PS News

No.1, Autumn 2001

PLANT SURVIVAL
National Centre of Competence in Recherch

Newsletter of the National Centre of Competence in Research (NCCR)
Plant Survival in Natural and Agricultural Ecosystems

Editorial

Sowing seeds for the future

For all of us, this first semester of activity has been a period of construction and daily reflection on the future. Our challenges are so numerous that I can only compare them to the seeds sown in the "Plant Survival" garden.

I would begin by listing the first among these seeds: "interaction". Exchange between our researchers has got off to a good start. Collaboration is growing and discussion deepening. But beyond the people involved, I am also counting on the interaction between observation, experience and theoretical formalization to broaden our understanding of plants and the subtle relationships they have with their environment.

The second seed we wish to see sprout is "imagination". Our goal is that research, basic as well as applied, will develop plants with optimal defense mechanisms that, nevertheless, respect the environment. To get there, we have devised 12 projects, voluntarily limited to a handful of model plants that we will study from all angles. The originality of the study proposed lies, thus, in the many approaches used, rather than in the diversity of plants.

We are also taking particular care to cultivate teaching or, in a more general sense, the "knowledge transfer", to confront reality and adapt our vision to daily life. Knowledge transfer allows us to break habits, take risks, create concepts that go beyond convention. It is not only a matter of communicating farming methods that protect the natural and agricultural environment, but also of transmitting to future generations of researchers scientific know-how, a certain concept of integrated research.

The progress of knowledge is the fourth seed in our extraordinary garden. We would like to diversify as much as possible. Progress made should not be measured by the number of discoveries (no matter what they are), but by the deepening and continually renewed interrogation. Going back to the drawing board as often as necessary, not hesitating to look at problems from other points of view: this is the price for obtaining precise answers.

The main challenge I see for "Plant Survival" - to make these seeds grow – requires tools! Two tools stand out in the undertakings so far: a network and a Graduate School. A network of researchers and users is the fruit of a fusion between the seeds "interactions" and "imagination". As for the Graduate School, we would like it to constitute a platform of exchange that encourages students toward mobility, so that each of them can have a taste of the experimentation conducted in other laboratories.

For now, you hold in your hands the first issue of our newsletter. This publication, due to appear four times a year, hopes to give a glimpse of the NCCR. The goal, however, is not to limit ourselves to the presentation of subjects of research - for they would be nothing without the protagonists who work on them: the scientists themselves. It is to all these artisan-gardeners that we dedicate this vehicle of information. Please do not hesitate to send us your suggestions. They are always welcome. Happy reading.

Martine Rahier
Director of the NCCR

Jumping genes take on petunia

Petunia is an ornamental plant dear to balconies. But what interests Cris Kuhlemeier are petunia's genetic pecularities. The study of this plant is helping scientists to identify genes that control various morphological and physiological characteristics desirable in such important food plants as the tomato and potato.

An eminent member of the Solanaceae family, petunia holds special interest for geneticists, says Cris Kuhlemeier, professor of botany at the University of Bern and one of the three NCCR Vice-Directors. The genome of this plant is very close to that of the tomato and the potato. In addition, petunia offers excellent tools for identifying the genes involved in the control of morphological or physiological characteristics, such as the length of the stalk, the timing of the release of scent, the quantity of nectar produced or even the plant's resistance to flooding.

Signals to genetic variations

These exceptional tools are called transposons, or more familiarly, "jumping genes". They act as signals of genetic variations.

To understand how they work, consider a white petunia. Inside each white petal is a gene responsible for the color. And inside this gene is a fragment of DNA with a priori no obvious importance, the transposon. The transposon may "jump" from its original gene onto another gene. The DNA of the petals that has "lost" its transposon will change the color of the cells concerned: they will become red. Thus, petunia flowers whose jumping genes have "left their post" will become white with red spots. More than 3000 petunias with jumping genes are today cultivated in the Botanical Garden of the University of Bern.

The fascinating side of this research is that, once freed, the transposons can insert themselves into any gene, thereby blocking or diminishing the gene expression. In a petunia with spotted flowers, it is possible to count up to 300 transposons

Red spots on petunia flowers reflect the activity of jumping genes

that have shifted location. That means that one may expect an equal number of mutations, some of which will show up in the metabolism or morphology of the plant.

