatever Mother Nature dishes out In 2005, for example, the EU set new codes for earthquake design of hydrocarbon storage reservoirs. Switzerland has 7.8 million millions of francs saved - say, how about cubic meters of hydrocarbons stored in 300 funding basic research? huge above-ground steel tanks, in compliance with Swiss law guaranteeing a minimum level of gasoline, kerosene, diesel, and fuel oil in case of crisis or catastrophe. These tanks are placed directly, unanchored, on compacted soil and are thus vulnerable to earthquakes, particularly at the joint between the wall and the base of the tank. If this joint fails, liquid can escape, defeating the purpose of the reservoir and potentially polluting groundwater reservoirs. When assessed, two-thirds of Switzerland's existing reservoirs didn't appear to satisfy the new code prescriptions. Before launching a costly and complicated retrofitting endeavor, the Federal Office of the Environment (OFEV) and Carbura (a non-profit organization commissioned by the Swiss government to ensure that Switzerland has adequate hydrocarbon reserves) decided to take a closer look. In 2008, they commissioned ENAC's Steel Structures Laboratory (ICOM) to study the situation and run some experiments.

Over the next two years, Jean-Paul Lebet, Alain Nussbaumer, Gustavo Cortes and their ENAC colleagues Katrin Beyer (EESC) and Pierino Lestuzzi (IMAC) studied several aspects of the problem. They suspected that the formula used for setting the norm didn't take recent research findings and computational improvements into account, and that the codes were overly conservative as a result. It was up to them to prove this scientifically. Using numerical models, they estimated the number of cycles that the joint would have to resist in a realistic 100year earthquake in Switzerland (6.5 on the Richter scale). They ran laboratory experiments measuring the rotational capacity of a range of sample joints when subject to this cyclic loading. They also looked at the fundamental problem of modeling how the joint material degrades under this kind of very low cycle fatigue. Their continuing research has already shown that, indeed, for even the weakest joints tested, the new European codes were too conservative. Switzerland's hydrocarbon reservoirs are well able to withstand whatever Mother Nature decides to dish out, and thanks to ENAC, there are numbers to back up this claim. I'm sure the government can figure out something better to do with the tens of

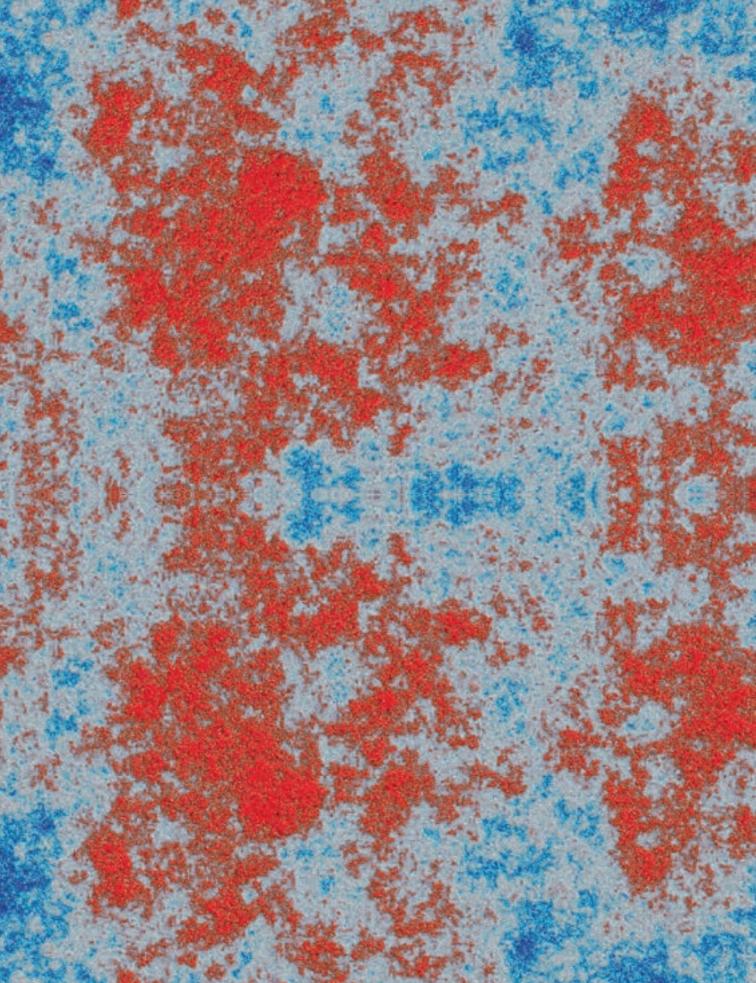




JEAN-FRANCOIS MOLINARI IS TAKING FRICTION FROM A RECIPE-DRIVEN MEASUREMENT TO A FORCE WHOSE PHYSICS IS INCORPORATED ON A MUCH MORE FUNDAMENTAL LEVEL.

COMPUTATIONAL SOLID MECHANICS LABORATORY http://lsms.epfl.ch

IEAN-FRANCOIS MOLINARI. Director



"Wherever you have contact, you have fric-mirrors – as you endlessly go deeper and Molinari's research is at the vanguard of tion and wear," announces Jean-Francois deeper, smaller and smaller, the computhese simulation efforts. He's taking fric-Molinari, a young French-born professor ter time starts to pile up, the centuries go tion from a recipe-driven measurement to who joined EPFL's ENAC school faculty by, and you never actually reach the end. a force whose physics is incorporated on a in 2007. Friction is an expression of the Even if those surfaces could be modeled much more fundamental level. Using high forces acting when subatomic particles rub perfectly, Molinari says, we'd still have performance computing to run parallel shoulders. Anything that touches anything trouble, because the friction force itself scalable algorithms, he is combining moleelse is subject to this ubiquitous force - isn't just a simple calculation. And there cular dynamics at the very small scales with roads, joints in structures, railroad tracks, are many different kinds of friction, depen- continuum mechanics at the larger scales. waves crashing on a beach. The flame spar- ding on the type of surface involved. "It's The result: the first physics-based, parallel, ked when you rub two sticks together, the extremely complex physics," he admits. multiscale simulation platform for directly relentless scouring of a mountainside by a "Different dissipative mechanisms are computing the friction force. It is incorpoglacier, the devastating damage of earth- taking place, resulting in lots of different rated into an open software hub, so that it quakes and tsunamis - all caused by fric- physical phenomena." The traditional way can be used for a number of practical aption. "Maybe because it's everywhere, we to get a grip on friction is to run experiplications – to design surfaces with specific take it for granted," he shrugs. "But it's ments and measure the resulting "friction adhesive properties, to optimize surface fivery, very important. Probably 5% of GDP coefficient." Although this quantity helps nishes, to design biological lubricants and is wasted by replacing components that de- all the equations balance out, it doesn't materials, for example. Molinari also hopes grade via friction."

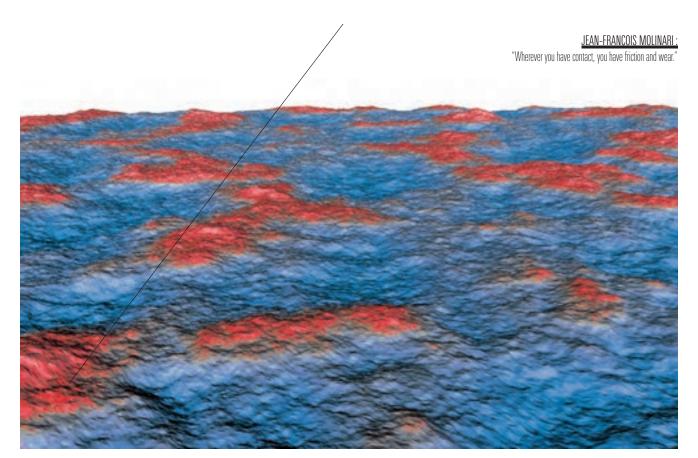
Despite the fact that it affects everyone and encouragingly. Our increasing obsession as our inability to predict temperature ineverything on the planet (and beyond), fric- with nanotechnology has led to new tech- creases in earthquakes. tion is still not very well understood. "It's niques, such as atomic force microscopy, one of the greatest unsolved mysteries in that allow us to measure frictional forces at science," Molinari insists. Why is friction tinier and tinier scales. In 2008, scientists such a sneaky force? To begin with, it ope-managed to move a single atom across a rates at multiple time and length scales. In surface and measure the forces involved. order to model it, you have to know exactly Thanks to these improvements, numerical how much of a surface is touching another simulations have progressed considerably. surface. Take a book sitting on a desk, for example. Believe it or not, only about 1% of the book's surface is actually in contact with the desk. This is because the two surfaces are very rough. Fractal models are the perfect way to describe rough surfaces, all the way down to the atomic scale. But elegant as this solution may appear, it's not at all practical. Fractals are like mirrors inside

reveal much about the actual physics ta- it can be used to shed light on problems king place. "But there's hope," he smiles that cannot be studied experimentally, such





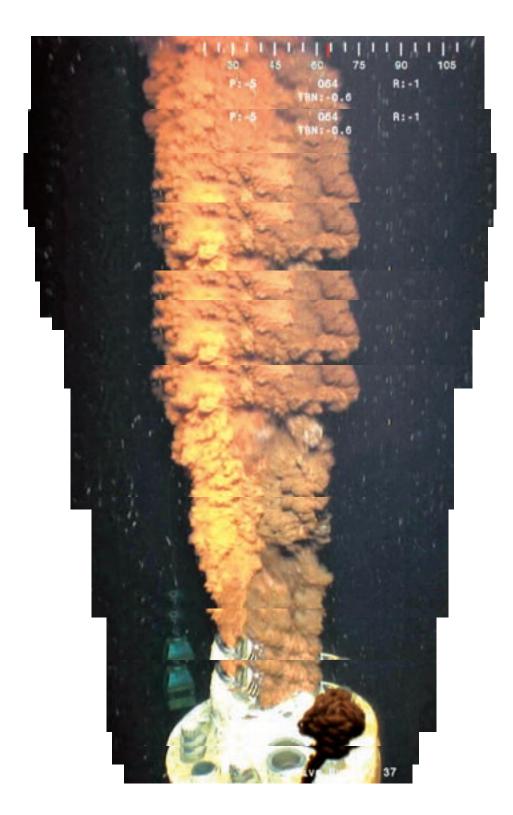
Probably 5% of GDP is wasted by replacing components that degrade via friction





 THE DISASTROUS DEEPWATER
HORIZON OIL SPILL IN THE GULF OF
MEXICO WAS AN OPPORTUNITY FOR
EPFL PROF. SAMUEL AREY TO LEARN
MORE ABOUT THE FATE OF
HYDROCARBONS IN THE
DEEP WATER ENVIRONMENT.





SAMUEL AREY:

"The compositional evolution of hydrocarbons during their trajectory through the water column can be used to diagnose the physical, chemical, and biological processes acting on petroleum released to the deep sea."

The Deepwater Horizon oil rig in the Gulf of Mexico was a real record-setter. In September 2009 it drilled the deepest oil well in history, the Tiber field well, On April 22, 2010, while drilling in another location, the Macondo prospect well, the rig exploded and then collapsed, setting another record as the largest offshore oil spill in U.S. history as it relentlessly unleashed millions of barrels of oil and gas into the waters of the Gulf. Deepwater Horizon also has the dubious honor of being the world's first deep-water gusher; all other oil spills have occurred on or near the sea surface. This brought in its wake a slew of unknowns: What happens to the oil and gas as it blasts upwards through the water from 1500 meters down? Where do these chemicals go, and in what form? What are the implications for marine life in the Gulf of Mexico and even farther afield? EPFL Professor Samuel Arey, a specialist in aquatic chemistry, and colleagues from the Woods Hole Oceanographic Institute were immediately on the front lines, working to answer these questions.

over tens of kilometers. The deep water plume contained methane, light aromatic hydrocarbons (benzene, toluene, ethylbenzene, and total xylenes – collectively referred to as BTEX), and many other compounds. Based on this intensive sampling campaign, the scientists hoped to better understand the physical, chemical, and biological processes that transform and transport oil and gas in the deep sea.

carbons – had an uncertain fate. During conventional oil spills near the sea surface, volatile hydrocarbons compounds quickly evaporate and escape into the atmosphere. But at the Deepwater Horizon site, many of these compounds dissolved instead and were trapped in the deep sea. "Hydrocarbons dissolved at a depth of 1,000 m may become trapped there and never make it to the sea surface," says Arey. "Most of these compounds will eventually be degraded by organisms. But the ecological consequences will be quite different from conventional oil spills, which always occur at the sea surface." Arey and his colleagues were able to demonstrate what fraction of these substances dissolved on their way up through the water column.

It's critical to understand how deep sea plumes are formed

In June 2010, Woods Hole sent a remotely operated vehicle down to the sea floor to collect samples of the oil and gas as they exited the well, and then brought the samples to the surface for analysis, maintained under hydrostatic pressure during transport. They also collected hundreds of water samples between the well and the sea surface. Using water sample analysis and in-situ mass spectrometry, the group studied a giant chemical plume of dissolved hydrocarbons at a depth of about 1,000 m, stretching in a southwesterly direction

By comparing the composition of the original oil and gas to that of the deep sea plume, Arey and his colleagues developed and tested a model to explain the fractionation of petroleum components. The results will be published in an article in the Proceedings of the National Academy of Sciences. "Very few studies have quantified chemical dissolution into the water column during an oil spill, and never in the deep sea," explains Arey. Insoluble liquid oil components formed both buoyant droplets that rose to the surface and heavier blobs that sank to the sea floor. Most of the gas fraction - which represents a significant portion of the carbon release quickly dissolved as it rose through the water. But many semi-soluble hydrocarbons - including the nasty BTEX hydro-

The fate of dissolved hydrocarbons is critical to the deep water ecosystems of the Gulf. "Before they eventually biodegrade, dissolved hydrocarbons could affect aquatic wildlife over a large area," explains Arey. "So it's important to understand how deep sea plumes are formed." The trends observed in the current study can be used by marine biologists and other specialists to analyze the ecological consequences of the spill.





RESEARCH HIGHLIGHTS

In our laboratories, some 70 lead researchers and their groups are advancing knowledge in the most challenging areas of architecture, civil engineering and environmental engineering today. Highlighted here is a sampling of some of the research conducted in 2010. To learn more about the latest studies by ENAC scientists, visit http://enac.epfl.ch/research

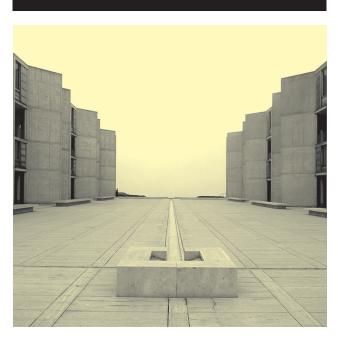
OPTIMIZATION OF FACADE ELEMENTS IN COM-POSITE CONCRETE: LOAD-BEARING, THIN AND HIGH THERMAL PERFORMANCE

Over the past decade, the public has grown considerably more aware of energy use in daily life. The two Swiss Federal Institutes of Technology are promoting a project, the 2000 Watt Society, to reduce energy consumption. In the Swiss building industry, labels like Minergie are becoming recognized; they certify a better quality of life at a much reduced level of energy consumption. These new goals set challenging thermal requirements, leading to the inevitable thickening of the exterior envelope of the structures. In Swiss cities, particularly in the Geneva region, buildable land is increasingly rare, and the value of habitable surfaces is constantly increasing. Yet, the insulation that is typically used is cheap but voluminous. This increases the thickness of the outer walls and considerably reduces the exploitable surface of buildings. The insulation occupies space that is worth three times its own cost. The goal of the research is to obtain walls with a minimum thickness in order to increase livable space without reducing thermal performance, static characteristics or durability. Walls should not exceed a width of 26 cm and should remain competitive price-wise and meet the Minergie-P and Minergie-ECO standards.

Doctoral thesis in progress: Thierry Voellinger

Prof. Andrea Bassi Laboratory of Urban Architecture (LAURE) http://laure.epfl.ch/





TERRITORIAL SCALE IN THE ARCHITECTURE OF L.I.KAHN

This doctoral research extends a previous study and is designed to elucidate the important role that territory (in all its dimensions) plays in architectural work. The research rectifies the almost mythical concept that an architect produces and imbues the landscape with a vision coming uniquely from his or her own volition. The study shows, through several examples of remarkable institutions, that with patient study and careful understanding the architect can appropriate into the project a multitude of exterior aspects. In reorienting these aspects into the path of the architectural composition, the architect gives them qualitative added value. Thus, by accounting for the territorial contingencies and their qualities, a slow process of composition transforms an ideal design of space into an indivisible relationship between a luminous architecture and its surroundings.

"Kimbell Art Museum. Kontekst a tworzenie architektury."
(in French: "Kimbell Art Museum. Le contexte et la fabrication de l'architecture.")
JOURNAL TITLE: "Czasopismo techniczne. Seria: Architektura"
EDITION: Wydawnictwo Politechniki Krakowskiej
To be published by Marta Peczara, PhD student

Prof. Patrick Mestelan Studio of Architecture and the City's Institutions (AIC) http://aic.epfl.ch/

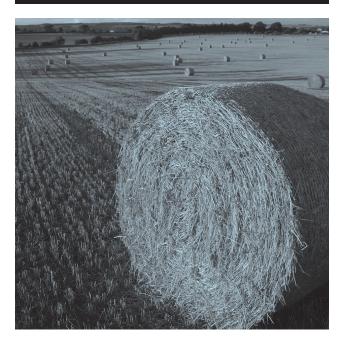


CONFLICTS IN MULTI-MODAL URBAN TRAFFIC SYSTEMS: MODELING CONGESTION AND IMPROVING MOBILITY

As cities around the world grow rapidly and more people and modes compete for limited urban space to travel, there is a need to understand how this space is used for transportation and how it can be managed to improve accessibility. Our research seeks to shed some light on the modeling, planning and management of traffic flow for overcrowded cities with multimodal transport. We develop methodologies to model and understand collective behavior for different types of multi-modal systems, with emphasis on conflicts for the same road space (e.g. mixed bus and car traffic or vehicles searching for parking). Ultimately, the goal is to develop optimization tools for distributing city road space to multiple modes and understanding the level of accessibility for cities of different structures. We also investigate what type of real-time active traffic management schemes (congestion pricing, vehicle restriction, largescale traffic-signal control) can improve mobility measures in a city. Until now, traffic control systems in urban areas have been locally programmed with little control over the impact of a micro-scale response to the macro-scale level. We build a hierarchical feedback control network of multiple levels. The validation of the modeling methodologies and the traffic management schemes will be conducted in various, complex city-structure scenarios using data from field experiments and advanced micro-simulations. This research is mainly supported by two SNF basic research grants.

Prof. Nikolas Geroliminis Urban Transport Systems Laboratory (LUTS) http://luts.epfl.ch/





SUSTAINABLE BIOREFINERY

Advanced generation biofuels are produced from biomass feedstocks that do not compete with food or reduce landuse change, but increase technical challenges for industrial production. In our research we examine different feedstocks such as wood, agricultural residues or microalgae. In a further effort towards sustainability, we focus on the utilization of selected feedstocks for the simultaneous production of biofuels and extraction of the protein fraction for use as animal feed or possibly for human consumption. In parallel, modelling work is carried out to assess the actual environmental impact of bioenergy, for instance in terms of greenhouse gas emission: this is achieved through rigorous life-cycle analysis. Similarly, technoeconomic analyses help scientists gain insight into the scale-up process of laboratory results to industrial implementation.

E. Gnansounou, A. Dauriat, J. Villegas and L. Panichelli

Life cycle assessment of biofuels: Energy and greenhouse gas balances, Bioresource Technology, Vol. 100, Num. 21, p. 4919-4930, 2009.

S. Chiesa and E. Gnansounou

Protein extraction from biomass in a bioethanol refinery - Possible dietary applications: use as animal feed and potential extension to human consumption, Bioresource Technology, Vol.102, Num.2, p. 427-436, 2011.

Prof. Edgard Gnansounou

Bioenergy and Energy Planning Research Group (BPE) http://bpe.epfl.ch/

RESEARCH HIGHLIGHTS

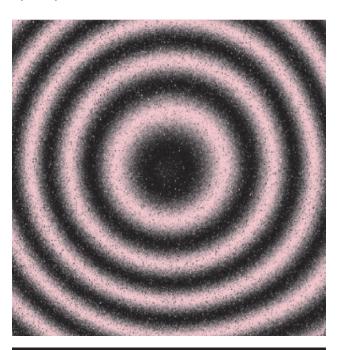
VERSATILE OPTICAL TECHNIQUES FOR NON-DES-TRUCTIVE TESTING AND EVALUATION

Whole-field, non-contact characteristics and accurate measurement capabilities are among the attractive features of optical techniques such as interferometry and fringe-projection profilometry. These techniques encode information of the measurand in phase characteristics of a two-dimensional fringe pattern. The piecewise polynomial phase approximation approach that we introduced has enabled simultaneous and direct estimation of the phase and its first- and second-order derivatives from a single fringe pattern. This approach allows for the simultaneous measurement of displacement, strain, and curvature of a deformed object, and thus avoids the necessity of using filtering and unwrapping procedures, multiple analysis techniques, and multiple interferometric configurations. Moreover, its high computational efficiency has opened up avenues for rapidly obtaining measurements such as the evolution of full-field deformation and strain at standard video frame rates.

S.S. Gorthi

Spatial fringe analysis techniques and their application to holographic interferometry and fringe projection techniques, EPFL Thesis Nr. 4799, 103 p., EPFL 2010

Prof. Pramod Rastogi Applied Computing and Mechanics Laboratory (IMAC) http://imac.epfl.ch/





INNOVATIVE BOGIE DESIGN HELPS OPTIMIZE THE RAILWAY NETWORK

Track maintenance expenses contribute heavily to the overall operating costs of railways. Track degradation depends on a variety of factors, and bogie design is crucial among them. Bombardier Transportation developed an innovative bogie design that ensures roll compensation and provides radial steering of the axles. This is expected to significantly reduce track degradation. Combining results of its own research on track maintenance and Bombardier's data on bogie behaviour, the research led by EPFL-LITEP made it possible to assess the cost savings that this innovation can provide. This research work was a major contributory factor to the choice the Swiss Federal Railways made last spring for new rolling stock; it needed to both satisfy the requirements of the future railways whilst avoiding extra infrastructure investment.