Impossible interbreeding

Every transposon is a tag that allows the detection of the blocked gene. This observation is important when one thinks of the interbreeding impossible in nature due to such incompatibilities as for instance pollination schedules. Nocturnal petunias pollinated by moths, for example, are unable to cross with petunias that diffuse their scent in broad daylight and whose pollination agents are bees.

The goal of Jeroen Stuurman, post-doc in the Kuhlemeier group, is to force destiny by detecting, with the help of transposons, the gene or genes at the origin of these differences. In his work, artificial crossings are made between petunias with activated transposons and their wildflower cousins. There is a strong chance that the hybrids obtained carry the desired

modification - for example, a change in the rhythm of scent diffusion. This phenomenon affects the interactions between plants and insects and, most particularly, between plants and pollinators.

Collaboration with Neuch tel

It is not at all surprising, then, that the Bern group at NCCR maintains close relations with Ted Turlings and his colleagues at the University of Neuchâtel.

This collaboration will allow the completion of the genetic approach with an analysis of odors using a GC-MS, a Gas Chromatograph coupled with a Mass Spectometer, located in Neuchâtel. It will be possible to deduce which volatile substances attract the most insect pollinators.

Finally, the arrival in Bern in October of Maria Fritzsche, who has just completed her doctoral thesis in Ted Turlings' group, creates a bridge between genetics and plant ecology. The NCCR hopes to promote other such synergies.

Flooding resistance

In coming decades, we should expect an increase in flooding almost everywhere in the world due to global warming. Switzerland will not escape, as shown in the catastrophes that have hit the Valais in recent years, as well as the spring thaws that exacerbate the phenomenon. As floods entail a drastic decrease in the quantity of oxygen in the soil, crops like wheat or potatoes deteriorate after a few hours.

"Nevertheless, plant damage is not an inevitable consequence of flooding," insists Cris Kuhlemeier. At NCCR, the Bern research group is counting on transposons to identify the genes that prolong the life of crops in a flooded field. This hypothesis is hardly far-fetched: marsh plants capable of surviving for up to two months in flood conditions do exist. Cris Kuhlemeier and his colleagues hope to discover the paths of energy production which, even in the absence of oxygen, help the plant survive thanks to appropriate enzymes synthesis.

To identify flood-tolerance at the molecular level, specially selected hybrid species of petunia will be cultivated. Then, a systematic analysis of leaf DNA will be made, using a technique well-known to genetics, the PCR (Polymerase Chain Reaction). The first results are expected sometime within the next two years.

Photo: www.thirsk.org.uk

Plants have to withstand flooding more frequently

When insects lent their wings

With animal ecology as her thesis subject, Maria Elena Fritzsche Hoballah has just finished her doctorate in science at the University of Neuch tel under the direction of Ted Turlings and Martine Rahier. The young biologist pursues her research at NCCR in the Bern group of Cris Kuhlemeier. Overview of a scientific path across three continents.

Maria has a taste for travel. In 1995, just before receiving her diploma in biology from ETHZ, this passion took her to Benin. She spent six months in the African heat of Cotonou working on thrips, (*Megalurothrips sjostedti*), tiny insects that devastate crops of *ni b* , Benin's major food source.

Parasitoids and bugs

Maria's mission was to observe the action of parasitoids (*Ceranisus menes*) and predators (the bug *Orius albidipennis*) potentially able to slow the proliferation of Asian thrips. Thanks to her observations at the International Institute of Tropical Agriculture, we now know that these local parasitoids are probably not enough effective in controlling the destructive Asian species.

Change of scene: after Benin, Maria set out for a three-month break in the Canary Islands as a volunteer with Thetys, an Italian association for the protection of marine mammals. Maria's project was to compare the behavior of dolphins in protected areas of the Island of Gomera with that of dolphins accessible to observation boats for tourists.

After that break, the young scientist returned to ETHZ where she met Ted Turlings, working on the interactions between maize, its pests and parasitoids of the pests. The Dutch scientist was moving to Neuchâtel to pursue his research - and had a Ph.D. student position to offer. Maria applied for the post and got it.