COLLABORATORS: Dr. P. Tzieropoulos, Dr. W.-J. Zwanenburg, D. Emery, M. Vidaud, D. Tron

W-.J. Zwanenburg, P. Tzieropoulos (2010), "Relative importance of track wear and degradation factors and the influence of innovative constructive technologies of rolling stock," EPFL-LITEP (restricted distribution)

W-.J. Zwanenburg, P. Tzieropoulos (2010), "Relative importance of track wear and degradation factors and the influence of innovative constructive technologies of rolling stock - Stage 2: Case study Geneva - Lausanne - Bern - St. Gallen line," EPFL-LITEP (restricted distribution)

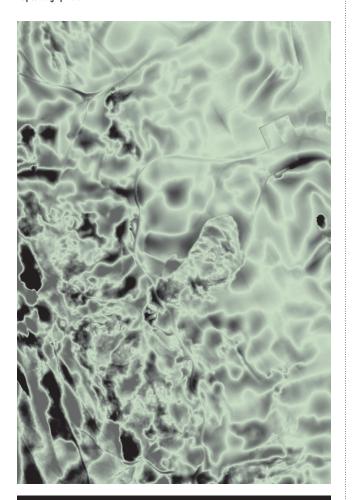
Prof. Panagiotis Tzieropoulos Intermodality and Transport Planning Group (LITEP) http://litep.epfl.ch/



MULTISCALE GEOMORPHOLOGICAL ANALYSIS

A comprehensive description of most natural phenomena, geomorphological and geological features (such as landslides) can only be achieved by combining relevant information at a large spectrum of scales, from the overall shape of the landslide down to the detailed folds of the accumulation area. Using high-resolution Digital Elevation Models (DEM), we applied wavelet modeling and generalization processes to produce a systematic set of successive B-spline and related wavelet parameters. Geological features may then be identified and extracted from different decomposition levels through a filter bank.

Prof. François Golay Geographic Information Systems Laboratory (LASIG) http://lasig.epfl.ch/





BENEFITS AND RISKS OF IRRIGATION WITH TREATED WASTEWATER

Wastewater reuse in agriculture is a widespread practice in developing countries, especially in urban areas where water shortages and poverty encourage people to use that marginal resource. Research was carried out in Ouagadougou (Burkina Faso) with the objectives, among other things, of evaluating the impact on soil quality of irrigation with industrial treated wastewater. In this particular case, chemical analysis, assessment of the soil's hydrostructural stability by measurements, and modelling of shrinkage curves and threedimensional fluorescence spectra analysis revealed a strong deterioration of the soil structure in a relatively short period of time. Over a long period, it is possible that such a degradation could result in a total alteration of the soil with highly detrimental agronomic consequences, as confirmed by a 50% decrease in eggplant yields between the first and second year of irrigation with recycled water.

M. Sou. Recyclage des eaux usées en irrigation: potentiel fertilisant, risques sanitaires et impacts sur la qualité des sols. EPFL Thesis Nr. 4578, EPFL 2009

P.B.I. Akponikpe, K. Wima, H. Yacouba and A. Mermoud.

Reuse of domestic wastewater treated in macrophyte ponds to irrigate tomato and eggplant in semi-arid West-Africa: benefits and risks. Accepted in Agricultural Water Management, 2010

M. Sou, A. Mermoud, H. Yacouba and P. Boivin. Impacts of irrigation with industrial treated wastewater on soil properties. Submitted to Agricultural Water Management, 2010

Prof. André Mermoud Laboratory of Ecohydrology (ECHO) http://echo.epfl.ch/

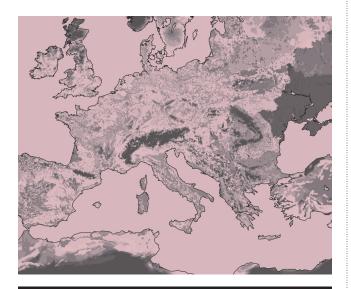
RESEARCH HIGHLIGHTS

<u>DID PREHISTORIC HUMANS PREVENT</u> A NEW ICE AGE?

Humans have altered the Earth's land surface since the Paleolithic by clearing forests, first to improve hunting and gathering opportunities, and later to produce agricultural cropland. In the Holocene, agriculture was established on nearly all continents and led to widespread modification of terrestrial ecosystems. To quantify the role that humans played in the global carbon cycle over the Holocene, we developed a new inventory of anthropogenic land-cover change from 8000 years ago to the beginning of large-scale industrialization (AD 1850). Using this data set, we forced the LPJ dynamic global vegetation model to evaluate the impacts of humans on terrestrial carbon storage during the preindustrial Holocene. By three thousand years before the present (ka BP), cumulative carbon emissions caused by anthropogenic land-cover change in our new scenario ranged between 84 and 102 Pg, translating to ~7 ppm of atmospheric CO₂. By AD 1850, emissions were 325-357 Pg. Simulated cumulative anthropogenic emissions over the preindustrial Holocene support the hypothesis that anthropogenic activities led to the stabilization of atmospheric CO₂ concentrations at a level that made the world substantially warmer than it otherwise would be.

J.O. Kaplan et al., 2010. Holocene carbon emissions as a result of anthropogenic land cover change. The Holocene, doi: 10.1177/0959683610386983

Prof. Jed Oliver KaplanAtmosphere-Regolith-Vegetation Group (ARVE) http://arve.epfl.ch/





UNDERSTANDING THE COMPLEXITY OF ALPINE HYDRO-METEOROLOGY

At large enough spatial and temporal scales, the hydrology of an alpine watershed may seem simple: entering precipitation is more or less balanced by the exiting streamflow. Zooming in and taking a closer look, however, reveals the system's much more complex dynamics. For the past four years, researchers from the EFLUM lab led by Professor Marc Parlange have been returning to Val Ferret to study this complexity in one of the most intact watersheds in Valais, Switzerland. Using a wireless network of sensing stations that monitor meteorological and hydrological quantities in conjunction with numerical modeling techniques, they are studying how spatial and temporal heterogeneity influence hydro-meteorological processes such as wind flow, water runoff and subsurface flows, the distribution of soil moisture, evapotranspiration, and snow and ice melt. A better understanding of the phenomena involved in driving small-scale hydrological processes will provide a stronger scientific basis for hydrological model development, ultimately leading to more confidence in decisions regarding the management of one of Switzerland's most valuable natural resources: water.

D. Nadeau, E. Pardyjak, C. Higgins, H. J. S. Fernando and M. Parlange.

A simple model for the afternoon and early-evening decay of turbulence over different land surfaces. Annual Meeting of the European Meteorological Society, Zurich, Switzerland, 13-17 Sept. 2010.

Prof. M. Parlange Environmental Fluid Mechanics Laboratory (EFLUM) http://eflum.epfl.ch/

ENAC AT LARGE



Examples of Knowledge & Technology Transfer

ALUMNI NEWS

Carolina Osorio has been appointed assistant professor at MIT in the Civil and Environmental Engineering Department. She defended her PhD thesis "Mitigating network congestion: analytical models, optimization methods and their applications" in April 2010, under the supervision of Professor Michel Bierlaire. Dr. Osorio's research interests are in applied probability theory, simulation and simulation-based optimization for transportation problems, including macroscopic traffic modeling, large-scale traffic management and transportation systems analysis. She has developed a simulation-based urban traffic control framework that achieves tractability by coupling simulation-based and analytical urban-traffic models. She also develops analytical models, simulation-based models and optimization methods to mitigate network congestion for health-care systems and biological networks.



Mathieu Nuth has been appointed assistant professor at the Faculty of Engineering of the University of Sherbrooke, Canada. He defended his PhD thesis entitled "Constitutive modelling of unsaturated soils with hydro-geomechanical couplings" in March 2009, under the supervision of Professor Lyesse Laloui. Dr. Nuth developed an innovative theory to describe and predict the mechanical behaviour of soils and to allow a sustainability-oriented design of geo-structures, accounting for future climatic scenarios, and contributing to risk management. He obtained the ALERT award of the best European PhD work in Geomechanics in 2010, the Chorafas 2009 award for the best PhD thesis in the category "Sustainability," and the AUGC Rene Houpert Prize for the best young researcher in civil engineering in 2008.

His paper with Professor Laloui, "Effective stress concept in unsaturated soils," was the most-cited paper of the International Journal for Numerical and Analytical Methods in Geomechanics in 2009.



KIDS LEARN ABOUT CLIMATE

Launched in 2008 within the framework of Swiss Experiment, ClimAtscope is an educational program that introduces young people between the ages of 6 and 18 to environmental monitoring in the Alps. Ten Sensorscope stations have been installed in schools in the Valais. A workbook has been designed for every age group. Experiments are at the center of the program; the kids build rain gauges, draw graphs connecting the vegetation to the temperature, compare and interpret their station's data. Thanks to its success, ClimAtscope was further developed in 2010. Three fixed stations were established in Lausanne, Zurich and Sion and three others are available for loan. At the European level, a similar initiative has been set up. Called O3E, the collaboration between France, Italy and Switzerland is creating a network between schools, allowing the exchange of seismological, meteorological or hydrological data. "France even bought Sensorscope stations," says Vincent Luyet, project leader based in ENAC's Environmental Fluid Mechanics Laboratory.

http://eflum2.epfl.ch/climatscope/



ENAC AT LARGE

ENAC IN RAS AL KHAIMAH

EPFL Middle East is a collaborative project between Ras Al Khaimah Investment Authority (RAKIA) and EPFL, Switzerland. Its mission is the development of leading-edge research programs, graduate and post-graduate educational programs (masters, PhD, continuing education) and practical and innovative technology-transfer interfaces with industrial and economic bases in the United Arab Emirates. These activities will take place in state-of-the-art scientific and technological infrastructures.

The project will give the Emirate of Ras Al Khaimah and the United Arab Emirates the high-level research and teaching resources necessary for taking on the daunting technological challenges that the global states and similar countries will be facing in domains such as energy, environment, construction, and information technology.

Several ENAC labs are involved in a wide range of topics with a trans-disciplinary approach such as:

- Renewable energies: Wind engineering and Renewable Energy Laboratory
- Sustainable Urban and Architectural Design: Interdisciplinary Laboratory of Performance-Integrated Design, Laboratory of Architecture and Sustainable Technologies, Composite Construction Laboratory, Media and Design Laboratory
- Governance and policies: Solar Energy and Building Physics Laboratory
- Sustainable Multimodal Transportation: Transport and Mobility Laboratory
- Water Resources: Ecological Engineering Laboratory

http://www.epfl.ae/

A CHAIR FOR CO2 SEQUESTRATION

In May 2010, Petrosvibri, a company that conducts natural gas explorations under Lake Geneva, signed a scientific agreement with EPFL to create a chair dedicated to long-term CO₂ sequestration. This 2.5 million Swiss franc chair will be part of ENAC. The objective is to better understand the interactions between CO₂ and the rock formations in which it is to be sequestered. Reactions will be studied in a variety of geological situations, temperatures, depths, and tectonic movement conditions. "Finding constructive solutions to the CO₂ problem is urgent, and this chair is a good way for our country to contribute to this task," said Philippe Petitpierre, vice-president of Petrosvibri and an EPFL environmental engineering alumnus.

REINING IN RADON

In 2010, ENAC, in collaboration with the Federal Office of Public Health (OFSP), the Institute of Radiation Safety at the Centre hospitalier universitaire vaudois (CHUV), the Academy of Architecture at the Swiss-Italian University and the Société suisse des ingénieurs et des architectes (SIA) organized a continuing education course on "Radon in buildings: the scientific, technical and legislative approach." It has been only in the past few years that we have become aware of the risks associated with radon, a naturally-occurring radioactive gas that, after smoking, is the second most prevalent cause of lung cancer. New construction techniques can accentuate the accumulation of radon in the air of our interior working and living spaces. Switzerland has laws concerning radon, construction codes for buildings and thus, indirectly, places responsibility on architects and engineers. In 2009, the World Health Organization set forth new, lower limits on radon that will radically affect construction and renovation on buildings in Switzerland.