Targeting maize

Maria now found herself in the Laboratory of Animal Ecology and Entomology, one of the departure points of NCCR. The young scientist was interested in biological control - specifically, in the identification of insects able to protect maize from pests. From 1997, Maria made two three-month trips to Mexico, a land where the *Spodoptera* caterpillar feasts on maize leaves. This caterpillar's saliva stimulates the maize plant to produce an odor that, in turn, attracts a *Spodoptera* parasitoid, the *Cotesia* wasp.

Through her work, Maria showed which odors were more attractive for parasitoids. She also proved that five species of parasitoids kill the appetite of caterpillars: a beneficial effect for the plant.

The knowledge acquired in ecology helps the new collaborator of Cris Kuhlemeier to apply experiments in the field that the Bern group had obtained in the greenhouse - in particular, isolating the gene that makes petunias resistant to flooding. The potential impact of this research will show best in protecting the petunia's close cousins, the potato and tomato, also members of the Solanaceae family.

Enrico Martinoia receives the K rber European Science Award 2001

On September 7, Enrico Martinoia, Vice-Director of the NCCR, was one of five European scientists to receive the K rber European Science Award in Hamburg. The prize of 750,000 euros (1.15 million Swiss Francs) will finance a research project on plant physiology.

The Körber Foundation encourages European science by, each year, choosing a project presented by internationally known candidates. This year's prize goes to five specialists in plant physiology, among them, Enrico Martinoia, Professor of Biology at the University of Neuchâtel.

The other laureates are the German Professors Wolf-Bernd Frommer (University of Tübingen), Rainer Hedrich (University of Würzberg), Norbert Sauer (University of Erlangen-Nürnberg) and the British Professor Dale Sanders (YorkUniversity).

This year's winning project is a study of the genes that control proteins playing a role in the circulation of substances produced or absorbed by plants. The subject is of primary importance, for these transport processes can have a positive effect on productivity, on plant resistance to environmental constraints and on the production of vegetable extracts important in pharmacology.

The Neuchâtel team's contribution is in the examination of the mechanisms that allow plants to accumulate in their cells substances useful to medicine. Such substances include morphine, a well-known pain-killer; taxol and vincristine, two substances that fight tumors; and cardiac glycosides, molecules effective, notably, for disrupted cardiac rhythm. Thanks to the Körber Prize and the participation of NCCR, Enrico Martinoia can work towards improving the production of such plant substances vital to medicine.

The Plant Physiology Laboratory at Neuchâtel hopes, as well, to deepen research on the genetic mechanisms that allow a plant to extract heavy metals, like cadmium, lead, zinc and copper, from the soil. With so much of the planet contaminated, the extraction of these toxic elements by plants is one of the few economically viable solutions. The Lab's goal is to research plants which, after having accumulated the toxic elements, could then be incinerated in special ovens. Scientists hope this strategy will allow us, within five to eight years, to reduce heavy metals in the soil by 90 percent.

The third path of investigation on which Enrico Martinoia is working is the survival of plants in arid environments. Specifically, he is examining how plants maintain as much water as possible in their leaves by studying genes that control the diameter of the stomata, equivalent to pores in animals.

The Neuchâtel professor insists that the changes affected in the laboratory also occur in nature. "We do not insert any genes from foreign species, bacteria or otherwise, into plants," he says. "We are content to accentuate the physiological processes that already exist. In this sense, our approach remains perfectly ecological."

People

Let's stimulate the dialogue to achieve excellence in research

Bernd H gele officially took on the role of coordinator of the NCCR in April. With a PhD in ecology and postdoctoral experience in insect physiology, he would like to help to build new bridges between the different disciplines of biology.

Bernd, you have now been in your position as coordinator of the NCCR at the University of Neuch tel for six months. What are your objectives?

First, to take care that the researchers do not give into the desire to retreat into "bubbles", but maintain a standing interest in the project as a whole. We should avoid that project participants, once the money is in hand, close themselves off in their laboratories until they get results, leaving discussion with their peers to later when they make public presentations or attend conferences.

But isn't that a normal process common to scientists worldwide? What would you like to change?

I would like for dialogue to come into play earlier within the NCCR and that it be broader. Let us not forget that we are working within a network, which obliges us to rethink our concept of research. That is also the *raison d' tre* of participant meetings, the first of which took place on 31 May in Neuchâtel. These meetings give scientists very different opportunities to mutually fill in their knowledge, notably in small group discussions of five or six people. I take part also in internal meetings of the 12 "Individual Projects" to get an overview, which allows me to suggest and stimulate cooperation.