ÉLEMO

The foundation brings together three partners: EPFL, Ferring Pharmaceuticals and the Honorary Consulate of Russia. It will fund projects to study the deep layers and the interface between the water and sediments on the bottom of Lake Geneva, using two submersibles. The project goes by the single name ÉLEMO (previously MIR). Several scientific partners are involved in the project. The two submersibles are provided by the Institute of Oceanography of the Russian Academy of Sciences. They have been used to carry out research and analysis in the deep Arctic Ocean. The projects funded, for a duration of one to four years, are based at EPFL, Eawag, the University of Neuchâtel and the University of Geneva. The dives will take place between June and August, 2011. In total, 100 dives, or two per day, are planned, one in each submersible.



REAL-TIME RISK MANAGEMENT FOR EXTREME ENVIRONMENTS

Gaiasens was created in a multidisciplinary spirit, with environmental and electrical engineers and computer scientists. Meteorological measurements, made in real time in extreme environments, are its main activity, and are a boon to surveillance in high-risk zones. Gaiasens installs measurement stations and gives access to data in real time through a web interface. This makes it possible to manage natural risks in real time, as well as classify risk-prone periods in a database. Gaiasens' second activity is the study, modeling and prediction of air quality through the atmospheric model Map3D, which won an Innogrant in 2007, and gives direct access to air quality and weather predictions.

http://www.gaiasens.com

DIAGNOTHERM HELPS CLIENTS THROUGH ENERGY MANAGEMENT

After first-hand experience in building renovation, Martin Froidevaux and Fabrice Boucher, EPFL environmental engineers who graduated in 2005, decided to create their own energy management consulting firm, Diagnotherm. Consumers now face a wide range of insulation and heating systems, with each product touted as being more efficient, ecological and cheaper than the rest. Diagnotherm, created to promote thermal efficiency in buildings independently of manufacturers, simulates and measures the thermal behavior of buildings and proposes solutions adapted to each situation. This may range from the choice of materials and installation to advice for do-it-yourself construction.

PRESS REVIEW 2010

http://actualites.epfl.ch/presse

JANUARY

One precious degree

Anne Nolin, invited professor who occupied the Landolt & Cie. chair in 2010, gave a lecture in the Verbier Telecabine hall. The American climatologist spoke about the rise in average winter temperatures and gave several worrisome predictions.

Hello, it's raining here

According to an innovative idea from the Environmental Remote Sensing Laboratory at ENAC and Eawag, mobile phone antennas could be used to measure rainfall. Combined with an intelligent system to regulate the water-treatment network, this method could improve water quality in urban areas.

FEBRUARY

The Avancon will stay in its bed

ENAC's Hydraulic Constructions Laboratory has used a scaled-down model to test a retention dam that secures the banks of the Avancon river in the village of Bex.

Heat from underground

Switzerland is at the cutting edge of geothermal research. Research done in ENAC's Soil Mechanics Laboratory has contributed, notably by a study of the thermodynamic behavior of structures using simulation.

MARCH

The contract of the century

New trains will be built for the CFF. Bombardier, one of the companies bidding for the contract of

the century, which is worth more than 2 billion francs, commissioned researchers from ENAC's Intermodality, Transports and Planning group to study rail wear and to develop a system that would save money on rail maintenance.

APRIL

Hardening the soil

A PhD student in the Soil Mechanics Laboratory succeeded in modifying a bacterium so that it would act as a kind of glue in sandy soils. This discovery could be useful in earthquake protection, reinforcing unstable ground.

Geneva's urban future

ENAC's Laboratory of the Production of Architecture is drawing a wide picture of a vision for the future of the canton of Geneva. "Three paths to change Geneva," are proposed: a marked urban densification, the development of the proximity of the Geneva airport as the new main station of the city, and finally, strengthening the transportation network. The project was featured in an exhibition and a roundtable discussion in the city of Geneva.

LIDAR probes a cloud

The Payerne meteorological station is analyzing the evolution of the ash cloud emitted by the Eyjafjoll volcano, using LIDAR. This system, developed under the leadership of ENAC's Environmental Fluid Mechanics Laboratory, can identify the altitude and thickness of the doud, something conventional measurement systems cannot achieve.

MAY

Meeting about mountains

The Alps are more sensitive than the plateau to global warming. During a workshop held in Interlaken, 100 experts tried to identify the important variables to measure. Among them, Cecilia Matasci, a PhD student in ENAC's Environmental Economics and Management Laboratory, is developing a map of vulnerabilities to determine the consequences of changing climate on living areas.

A simulated pontoon

Reneva is building a new floating dock near the Perle du lac. Its location will be calmer than that of the previous pontoon. In addition, the new position was scientifically calculated in a testing tank in ENAC's Hydraulic Constructions Laboratory.

Predicting ruptures of steel lined pressure shafts and tunnels

An article presents a research project that aims to develop a new method of locating and quantifying weak reaches in a steel-lined pressure shafts, which guide water from dams to hydropower plants. The research is being done by ENAC's Hydraulic Constructions Laboratory within the framework of the HydroNet consortium and is supported by CCEM and the Federal Energy Office.

A man for all worksites

L'Hebdo magazine lists 100 people who promoted the region over the past year. Among them are many EPFL figures, including Professor Laurent Vulliet. Since January 2008, the former ENAC dean has led the Lausanne-based engineering consulting firm BG, which is on track to become Switzerland's top firm in the field of civil engineering.

The Alps under surveillance

Swiss Experiment, a project launched in 2007 that involves several ENAC laboratories, aims to understand how global warming modifies the hydrologic cycle in the Alps. Marc Parlange, head of ENAC's Environmental Fluid Mechanics Laboratory and ENAC's dean, explains these experiments and the results that have already been obained.

A titanic struggle

A drain saring the full statements and the full of Mexico seems to have finally been stopped. Aurèle Parriaux, head of ENAC's Laboratory of Engineering and Environmental Geology explains how the flow of hydrocarbons was stopped by the injection of mud in the well, and describes the difficulties associated with this method.

JUNE

Urbanism and agreements

Monique Ruzicka-Rossie, member of ENAC's Choros Laboratory, has studied the development of the Nyon district. She thinks that the development of the region demands participation on the part of inhabitants. The challenge, she concludes, "is to bring to the table all the actors, in order to find a coherent solution in the face of all the levels of apprehension concerning the region."

OCTOBER

Climate research

The Aubonne Arboretum attracted a lot of interest during the 125th anniversary of the Institute of Forest, Snow and Landscape Research, as did its EPFL antenna directed by Professor Alexandre Buttler. Researchers presented their work on biodiversity and climate change, done in part in the Aubonne Valley.

Spatial and Urban installation

The Tilt space, dedicated to contemporary art and urban spaces, was inaugurated in Renens. Visitors are welcomed by a ball-shaped installation that was made by a team from ENAC.

DECEMBER

Verbier calls upon the Urban Sociology Laboratory

The Bagnes Valley ski area commissioned a study from ENAC's Urban Sociology Laboratory to try and improve traffic flow in the village's streets. The results of the pre-study — done with the support of the Landolt & Cie Chair — were appreciated by the various local participants, as much for their scientific quality as for their local applicability.

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.



hibit shed light on current research being and Laurent Stalder were invited to speak done in ENAC's IBOIS laboratory. The about the various facets of teaching and exhibit was focused around five research Snozzi's influence. areas that were the subject of as many PhD theses: Origami, folding, braiding, asto- In parallel to these activities, Archizoom nishing welded wood and structures gene- continued the lecture series of invited prorated from fractal geometry. The most refessors in architecture, open to the public, cent student projects done in the workshop which is becoming increasingly popular. were also exhibited, to show that research On the side, Archizoom invited Profesis intimately linked with teaching. Pro- sor Jacques Lucan when his book was fessors Yves Weinand, Pekka Heikkinen released, and Dr. Alberto Alessi spoke

EPFL 2009-2010" exhibit presented the took place in the Rolex Learning Center best student work, from all classes. This on the theme of public space. exhibit was open in the SG building at EPFL, then in the showroom in the new In partnership with Swissnex, Archizoom

In the fall semester, the "Luigi Snozzi, Prof. d'Architecture" exhibit revisited the immense influence that Snozzi had in Lausanne and Switzerland in the education of architects. Forty architects were invited to exhibit a recent work that revealed the heritage of their years of study with Luigi Snozzi. The exhibit also included a wide range of the Swiss-Italian architect's work. Snozzi gave a lecture to open the exhibit, then architects Olivier Fazan, In spring 2010, the "Timber Project" ex- Geneviève Bonnard, Pierre-Alain Croset

and Andrea Deplaces each gave a lecture. about the importance of architects in product design. Three PechaKucha lectures In September, the "Best of Architecture were organized in Lausanne, one of which

building of the Getaz company in Etoy. exhibited two IBOIS prototypes in the Swiss pavilion of the universal exhibition in Shanghai, then in two other large exhibitions in China. In May 2010, the "Archizoom Associati" exhibit was shown in the Mendriso Academy of Architecture.





ARCHIZOC

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LANDOLT & CIE **CHAIR**

INNOVATIVE STRATEGIES FOR A SUSTAINABLE FUTURE

scientists and Alpine tourism specialists. extensive research contract with ENAC.

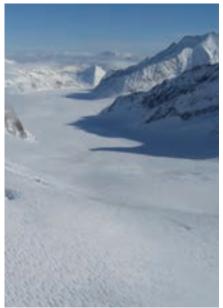
Professor Megan Murray, from the Harvard School of Public Health, began her activities as holder of the Landolt & Cie Chair TWO PUBLIC LECTURES WERE HELD IN THE PAST YEAR with an initial visit in summer 2010. Based in the School of Life Sciences, Murray will In May 2010, Professor Partha Dasgupta, offer a course and will do interdisciplinary economist at Cambridge University and research on infectious disease (TB, cholera) laureat of the Volve Environment Prize 2002 associated with sanitary and social conditions in developing countries. She is continuing her activities in 2011.



In 2010, the chair was occupied by Profes- Elsewhere, the chair has funded a prelimisor Anne Nolin from Oregon State Uni- nary study on sustainable mobility in the versity. Nolin is an expert in snow and ice commune of Bagnes in the Valais, to be done hydrodynamics. In addition to offering a by Professor Vincent Kaufmann's Urban course on this subject to master's and PhD Sociology Laboratory. This pre-study was students, Nolin conducted research on snow presented during the Green Pioneers Summit and ice in the Valais Alps in collaboration 2010 in Verbier, an international conference wtih scientists in ENAC's Environmental sponsored by the Prince of Wales Founda-Fluid Mechanics Laboratory. Nolin also tion for the built environment. The results participated in several national and inter- sparked much interest on the part of the national conferences that brought together commune and will probably lead to a more

(equivalent to the Nobel in this discipline) discussed the issue of whether it was economically preferable to invest today in attenuating the effects of climate change, or whether, betting on future growth in GDP, we should let future generations fund these measures; it is an inter-generational exercise in ethics.

On June 22, 2010, Archbishop Mgr. Jean-Louis Burgues, ID and PhD economist, Secretary of the Congregation for Catholic Education (Minister of Education) for the Vatican, presented the evolution of the idea of sustainable development in the policies of the Vatican over the course of the past few decades.







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.

SPACEWATCH WORKSHOP 2010

"SPACE AND US, TODAY AND TOMORROW"

Rural and urban development is one of the most controversial issues in the Swiss political arena. Created in 2008 by ENAC's Institute of Urban and Regional Sciences (INTER), the "SpaceWatch" project brings together Swiss and international specialists in the context of an expert committee. The committee is asked to make strategic recommendations to political authorities and land management professionals in order to meet the demand for sustainable development. The 2010 workshop was held in the larger context of the Swiss Platform of Science of Space (S3F), funded by the ETH board. It was held at EPFL and involved a public debate in which many attendees active in practice or in research on urban and regional planning participated.

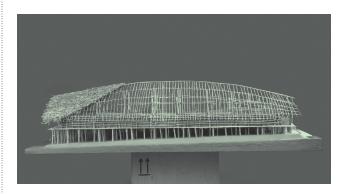
http://spacewatch.epfl.ch

INTERDISCIPLINARY COLLOQUIUM

"CONCRETE, MATERIAL IN THE MAKING"

The first session of the three-year colloquium was held in June 2010. It has a two-fold objective: first, the colloquium is an opportunity for researchers and practitioners — engineers, architects, business people, and administrators interested in concrete — to exchange their points of view, concerns, research directions, and to come together to formulate propositions for meeting the challenges that concrete is facing today. Second, raising awareness in the student community of the issues and challenges associated with the production and use of this construction material, which is the most widely used in the world. Those who work on concrete and who want to share their progress are encouraged to contact the organizers to participate in the future sessions of the colloquium!

http://beton-colloque.epfl.ch/



LEARNING FROM VERNACULAR -AN ARCHITECTURAL EXHIBIT

Installed in the village of Rossinière during the summer of 2010, this exhibit invited the public to discover the foundations of vernacular architecture from the Archives of Modern Construction (ACM), a unique assembly of documents and models at the 1:20 scale of various traditional buildings from all over the world. The exhibit's goal was to highlight the diversity of spatial devices explored by various cultures, as well as the use of materials as diverse as wood, stone, dirt and straw. An impressive array of ancestral know-how, often thousands of years old and in danger of disappearing forever, represents a storehouse of ingenious solutions that we can imagine incorporated into contemporary works in response to modern criteria of sustainability.

http://learning-from-vernacular.epfl.ch

2010 LATSIS SYMPOSIUM - ECOHYDROLOGY

The Latsis Symposium was an interdisciplinary, mid-size conference on ecohydrology and sustainable water resources use. The conference brought international experts and young researchers in traditionally separate fields such as surface hydrology, soil and plant ecology, environmental complexity and water resource management together in a setting more suited to discussion and interaction than large conferences. The symposium was an invaluable means of establishing communication and collaboration between group leaders and promising young researchers. It also set the stage for strengthening links between the different disciplines and bridging the gaps between them.

http://latsis2010.epfl.ch

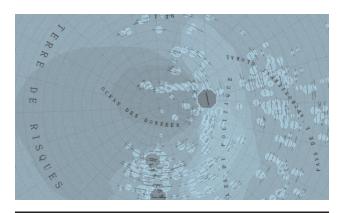


ENAC RESEARCH DAY

"LIVING WITH RISKS: HOW TO BUILD NEW FORMS OF EXPERTISE"

The area of risk management is booming today, as much in the political and economic arenas as in the area of scientific research. ENAC made this theme the central focus of its Research Day in June 2010. The program included the "Terre des risques" installation, set up by the Study Group on the Spatiality of Risks (ESpRi), stands presenting various ENAC laboratories working on problems involving risk, three well-known invited speakers and a PhD poster session.

http://enac.epfl.ch/research-day http://espri.epfl.ch



10TH INTERNATIONAL SYMPOSIUM ON DISTRIBUTED AUTONOMOUS ROBOTIC SYSTEMS

The Symposium on Distributed Autonomous Robotic Systems provided a forum for the exchange and stimulation of research into advanced distributed robotic systems, a rapidly growing, interdisciplinary field at the intersection of computer science, communication and control systems, and electrical and mechanical engineering. Technologies, algorithms, system architectures, and applications were presented and discussed during a three-day symposium. DARS was an excellent 10th anniversary edition thanks to the high quality of the submissions and a panel of outstanding speakers, and provided an exciting environment for the presentation of novel theoretical results, implementations and applications.

http://dars2010.epfl.ch

SAMPLING OF INTERNATIONAL EVENTS ORGANIZED BY OUR SCHOOL'S LABORATORIES

17-21/01/2010

Spring Seminar of the "3ème cycle romand de Recherche Opérationnelle" — Transportation and Mobility Laboratory

07-11/02/2010

Discrete Choice Analysis: Predicting Demand and Market Shares — Transportation and Mobility Laboratory

08-10/02/2010

SpaceWatch 2010 "Space and Us, Today and Tomorrow"— Chôros Laboratory

19/02/2010

EPFL Doctoral Conference in Mechanics — Soil Mechanics Laboratory

19/02-16/04/2010

Exhibition "Jean Prouvé. La poetica dell'oggetto tecnico," Galleria dell'Accademia, Mendrisio — Laboratory of Techniques and Preservation of Modern Architecture

16-21/04/2010

Exhibition "GVA Cube," Maison de l'Architecture, Genève — Laboratory for the Production of Architecture

10-11/05/201

"8e plateforme internationale sur les agglomérations urbaines" — Urban and Regional Planning Community

17-21/05/2010

Conference on Advanced Phase Measurement Methods in Optics and Imaging — Applied Computing and Mechanics Laboratory

17-28/05/2010

Exhibition "François Maurice, architecte" at the Haute Ecole du Paysage, d'Ingénierie et d'Architecture de Genève — Theory and History of Architecture Laboratory 2

20/05-18/06/2010

Exhibition "Devanthéry & Lamunière — InDetails," La galerie d'architecture, Paris — Laboratory of Architecture and Urban Mobility

03/06/2010

Interdisciplinary colloquium "Le béton matière en devenir" — Laboratory of Urban Architecture

05/06-21/08/2010

Exhibition "Learning from vernacular" in Rossinière
— Archives of Modern Building

09/06/2010

ENAC Research Day 2010 : "Living with Risks: How to Build New Forms of Expertise" — Study Group on the Spatiality of Risks & ENAC Deanship

15-18/06/2010

European Rock Mechanics Symposium — Rock Mechanics Laboratory

20-25/06/2010

Gordon Research Conference Environmental Sciences: Water, Holdemess, New Hampshire — Environmental Chemistry Laboratory

27/06-02/07/2010

Conference "Thirty years of stochastic subsurface hydrology: Where do we stand and what are the emerging challenges?" — Laboratory of Ecohydrology

30/06/2010

Navigare 2010, GNSS in ITS: the way of co-operation — Geodetic Engineering Laboratory

05-09/07/2010

ALERT European Doctoral School "Mechanics of Unsaturated Geomaterials" — Soil Mechanics Laboratory

14-23/07/2010

Summer School "Desperate Houses" — Urban, Rural and Architectural Planning Laboratory, Laboratory of Architecture and Urban Mobility & Construction and Conservation Laboratory

19-21/07/2010

Summer School "Globalization of Urbanity: Urban Systems and Urban Models" — Chôros Laboratory

19-21/08/2010

Sixth Workshop on Discrete Choice Models — Transportation and Mobility Laboratory

28/08-03/09/2010

9th International NCCR Climate Summer School "Adaptation and Mitigation: Responses to Climate Change" — Economics and Environmental Management Laboratory

01/10/2010

Colloquium "Condition d'architecture, condition d'école" — Urban, Rural and Architectural Planning Laboratory

08-10/10/2010

Celebration of WSL Lausanne 20 years of representation in the French part of Switerland — Ecological Systems Laboratory

17-20/10/2010

LATSIS Symposium Ecohydrology — Environmental Fluid Mechanics Laboratory & Laboratory of Ecohydrology

01-03/11/2010

10th International Symposium on Distributed Autonomous Robotic Systems — Distributed Intelligent Systems and Algorithms Laboratory

16-17/11/2011

International seminar "The Glass in the 20th Century Architecture: Preservation and Restoration," Accademia di architettura, Mendrisio — Laboratory of Techniques and Preservation of Modern Architecture

28/11/2010

Symposium "Athens in Crisis," Benaki Museum, Athens — Laboratory for the Production of Architecture

FACULTY

<u>NEW PROFESSORS</u> APPOINTED AT ENAC IN 2010



Marilyne Andersen

Associate Professor of Sustainable Construction Technologies

Marilyne Andersen will bring energy and vision to EPFL's Institute of Architecture. Her research interests lie at the crossroads of social, technological and environmental issues. She develops daylighting visualization methods in close collaboration with architects and engineers, and analyzes the many factors that influence the interior built environment and its interactions with climate. She collaborates with the Harvard Medical School to study the photo-biological impact of natural light on circadian rhythms and has developed synergies with other laboratories at EPFL within and outside of ENAC as well as institutions in the UK, Belgium and the US on improving energy-efficiency, comfort and health in buildings using natural resources. She will also help strengthen ties between EPFL and its future campus in Ras al Khaymah (United Arab Emirates). Marilyne Andersen is a Swiss citizen. She earned a degree in physics and then a PhD in building physics at EPFL. Since 2004 she has directed MIT's Daylighting Laboratory. She has received many distinctions, including the Chorafas Foundation Prize in 2005 and the Taylor Technical Talent Award in 2009.



Janet Hering

Full Professor of Environmental Chemistry

Janet Hering has been the director of the Swiss Federal Institute of Aquatic Science & Technology (Eawag) and professor at ETH Zurich since 2007. From 1996 to 2006, she was a professor at the California Institute of Technology (Caltech), where she also served as the executive officer for the Keck Laboratories for Bioengineering, Environmental Science & Engineering, and Materials Science from 2003 to 2006. Prior to 1996, she was an assistant and later associate professor of civil and environmental engineering at UCLA. She has an A.B. in chemistry from Cornell University, and A.M. in chemistry from Harvard University and a PhD in oceanography from the MIT-Woods Hole Oceanographic Institution Joint Program. Hering's research interests include the biogeochemical cycling of trace elements in natural waters and water treatment technologies for the removal of inorganic contaminants from potable water. She will divide her time equally between the two Swiss Federal Institutes of Technology.

at the Eawag, Kristin Schirmer is also an adjunct professor in the Department of Biology at the University of Waterloo (Canada) and a senior lecturer in environmental toxicology at ETH Zurich. Schirmer's field of expertise is environmental toxicology, particularly the study of animal cells. She cooperates closely with ecologists, hydrogeologists, microbiologists, chemists and engineers. Her background and leadership qualities will enable her to further strengthen existing ties among the various researchers in EPFL's School of Architecture, Civil and Environmental Engineering. Schirmer earned a master's degree in biology at Universität Hohenheim (Germany), and then a PhD at the University of Waterloo, where she has held a position as an adjunct professor since April 1999. Between July 2003 and December 2007, she was the director of the Department of Toxicology at the Centre for Environmental Research in Leipzig.



Emmanuel Rey

Tenure-track Assistant Professor of Architecture and Sustainable Construction Technologies

Emmanuel Rey is an expert in sustainable architecture, particularly concerned with how sustainability principles operate at various levels - from city planning to construction components - and how evaluative and innovative criteria can be incorporated into the architectural proiect. His interdisciplinary approaches help build dynamic ties between engineers and architects. Rev, a Swiss citizen, earned his architecture degree at EPFL in 1997, followed in 1999 by a European postgraduate diploma in architecture and sustainable development conferred jointly by EPFL, the Université Catholique de Louvain, ENSA Toulouse and the Archi-



Kristin Schirmer

Adjunct Professor of Environmental Toxicology

In addition to being the director of the Department of Environmental Toxicology



tectural Association School of Architecture in London. In 2006, while managing the Bauart Architectes et Urbanistes SA firm with his partners in Bern, Neuchâtel and Zurich, he completed his PhD at the Université Catholique de Louvain.