I would also like to make participants aware of knowledge and technology transfer, one of the demands set out in our contract with the Swiss National Science Foundation. Of course, it is too early to present already results that might be used by third parties. But that should not make us forget the importance of establishing links, in particular with our partners and potential users of our future results (applied research organisations, farmers, politicians, etc.)

But aren't you afraid that too many meetings and discussions may encroach on the time scientists should be giving to their real research work?

Not at all. Laboratory or fieldwork will always be their primary centre of interest – that's almost a natural law. To convince participants to exchange ideas, on the other hand, calls for a lot of energy. But it is not time lost from research for many new disciplines emerge, in fact, from unexpected combinations between specialties that are, *a priori*, distant. Neuro-informatics is one example. Closer to our preoccupations, one could cite the work of Ian Baldwin, recently invited to Neuchâtel for a graduate course co-organized by the NCCR. Among others, Ian has demonstrated that there is a vast amount of induced genetic differences between tobacco attacked by herbivores and intact plants. His work brings together two disciplines heretofore distinct: ecology and molecular biology. That is why I invite everyone to become actively interested in the work as a whole being done in the NCCR, to enrich everyone's own field of expertise and thereby I hope that we might lay grounds for some new and exciting results that we would not have had otherwise.

Equipments special

The use of NCCR funds to buy equipment will expand and enrich the possibilities for valuable research. A presentation of some installations which costs range from CHF 90'000 to 250'000.

A high-tech greenhouse in Zurich-Reckenholz

Franz Bigler of the Swiss Federal Research Station for Agroecology and Agriculture is using NCCR financial aid to build a 4m x 8m top-security greenhouse for the study of genetically modified plants.

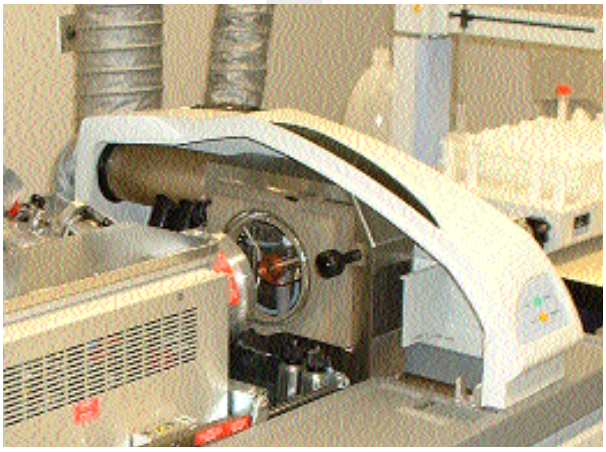
The greenhouse's primary characteristic is a compartment that allows air pressure inside to be kept slightly lower than that outside, so pollen from transgenic plants is confined inside the work area. Secondly, access to the greenhouse will be through an airlock and pollen filters will be installed to avoid any contamination of fields outside by undesirable seed. Water used will also be controlled, in that flow will be kept separate from common drainage systems. In addition, Franz Bigler's team intends to observe the behavior of insects when confronted with genetically modified plants, with the aid of a camera connected to a computer which will allow continuous monitoring.

Neuch tel: what elements does the plant take from the soil?

Thanks to a brand new instrument recently acquired by the geochemistry lab directed by Karl Föllmi, the tracking of chemical elements on their way from the soil to the plant will become more precise. In Neuchâtel, the NCCR has now an ICP-MS (Inductive Coupled Plasma Mass Spectrometer) available. This instrument signals the presence of virtually any element in the periodic table with a precision of 100 to 1000 times greater than that offered by comparable devices, like the graphite furnace.

In the ICP-MS, the sample is introduced into an argon plasma at a temperature of 6'000-10'000°C, where it is "pulverized" into isolated atoms. Each atom can then be sorted on the basis of its mass: thereby, obtaining a measurement both of type and quantity of the atoms present.

In the NCCR framework, scientists will be able to count, from samples taken from the soil or the plant, the quantity of essential elements for the plant development, such as potassium, sodium, magnesium, manganese or zinc. They can also evaluate the proportion of harmful substances, in particular heavy metals such as cadmium, copper or arsenic.