Paolo Perona

SNF Assistant Professor

Paolo Perona has been senior research associate at the Institute of Environmental Engineering of ETH Zurich (2003-2010), postdoc at Politecnico di Torino (2001-2003), and holds a PhD in hydraulic engineering from Politecnico di Milano (2001). His research interests are in experimentation and modelling in fluid mechanics, rheology and time series analysis. Recent studies address the dynamics of river and riparian vegetation, the hydrology of alpine catchments and the search for innovative strategies of optimal water allocation between traditional and non-traditional water uses toward long-term sustainable management of water resources.

PROMOTIONS

Associate Professor Vincent Kaufmann

> Senior Scientist Y. Pedrazzini

DEPARTURES

Prof. J.-D. Marchand Prof. V. Slaveykova-Startcheva

ENAC FACULTY MEMBERS APPOINTED OUTSIDE EPFL

Prof. Marilyne Andersen

Visiting Scientist

Massachusetts Institute of Technology,
Cambridge, USA

Prof. Jed Oliver Kaplan

Adjunct Assistant Professor
University of Victoria,
Canada

Prof. Lyesse Laloui

Adjunct Full 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

Prof. Marc Parlange

Adjunct Professor
School of Engineering, Johns Hopkins University,
Baltimore, USA

Dr. Darren Robinson

Visiting Professor
VTT Technical Research Centre of Finland

VISITING PROFESSORS AND ACADEMIC HOSTS 2010

Architecture

Jean-Pierre Adam – Thirugnanasuntharan Aravinthan – Marco Bakker – Frank
Barkow – Timothy Benton – Alexandre
Blanc – François Charbonnet – Adalberto
Dias – Bill Dunster – Urs Egg – Yvonne
Farrell – Christian Gilot – Jean-Paul
Jaccaud – Anne Lacaton – Patxi Mangado
– Shelley McNamara – Pier Nicola Pagliara
– Charles Pictet – Marco Rampini – Camilo
Rebelo – Deborah Saunt – Eduardo Souto
de Moura – Stephen Taylor – Jean-Philippe
Vassal – Ariane Widmer-Pham

Civil Engineering

Robert Amor – Jan Belis – Didia Cameira Covas – Felix Darve – John Mark Gray – Alfred Hatt – Tomasz Hueckel – Seokwon Jeon – Dinis Juizo – André Roy

Environmental Engineering

Wilfried Brutsaert – Gregory William Characklis – Stephen Drake – Lyatt Jaeglé – Fengxiang Jin – Florent Joerin – David Johnson – Dorothy Parker – Graham Sander – Nicolaas Cornelis Van de Giesen

Urban & Regional Planning

Moshe Ben-Akiva - Julio Cesar De Carvalho - Marc Demange - Jill Litt - Ashok Pandey - Christophe Picouleau - Theodoros Tsekeris

FNAC

Anne Nolin

DISTINCTIONS & AWARDS

Our school has made an impact in the world: here is a sampling of awards received in 2010

TWO INTERNATIONAL AWARDS FOR PROFESSOR ANDREA RINALDO

Professor Andrea Rinaldo was awarded the Hydrology Days Lecturer and Borland Award from the American Geophysical Union (AGU) in March 2010 for "pathbreaking contributions to the field of ecohydrology." This work, done in EPFL's Laboratory of Ecohydrology – established at the beginning of 2008 – aims to find ways to integrate riparian systems into large-scale water resource management, develop spatial strategies to minimize loss of freshwater biodiversity, and launch effective prevention campaigns against epidemics of water-borne diseases; all issues of great practical importance to human life and to social and ecosystem welfare.

Along with colleague and friend Professor Ignacio Rodriguez-Iturbe (Princeton University, USA), Rinaldo was awarded the Creativity Prize of the "Prince Sultan Bin Abdulaziz International Prize for Water" in November 2010, for "their invention and development of the new field of ecohydrology, which bridges the gap between the physical and life sciences." Also from the press release: "The work being awarded represents the joint Princeton-Lausanne research group that was built by the two prizewinners through years of collaboration. ...Their work facilitates avenues of research into many areas of vital importance for society, especially where the ecological significance of human water use is at issue."

http://echo.epfl.ch



WALLPAPER* MAGAZINE GRADUATE DIRECTORY

The magazine Wallpaper* – the must-have fashion and design bible – recognized two 2010 EPFL architecture graduates, Estelle Lépine and Shin Koseki, who appeared in the international "Next Generation" selection in the magazine's January 2011 issue. Estelle Lépine's master's project was a high altitude refuge for the "Aiguille du Goûter" on the flanks of Mt. Blanc in France. Shin Koseki's was a skyscraper in Manhattan artfully interconnected with its urban surroundings.

ALLIANCE ASSOCIATION PRIZE 2010

Alliance, a technology transfer consortium for western Switzerland and the canton Ticino, awards a yearly prize to an EPFL invention that "appears promising, and which encourages creativity, innovation, curiosity and imagination." Out of the 80 inventions chosen to be included in the competition, the jury awarded Aurelio Muttoni, director of ENAC's Concete Construction Laboratory and his collaborator Miguel Fernandez Ruiz. Their invention was a system for improving anchoring in thin concrete slabs using nails made of high-performance concrete; this is a solution that avoids corrosion problems caused by traditional anchoring systems.

http://ibeton.epfl.ch





VENICE ARCHITECTURE BIENNALE GOLDEN LION

The Venice 2010 Architecture Biennale's Gold Lion Prize for Best National Participation was awarded to the Kingdom of Bahrain and ENAC's Laboratory for Architectural Production (LAPA). The Bahrain exhibition curator was EPFL graduate Noura Al-Sayeh, and Professor Harry Gugger and Leopold Banchini from LAPA designed the exhibition in collaboration with the Bahraini Ministry of Culture and Information. The exhibition concluded a year-long LAPA studio in which EPFL and University of Bahrain students developed a "Cultural Master Plan for the Kingdom of Bahrain." LAPA's latest book, "Bahrain Lessons," was officially launched at the opening.

http://lapa.epfl.ch



Teaching and Research Awards

BERTUZZO Enrico

Aleardo Zuliani Award for PhD thesis, Venezia, Italy

BHASKAR Ashish

Prix Swiss Association of Road and Transportation Experts (VSS) for outstanding PhD thesis

BOBERG Maria

3rd Best Poster Award, ENAC Research Day, EPFL Lausanne

DIETZ Dieter - EGG Urs - MEILI Christian - BAUR Raffael - VISCHER Dieter

UNDEND Architecture AG Zurich

1st prize "Studienwettbewerb" Park Altenrhein, St. Gallen

DESHOGUES Arnaud

Best Paper Award, International Society for Photogrammetry and Remote Sensing (ISPRS), Commission VI Mid-Term Symposium, Enschede. The Netherlands

EGGENBERG Niklaus

Honorable mention, Dissertation Award in areas related to aviation, Institute for Operations Research and the Management Science (INFORMS) Annual Meeting, Austin TX, USA

GUGGER Harry et al.

Golden Lion, 12th International Architecture Exhibition, Venezia, Italy

HALDI Frédéric - ROBINSON Darren

Building and Environment Journal 2010 Best Paper Award

HUDERT Markus

3rd Best Poster Award, ENAC Research Day, EPFL Lausanne

HUANG Jeffrey

Recipient of Berkman Fellowship, Harvard University, USA

LAORY Irwanda -KRIPAKARAN Prakash - SMITH Ian F.C.

Best Paper Award, XVII EG-ICE Workshop on Intelligent Computing in Engineering 2010, Nottingham, UK

LEBET Jean-Paul - HIRT Manfred A.

Roberval Prize for their book "Traité de Génie Civil 12: Pont en Acier" published at the PPUR

LESTUZZI Pierino - BADOUX Marc

Roberval Prize for their book "Génie parasismique — Conception et dimensionnement des bâtiments" published at the PPUR

LIPS Stefan

Ernst & Sohn achievement awards, 8th fib PhD Symposium 2010, Kgs. Lyngby, Denmark

LOCHMATTER Thomas - AYDIN Ebru - NAVARRO Iñaki - MARTINOLI Alcherio

Finalist, Best Paper Award, 10th International Symposium on Distributed Autonomous Robotic Systems (DARS 2010), Lausanne

MERMOUD Grégory - MATTHEY Loïc -EVANS William Christopher -MARTINOLI Alcherio

Finalist for CoTeSys Best Robotics Paper Award, 9th International Conference on Autonomous Agents and Multi-Agent Systems (AAMAS 2010), Toronto, Canada

NADEAU Daniel

Outstanding Student Paper Award, 2009 Fall Meeting American Geophysical Union (AGU), San Francisco, USA

NUTH Mathieu

ALERT Geomaterials PhD Prize 2010, Aussois, France

NOSHIRAVANI Talayeh -BRÜHWILER Eugen

2nd Best Paper Award, 8th fib PhD Symposium 2010, Kgs. Lyngby, Denmark

PARLANGE Marc

"Prix Polysphère" 2009-2010 for the best teacher of ENAC School, EPFL Lausanne

REY Emmanuel / BAUART Architectes et Urbanistes SA, Neuchâtel Nominated, "Distinction romande d'architecture DRA II 2010" / 1st prize "Concours pour le Bâtiment de la Microtechnique sur le site de la Maladière à Neuchâtel," in collaboration with ERNE

RINALDO Andrea

Hydrology Days Award Lecturer, 30th Annual American Geophysical Union (AGU) Hydrology Days, Colorado State University, USA

RINALDO Andrea - RODRIGUEZ-ITURBE Ignacio

Creativity Prize "Prince Sultan Bin Abdulaziz International Prize for Water," 4th International Conference on Water Resources and Arid Environments, Riyadh, Saudi Arabia

RHODE-BARBARIGOS Landolf-Giosef

Best Poster Award, ENAC Research Day, EPFL Lausanne

RYCHEN Patrick

2nd Best Poster Award, ENAC Research Day, EPFL Lausanne

SCARTEZZINI Jean-Louis et al.

Best Paper Award Finalist, International Conference on Applied Energy ICAE 2010, Singapore

SCHLEISS Marc

Finalist for the best student paper award, 6th European Conference on Radar in Meteorology and Hydrology (ERAD 2010), Sibiu, Romania

STAUFER Astrid -

HASLER Thomas / Staufer & Hasler Architekten AG 1st prize "BBZ Bildungs- und Beratungszentrum Arenenberg, Neubau," Thurgovie

VACCA Ilaria

2nd Best Poster Award, ENAC Research Day, EPFL Lausanne

VACCA Ilaria - SALANI Matteo

Ranked 16th in the top 25 hottest articles of the Journal Transportation Research Part B for the period January-March 2010

WU Yu-Ting

Best Student Paper Award at the 19th Symposium on Boundary Layers and Turbulence of the American Meteorological Society in Keystone, Colorado, USA

DISTINCTIONS & AWARDS

BS/MS student awards

PRIX A3-EPFL - ARCHITECTURE

Jessica Matthey de l'Endroit / Architecture

PRIX ARDITI

Shin Koseki / Architecture

PRIX ASEP - ASSOCIATION SUISSE DES ENTREPRISES DE PRÉCONTRAINTE Richard Thürler / Civil Engineering

PRIX DE L'ASSOCIATION INGÉNIEURS GÉOMÈTRES DE SUISSE OCCIDENTALE Leïla Kislig / Environmental Engineering

PRIX BCV

Stéphanie Dennig / Architecture
Christophe Neyroud / Architecture
Coralie Pfister / Architecture
Grégoire Polikar / Architecture
Caroline Sicre / Architecture
Marine Skolka / Architecture
Raffaele Stefani / Architecture
Lauréline Zeender / Architecture

PRIX BETON HOLCIM

Richard Thürler / Civil Engineering

PRIX BG INGÉNIEURS-CONSEILS:
CONSTRUCTION ET DEVELOPPEMENT DURABLE
Lilli Gloria Asami / Architecture
Asako Berwert / Architecture

PRIX BG INGÉNIEURS-CONSEILS: SYSTÈMES ET DÉVELOPPEMEMT DURABLE Juliana León / Environmental Engineering

PRIX DE LA COMMUNE DE CHAVANNES Line Frossard / Architecture CSD AWARD

Jan Philipp Robra / Environmental Engineering Lactitia Carles / Environmental Engineering

DISTINCTION GCO (GROUPE SPÉCIALISÉ POUR LA CONSERVATION DES OUVRAGES SIA) Elena Broncano / Ambitecture

PRIX GEOSUISSE - SOCIÉTÉ SUISSE DE GÉOMATIQUE ET DE GESTION DU TERRITOIRE

Danielle Tendall / Environmental Engineering

LUCE GRIVAT AWARDS

Murielle Thomet / Environmental Engineering

Danielle Tendall / Environmental Engineering

PRIX JACQUES MARTIN-ZWAHLEN & MAYR
Sylvain Chaubert / Civil Engineering
Melchior von Rotz / Civil Engineering

PRIX MAURHOFER

Jean-Pascal Moret / Architecture

Jakob Loock / Architecture

MERIT PRIZE EPFL

Raymond Gauthier / Architecture

PRIX ORLANDO LAUTI
Aline Juon / Architecture
Jessica Matthey de l'Endroit / Architecture

PRIX SIA SECTION VAUDOISE

Marie Dougoud / Architecture

Alexandre Aviolat / Architecture

Olivier Ilegems / Architecture

PRIX SGEB - SOCIÉTÉ SUISSE DU GÉNIE PARASISMIQUE Verena Jungeblut / Civil Engineering El Mehdi Khaldoun / Civil Engineering

PRIX STÜCKY

Etienne Dufey / Civil Engineering

SVOR / ASRO PRIZE -SWISS OPERATIONS RESEARCH SOCIETY Aurélie Glerum / Civil Engineering

PRIX UPIAV - UNION PATRONALE
DES INGÉNIEURS ET ARCHITECTES VAUDOIS
Vincent Michel / Architecture

Eleanor Thalia Mir / Architecture
Mickaël Pinheiro / Architecture
Barbora Pisanova / Architecture
Florian Rochat / Architecture
Régis Widmer / Architecture
Etienne Dufey / Civil Engineering
Laetitia Bettex / Civil Engineering

BOOKS



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

SANTÉ ET DÉVELOP-PEMENT TERRITORIAL

Simon Richoz – Louis-M. Boulianne – Jean Ruegg

Presses Polytechniques et Universitaires Romandes, Lausanne 2010 - ISBN 978-2-88074-840-1



ADRIATICO

la città dopo la crisi Antonio Di Campli

List-Actar, Barcelona 2010 - ISBN 978-8-89562-323-8



LEARNING FROM VERNACULAR

Pierre Frev

Actes Sud, Arles 2010 - ISBN 978-2-7427-9388-4



SUPERSTUDIO

Roberto Gargiani - Beatrice Lampariello

Laterza, Roma-Bari 2010 - ISBN 978-8-84209-317-6



HONEGGER FRÈRES

Architectes et constructeurs (1930-1969)

De la production au patrimoine

Franz Graf – Christian Bischoff – Yvan Delemontey – Philippe Grandvoinnet Infolio Editions, Gollion 2010 - ISBN 978-2-88474-189-7



MYTHES ET PRATIQUES DE LA COORDINATION URBANISME-TRANSPORT

Regards croisés sur quatre agglomérations suisses et françaises

Caroline Gallez – Vincent Kaufmann INRETS. Lvon-Bron 2010 - ISBN 978-2-85782-683-5



MICHEL BASSAND

Un sociologue de l'espace et son monde

Christophe Jaccoud – Vincent Kaufmann
Presses Polytechniques et Universitaires Romandes, Lausanne 2010

ISBN 978-2-88074-762-6



L'ACTION PUBLIQUE FACE À LA MOBILITÉ

Hanja Maksim – Stéphanie Vincent – Caroline Gallez – Vincent Kaufmann

L'Harmattan, Paris 2010 - ISBN 978-2-296-11534-7



ET SI LES FRANÇAIS N'AVAIENT PLUS SEULEMENT UNE VOITURE DANS LA TÊTE?

Evolution de l'image des modes de transport Vincent Kaufmann – Kamila Tabaka – Nicolas Louvet – Jean-Marie Guidez

CERTU, Lyon 2010 - ISBN 978-2-11-098931-4



UNIFORM MATERIAL LAW: EXTENSION TO HIGH-STRENGTH STEELS

A Methodology to Predict Fatigue Life of High-Strength Steels

Sinan Korkmaz

VDM Verlag Dr. Müller, Saarbrücken 2010 - ISBN 978-3-639-25625-3



MECHANICS OF UNSATURATED GEOMATERIALS

Lyesse Laloui

ISTE Ltd / John Wiley & Sons Inc., London 2010 ISBN 978-1-848-21266-4



IN DETAILS

DL-A Architects

Patrick Devanthéry – Inès Lamunière – Joseph Abram

> Archibooks + Sautereau éditeur, Paris 2010 ISBN 978-2-35733-091-7



BOOKS

INVENTARE IL MONDO

Una geografia della mondializzazione Jacques Lévy (ed.)

Bruno Mondadori, Milan 2010 - ISBN 978-8-861-59486-9



LE SFIDE CARTOGRAFICHE

Movimento partecipazione rischio
Emanuela Casti (ed.) – Jacques Lévy (ed.)
Il Lavoro Editoriale, Ancona 2010 - ISBN 978-8-87663-447-5



EUGÈNE BEAUDOUIN ET L'ENSEIGNEMENT DE L'ARCHITECTURE À GENÈVE

Colette Raffaele

Presses Polytechniques et Universitaires Romandes, Lausanne 2010 ISBN 978-2-88074-791-6



LA CONSTRUCTION ET SON ENVIRONNEMENT EN DROIT PUBLIC

Eléments choisis pour les architectes, les ingénieurs et les experts de l'immobilier Jean-B. Zufferey – Isabelle Romy

Presses Polytechniques et Universitaires Romandes, Lausanne 2010 ISBN 978-2-88074-826-5



TIMBER PROJECT

Nouvelles formes d'architectures en bois Yves Weinand

Presses Polytechniques et Universitaires Romandes, Lausanne 2010 ISBN 978-2-88074-839-5



FACTS & FIGURES



2122 students, including 254 PhD students who contribute to ENAC's long-term research

665 collaborators, or 534 full-time equivalent positions

75 million CHF — total budget of ENAC

65 % of staff between 20 and 40 years old

69 nationalities

41 research and technology transfer agreements, for an amount of 5.4 million CHF

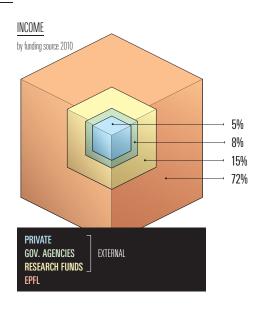
PEOPLE 31.12.2010

	No.	% WOMEN	% FOREIGNERS
PROFESSORS	51	14%	43%
Adjunct professors & Senior Scientists	17	6%	47%
Scientific Collaborators	446	34%	57%
Technical & Administrative Staff	151	49%	11%
BS/MS STUDENTS	1816	38%	35%
PHD STUDENTS	254	39%	70%

STUDENT NUMBERS

BS/MS STUDENTS	PHD STUDENTS				
1900					31
1700					2
1500					2
1300					2
1100					······ 2
900					2
700					1
500					1
300					1
2002 2003	2004 2005	2006 2007	2008	2009	2010

FINANCES



EXPENDITURES
by category 2010

2%
13%
85%

INVESTMENTS
OPERATING COSTS
PERSONNEL

INCOME BY FUNDING SOURCE 2003-2010 In Mio CHF rounded up

	2003	2004	2005	2006	2007	2008	2009	2010
EPFL	49	48	51	50	53	50	53	54
External	24	21	22	17	20	20	20	21
Total	73	69	73	67	73	70	73	75

EXPENDITURES BY CATEGORY 2003-2010 In Mio CHF rounded up

	2003	2004	2005	2006	2007	2008	2009	2010
PERSONNEL OPERATING C. Investments	59 11 2	58 9 1	59 11 3	57 8 2	59 10 3	60 8 2	62 8 3	64 9 2
TOTAL	73	69	73	67	73	70	73	75

CREDITS

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PHOTOGRAPHS

Christophe Ancey / p. 5.4, 18-19, 21
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Marc Diebold / p. 40
duncid (Flickr.com) / p. 13
Basile Geiser / p. 1, 14-15, 34-35
Fred Hatt / p. 44.1
Alain Herzog / p. 5.2, 12, 42
Hendrik Huwald / p. 45
Russell Loveridge / p. 2
Jean-François Molinari / p. 5.6, 26-27, 28, 29
Gary S. Prinz / p. 5.5, 24
Marie-Rose Ramboz-Matus / p. 63
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PRINTING

REPRO EPFL

ARCHITECTURE

ABOU JAOUDÉ Georges - Associate Professor

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

INFORMATIC AND VISUALIZATION LABORATORY (LIV)



ANDERSEN Marilyne - Associate Professor

Sustainable architecture, Daylighting strategies, Energy-efficient design, Façade technology, Human comfort and health in buildings, Climate-responsive envelopes

INTERDISCIPLINARY LABORATORY OF PERFORMANCE-INTEGRATED DESIGN (LIPID)



BASSI Andrea - Associate Professor

Urban project, Construction technologies, Energy considerations for building LABORATORY OF URBAN ARCHITECTURE (LAURE)



BERGER Patrick - Full Professor

Understanding and representation of the natural and built environment, The project at different scales of environment and architecture

URBAN, RURAL AND ARCHITECTURAL PLANNING LABORATORY (UTA)



COGATO LANZA Elena - Senior Scientist

Theory of urban and territorial design, History of urbanism construction and conservation laboratory (LCC)



DIETZ Dieter – Associate Professor

Processual knowledge in architectural training, Cultural analysis at the interface between the theory and practice of a project

DESIGN STUDIO ON THE CONCEPTION OF SPACE (ALICE)



FREY Pierre - Adjunct Professor

History of Architecure, archiving and recording of projects in architecture and civil engineering

ARCHIVES OF MODERN BUILDING (ACM)



GARGIANI Roberto - Full Professor

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

THEORY AND HISTORY OF ARCHITECTURE LABORATORY 3 (LTH3)



GRAF Franz - Associate Professor

Building and comfort technologies, Preservation and reuse project of the modern architecture LABORATORY OF TECHNIQUES AND PRESERVATION OF MODERN ARCHITECTURE (TSAM)



GUGGER Harry - Full Professor

Architectural Design, Urban planning, Project management, Construction management, Research in teaching methods, Research in architectural production