ICP-MS at Karl F llmi's lab

The activity of genes in color

Also at Neuchâtel, the group of Jean-Marc Neuhaus has recently received a microarray scanner. This device will be useful for showing up genetic differences that distinguish, for example, a grapevine attacked by mildew from a healthy plant. The results will not only show the genes concerned, but also their degree of expression, that is, if they are less or very active. One will also be able to deduce the genetic factors that favor or, on the contrar y, diminish the risk of developing the illness.

News from the labs

The expression of different genetic sequences shows up in fluorescent points more or less marked, in function of the light intensity that the instrument quantifies very precisely. By attributing a fluorescent color (red, green or blue) indicating the origin of a given sample, the scanner can compare up to three series of samples taken, for example, from a healthy plant, from a plant that has been sick for eight hours, and from a plant that developed the illness 24 hours earlier. Finally, one obtains a palette of luminous points whose color reflects the degree of gene activity within the three series of samples.

It should be emphasized that the microarray scanner has been entirely financed by the NCCR, through the budgets of the groups of Neuhaus (Neuchâtel) and Kuhlemeier (Berne). The two teams will share the use of the instrument.

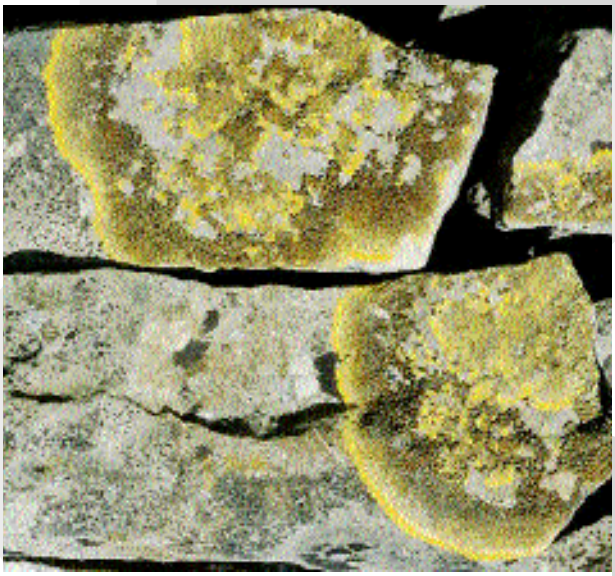
The microarray scanner will be used to investigate the genetics of grapevine

Birmensdorf: a robot to study lichens

Known for their capacity to prosper in extreme environments (arid deserts, frozen tundra, tropical forests), lichens have long intrigued scientists. Lichens result from a unique symbiosis between algae and fungi. Algae, rich in chlorophyll, produce sugars by photosynthesis that supply the organism with nourishment, while fungi offer it shelter against harsh environments.

Christoph Scheidegger, a researcher at WSL in Birmensdorf (ZH), is working on the analysis of lichen specific genes. But the preparation of samples of lichen DNA requires a series of precise and repetitive manipulations. A robot can reduce by a factor of five or ten the preparation time, that is, the deposition of liquid extracted from lichen seeds, or spores, into test-tubes. The robot, which can handle up to 96 test-tubes at a time, should be in place at the end of this year.

These preparations are essential for determining through PCR (Polymerase Chain Reaction) analyses the genetic characteristics specific to lichens so as to identify rare species and to deduce which ones are most endangered.



Lichens are colonizing extreme environments

Source: www.naturebrantacan.co.uk

Partners and sponsors

In each issue, PS News will tell you about the work of a selected partner or sponsor

Half a century of research to save prairies

For the past 50 years, the CABI Bioscience Switzerland Centre has been developing natural and ecological methods to fight the spread of weeds and insect pests.

Urs Schaffner in CABI's garden where some biological control methods are tested

Set at the edge of the forest overlooking Delémont (in the Swiss Jura), a three-story building dominates a panorama of green pastures. On the wall next to the entry, only an inconspicuous plate indicates that we are entering a research centre.

The specialty of the institute? CABI is dedicated to the biological control of weeds and insect pests, with the goal of replacing pesticides with beneficial insects or pathogenic fungi.

This approach attempts to solve a problem going back to the time when Europeans emigrated en masse to colonies in the New World. Unknowingly, the first settlers in North America brought along in their baggage weeds and insects native to Europe. Today, these exotic species have – in the absence of their natural enemies – so prospered that the biodiversity of various sites and the agricultural economy of entire regions are in danger.