LABORATORY OF THE PRODUCTION OF ARCHITECTURE (LAPA)



HASLER Thomas - Associate Professor

Theory and history of architecture, Project design

LABORATORY OF EXPRESSION (LABEX)



HUANG Jeffrey - Full Professor

Design thinking, Interactive space smart buildings, Digital architecture

MEDIA AND DESIGN LABORATORY (LDM)



LAMUNIÈRE Inès – Full Professor

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

URBAN ARCHITECTURE AND MOBILITY LABORATORY (LAMU)



LUCAN Jacques - Associate Professor

Theory of architecture, History of the theories of composition

THEORY AND HISTORY OF ARCHITECTURE LABORATORY 1 (LTH1)



MARCHAND Bruno - Full Professor

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

THEORY AND HISTORY OF ARCHITECTURE LABORATORY 2 (LTH2)



MESTELAN Patrick - Full Professor

Theory and critic of architectural and urban design, The institution and the public space STUDIO OF ARCHITECTURE AND THE CITY'S INSTITUTIONS (AIC)



ORTELLI Luca - Full Professor

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

CONSTRUCTION AND CONSERVATION LABORATORY (LCC)



REY Emmanuel - Assistant Professor Tenure Track

Sustainable architecture, Urban and architectural project, Sustainable construction technologies, Regeneration of urban wastelands, Sustainable districts

LABORATORY OF ARCHITECTURE AND SUSTAINABLE TECHNOLOGIES (LAST)



STAUFER Astrid - Associate Professor

Theory and history of architecture, Project design

LABORATORY OF EXPRESSION (LABEX)

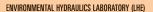


EXPERTISES

CIVIL ENGINEERING

ANCEY Christophe - Associate Professor

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





BEYER Katrin - Assistant Professor Tenure Track

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



EARTHQUAKE ENGINEERING AND STRUCTURAL DYNAMICS LABORATORY (EESD)

BRÜHWILER Eugen - Full Professor

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



STRUCTURAL MAINTENANCE AND SAFETY LABORATORY (MCS)

DENARIÉ Emmanuel – Senior Scientist

Rehabilitation of reinforced concrete structures, Engineering and applications of ultra-high performance fibre-reinforced concretes, Time dependent response of cementitious materials



STRUCTURAL MAINTENANCE AND SAFETY LABORATORY (MCS)

DUMONT André-Gilles - Full Professor

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



TRAFFIC FACILITIES LABORATORY (LAVOC)

KELLER Thomas – Full Professor

Structural design, Advanced composite materials, Multifunctional sandwich structures

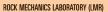


COMPOSITE CONSTRUCTION LABORATORY (CCLAB)



LABIOUSE Vincent - Senior Scientist

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





LALOUI Lyesse - Adjunct Professor

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





LEBET Jean-Paul - Adjunct Professor

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

STEEL STRUCTURES LABORATORY (ICOM)



LESTUZZI Pierino - Senior Scientist

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

APPLIED COMPUTING AND MECHANICS LABORATORY (IMAC)



MOLINARI Jean-François – Associate Professor

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

COMPUTATIONAL SOLID MECHANICS LABORATORY (LSMS)



MUTTONI Aurelio - Full Professor

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

STRUCTURAL CONCRETE LABORATORY (IBETON)



NUSSBAUMER Alain - Adjunct Professor

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

STEEL STRUCTURES LABORATORY (ICOM)



PARRIAUX Aurèle - Full Professor

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

ENGINEERING AND ENVIRONMENTAL GEOLOGY LABORATORY (GEOLEP)



RASTOGI Pramod - Adjunct Professor

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

APPLIED COMPUTING AND MECHANICS LABORATORY (IMAC)



ROBINSON Darren - Senior Scientist

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

SOLAR ENERGY AND BUILDING PHYSICS LABORATORY (LESO-PB)



SCARTEZZINI Jean-Louis - Full Professor

Daylighting systems, Photometry & colorimetry, Biomimetic control, Optimal stochastic control, Energy in buildings, Decision tools

SOLAR ENERGY AND BUILDING PHYSICS LABORATORY (LESO-PB)



SCHLEISS Anton - Full Professor

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

HYDRAULIC CONSTRUCTIONS LABORATORY (LCH)



SMITH Ian - Full Professor

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

APPLIED COMPUTING AND MECHANICS LABORATORY (IMAC)



VULLIET Laurent - Full Professor

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

SOIL MECHANICS LABORATORY (LMS)



WEINAND Yves - Associate Professor

Composite frames of wood and glass, Timber rib shells, Origami, Fractal geometry, Welding for wood, Stability of ribbed wooden shells

CHAIR OF TIMBER CONSTRUCTION (IBOIS)



ZHAO Jian - Full Professor

Rock dynamics, TBM excavation, Rock engineering of tunnels: slope and foundation, Testing characterisation and monitoring, Earthquake and blast protection

ROCK MECHANICS LABORATORY (LMR)



URBAN AND REGIONAL SCIENCES

BIERLAIRE Michel - Associate Professor

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

TRANSPORTATION AND MOBILITY LABORATORY (TRANSP-OR)



BOLAY Jean-Claude - Adjunct Professor

Social practices in urban societies, Rural-urban interface, Urban environment and social disparities, Director of international cooperation

URBAN SOCIOLOGY LABORATORY (LASUR)



GEROLIMINIS Nikolas – Assistant Professor Tenure Track

Traffic flow and control, Transport analysis, Transport operations

URBAN TRANSPORT SYSTEMS LABORATORY (LUTS)



GNANSOUNOU Edgard - Adjunct Professor

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

BIOENERGY AND ENERGY PLANNING RESEARCH GROUP (BPE)



KAUFMANN Vincent - Associate Professor

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

URBAN SOCIOLOGY LABORATORY (LASUR)



LÉVY Jacques - Full Professor

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

CHÔROS LABORATORY (LAC)



NOVEMBER Valérie – SNF Assistant Professor

Urban, social and environmental risks, Risk assessment and management, Role of stakeholders, Vulnerability of urban infrastructures

STUDY GROUP ON THE SPATIALITY OF RISKS (ESPRI GROUP)



PEDRAZZINI Yves - Senior Scientist

Urban sociology, Urban studies, Violence and insecurity, Urban planning and development, Southern urbanization

URBAN SOCIOLOGY LABORATORY (LASUR)



SCHULER Martin - Adjunct Professor

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

URBAN AND REGIONAL PLANNING COMMUNITY (CEAT)



THALMANN Philippe – Associate Professor

Environmental economics, Economics of sustainable development, Housing economics, Real estate economics

ECONOMICS AND ENVIRONMENTAL MANAGEMENT LABORATORY (REME)

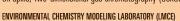


EXPERTISES

ENVIRONMENTAL ENGINEERING

AREY J. Samuel - Assistant Professor Tenure Track

Environmental chemical processes affecting organic pollutants, Computational quantum chemistry and thermodynamics, Phase partitioning and sorption models, Oil spills, Two-dimensional gas chromatography (GCxGC)





BARRY D. Andrew - Full Professor

Water quality, Contaminated land/soils, Numerical modelling, Constructed wetlands ECOLOGICAL ENGINEERING LABORATORY (ECOL)



BERNE Alexis – Assistant Professor Tenure Track

Remote sensing (radar, microwave,...), Hydrometeorology, Geostatistics

ENVIRONMENTAL REMOTE SENSING LABORATORY (LTE)



BERNIER-LATMANI Rizlan – Assistant Professor Tenure Track

Metal-microbe interactions, Metal bioremediation, Gene expression, Biogenic nanoparticles, Geobiology





BUTTLER Alexandre – Adjunct Professor

Ecology, Quantitative methods, Ecosystem and landscape restoration and management, Biodiversity, Biogeochemical cycles, Wetlands, Pasture woodlands, Invasions



ECOLOGICAL SYSTEMS LABORATORY (ECOS)



DE ALENCASTRO Luiz Felippe - Senior Scientist

Analytical chemistry of environmental trace pollutants, Fate and impact of contaminants in the ecosystem, Water quality, Scientific cooperation with developing countries CENTRAL ENVIRONMENTAL LABORATORY (GR-CEL)

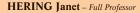


GOLAY François - Full Professor

GIS application design, Spatial decision support systems, Geospatial data infrastructures, GIS for environmental management and for urban studies and design



GEOGRAPHIC INFORMATION SYSTEMS LABORATORY (LASIG)



Biogeochemical cycling of trace metals and metalloids, Mineral weathering and reactions at mineral surfaces, Water treatment processes for removal of inorganic contaminants





HOLLIGER Christof - Associate Professor

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

LABORATORY FOR ENVIRONMENTAL BIOTECHNOLOGY (LBE)



KAPLAN Jed Oliver - SNF Assistant Professor

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





KOHN Tamar – Assistant Professor Tenure Track

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

ENVIRONMENTAL CHEMISTRY LABORATORY (LCE)



LUDWIG Christian - Adjunct Professor

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

EPFL-PSI JOINT PROFESSORSHIP ON SOLID WASTE TREATMENT



MARTINOLI Alcherio – Associate Professor

Swarm intelligence, Distributed and networked robotics, S&A networks DISTRIBUTED INTELLIGENT SYSTEMS AND ALGORITHMS LABORATORY (DISAL)



MERMINOD Bertrand - Full Professor

Acquisition of topographical data, Geodesy, Satellite positioning, Pedestrian navigation, Indoor positioning, Least squares estimation, Kalman filtering

GEODETIC ENGINEERING LABORATORY (TOPO)



MERMOUD André – Adjunct Professor

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

LABORATORY OF ECOHYDROLOGY (ECHO)



PARLANGE Marc - Full Professor

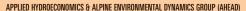
Land-atmosphere exchange, Large Eddy Simulation (LES), Evaporation, Snow physics, Atmospheric boundary layer

ENVIRONMENTAL FLUID MECHANICS LABORATORY (EFLUM)



PERONA Paolo - SNF Assistant Professor

River mechanics and erosion processes, Alpine catchments ecohydrology, Rheology and fluid mechanics, Time Series Analysis, Stochastic and dynamical systems theory, Optimization and decisional techniques





PORTÉ-AGEL Fernando – Full Professor

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

WIND ENGINEERING AND RENEWABLE ENERGY LABORATORY (WIRE)



RINALDO Andrea - Full Professor

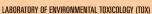
Groundwater and surface hydrology, Solute transport processes, Fluvial geomorphology, Ecohydrology

LABORATORY OF ECOHYDROLOGY (ECHO)



SCHIRMER Kristin - Adjunct Professor

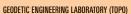
Molecular and cellular mechanisms of toxicity in vertebrate cells, In vitro alternatives to animal experiments, Bioavailability of contaminants, Combined chemical and biological water quality monitoring





SKALOUD Jan - Senior Scientist

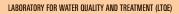
Kinematic positioning and attitude estimation mobile mapping, Satellite and inertial navigation, Sensor integration and calibration, Direct georeferencing





VON GUNTEN Urs - Full Professor

Drinking water quality, Physical chemical water treatment, Oxidation and disinfection processes, Micropollutant elimination, Disinfection by-product formation





CHAIR OF LAW

DUBEY Jacques – Associate Professor Law, Environmental and construction law CHAIR OF LAW (CDT)



ROMY Isabelle – Associate Professor Law, Environmental and construction law Chair of Law (CDT)



DESIGN

KELLER Pierre – Adjunct Professor Industrial Design University of ART and Design Lausanne (ECAL)



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MUTTONI Aurelio	32881

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ORTELLI Luca	5
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