An European solution for an American problem

To find a solution, CABI researchers started with the following hypothesis: if the problem came from Europe, its solution should also exist on this continent. Hence, the existence of the centre in Delémont. "It is here that we are identifying insects potentially useful in stopping the spread of weeds and pests, notably on the American prairies," explains Urs Schaffner, one of the 15 research directors at CABI in Delémont.

CABI's interests join those of NCCR, in that its work is close to that carried out in the Laboratory of Animal Ecology and Entomology at the University of Neuchâtel.

The interactions between plants, herbivorous insects and their natural enemies constitutes a field for investigation common to both research centres. However, the devices needed to identify the chemical mechanisms at the origin of these interactions are in Neuchâtel. Which explains CABI's interest in this partnership. As for the Delémont centre, CABI offers the possibility of direct applications from basic research – an aspect interesting for the members of NCCR who are sensitive to the preoccupations of stockbreeders and farmers.

A toxic plant to cattle

Present in Switzerland for 50 years, the international organization can be proud of its numerous successes. One of them concerns the control of *Euphorbia esulae*, a toxic plant to cattle that, in certain areas of the northwestern United States, had succeeded in contaminating up to 90% of pastureland.

Beginning in 1970, research piloted by CABI Switzerland identified *E. esulae*'s natural enemies – beetles of the genus Aphthona, native to Hungary. Specificity tests showed that these insects could be released in the American prairies with no risk to other plant-life.

Currently, CABI Bioscience Switzerland Centre is directing some 30 projects, the majority of which are concerned with the invasion of the prairies by weeds and the resulting decline of livestock in the USA and Canada.

Protecting apples

Among work relevant to the struggle against insect pests, one should also mention the research on a parasite of apples in Canada, the *Hoplocampa testudina*, a wasp that lays its eggs in the interior of the young fruit. Thanks to work by CABI, a natural enemy of the wasp has been identified: the parasitoid, *Lathrolestes ensator*, that lays its eggs inside the pest. In 1999, CABI released 850 of these parasitoids in Quebec orchards, thereby proving the method's effectiveness.

CABI is responsible for even more delicate missions. In the 1990s, American soldiers sent to Serbian territory inadvertently introduced a beetle well known in the US for destroying corn. Of the species Diabrotica virgifera virgifera, the beetle rapidly spread towards the southwestern Europe, reaching Switzerland in 2000. The European Union has launched a vast program to discover natural enemies of this destructive pest. At the head of an important international consortium (involving Austria, France, Germany, Hungary, Italy), CABI Bioscience Switzerland Centre, which holds special authorization to keep these dangerous beetles in quarantine, is well-placed to take up the challenge.

Insecticide from fungus

Biological control of locusts and grasshoppers, whose swarms periodically devastate crops throughout Africa, is another research priority at CABI. The usual way of eliminating these pests is through a massive spraying of chemical pesticides (up to 13 million litres were used during outbreaks between 1986-89) with all the harmful ecological effects one can imagine. CABI Bioscience Centre in England has developed a natural product, a mycoinsecticide, sold for the first time in South Africa in 1998 under the name "Green Muscle". This spray, developed from a pathogenic fungus, *Metarhizium anisopliae*, has shown itself to be not only biologically effective but also economically advantageous and ecologically safe.

Towards sustainable development

Created in 1930 as the "Commonwealth Agricultural Bureau", CAB became an international organization in the 1980s. Since then, under the name CABI, this non-profit organization has grown to 42 member countries, with Switzerland joining in 2000. CABI undertakes scientific research favouring sustainable development and concentrates a good number of its activities around biological control of weeds and insect pests. Although its headquarters are in the UK, CABI operates around the world thanks to its research centres and stations in Switzerland, North America, Pakistan, Malaysia, Trinidad-and-Tobago and Kenya.

CABI is self-financed by the expertise it provides to governments, principally to the US Department of Agriculture and its Canadian homologous, as well as the European Union and the Swiss Federal Office for Education and Science. It also fills mandates from consortiums of US farming associations. CABI defines itself as an international non-profit organization whose direction is managed by its own members.

People from CABI will be happy to present their activities or more specific research results in a research seminar. They also offer to suggest and supervise ecological mini-projects for students in ecology practicals or courses, as well as give guided tours through the centre at Delémont. Please contact Urs Schaffner if you are interested (u.schaffner@cabi-bioscience.ch).

First joint course *III*[e] *Cycle romand en sciences biologiques* and NCCR:

Plants are not just passive victims of herbivorous insects

The workshop on the "Exploitation of plant defence chemistry by insects" (10 - 12 September 2001, Neuchatel) was a great success. Forty-two participants attended the plenary lectures. The diversity of the excellent presentations by the five invited speakers reflected the complexity and sophistication of interactions between insects and plants. We were shown various examples of how plants use chemical and physical defences to protect themselves against insect herbivores and how insects have adapted to these defences.

Nicotine against the attacker

Plants may produce toxins for direct defence, but also use several strategies to attract natural enemies of herbivores as a form of indirect defence. As Professor Ian Baldwin from the Max Planck Institute in Jena (Germany) explained: wild tobacco plants can recognise which herbivore feeds on it and adapt their defence accordingly. In response to some insects the plant increases the production of nicotine, a toxic compound, while for herbivores tolerant to nicotine, the tobacco plant relies on the production of an odour that attracts predators.

Numerous specialised insects can circumvent plant defences or may even exploit them for their own defence. Professor Jacques Pasteels, invited speaker from the University of Brussels (Belgium) showed several examples of herbivores that sequester plant toxins in their tissues, which make them less palatable to potential predators. Some populations of Alpine Leaf Beetles, as pointed out by Karl Gotthard from the University of Neuchâtel, make effective use of plant toxins, while other populations still prefer plants without the toxin in question.

A shelter for mites

Other sophisticated interactions were discussed by Professor Maurice Sabelis from the University of Amsterdam (The Netherlands). He showed that some plants have adapted their morphology to offer predatory mites places where they can safely deposit their eggs. These so-called domatia come in the form of hair tufts that appear to serve only the mites. The mites eat small herbivores, but also nutritious pollen provided by the plant.

Bob Denno, from the University of Maryland (USA), showed various ways in which plant quality and location can affect the interactions between plant and insect and how these interactions determine population densities and structures. His examples were taken from his reach field work done in marsh lands on the East coast of the USA.

High quality presentations by several of the Swiss participants added information to the broad spectrum of interactions that were covered. It was particularly satisfying to see a good participation by the newly appointed graduate students and postdocs that are affiliated with the NCCR.
The topics ranged from basic ecological and evolutionary research to studies on how plant defence strategies can be exploited for insect pest control.

This was the first workshop organised by the NCCR graduate school and it can serve as a model for upcoming courses, for which we hope to receive an equally active participation by NCCR members.

Ted Turlings, Head of the Graduate School Committee

Upcoming events

First annual NCCR conference

March 14 and 15 2002. Please reserve these days in your diaries.

Graduate School Courses

Statistics - module 1:
«Introduction to Data Analysis for Biologists»
Dr. Anne-Catherine Favre, University of Neuchâtel
January 11, 18, 25 and February 1, 2002,
13:15 - 17:00
University of Neuchâtel, Uni Mail, Institut de chimie, room B1
Credit points: 1

Statistics - module 2:
« Data Analysis in Plant Sciences and Ecology»
Prof. Dr. Diethart Matthies, University of Marburg, Germany
February 21 and 22, March 4 and 5, 2002 (dates to be confirmed) 9:15 - 17:00
University of Neuchâtel, Uni Mail, Institut de chimie, room B1
Credit points: 2

Statistics - module 3:
«Advanced Data Analysis in Plant Sciences and Ecology»
Prof. Dr. Diethart Matthies, University of Marburg, Germany
Autumn 2002
University of Neuchâtel, Uni Mail, Institut de chimie, room B1

Information and registration:
http://www.unine.ch/nccr/seminars/seminars.html

Public talks organised by the Soci t neuch teloise des sciences naturelles (SNSN)

Date	Speakers	Topics
24 October	E. Martinoia (Université de Neuchâtel)	Physiologie des plantes
7 November	W.Wildi (Université de Genève)	Déchets atomiques
21 November	M. Rahier (Université de Neuchâtel)	Interactions plantes-insectes (PRN)
5 December	Th.Stocker (Université de Berne)	Global change and Switzerland
19 December	B. Hofmann (Musée Hist. Nat. BE)	La recherche de vie sur Mars
9 January	J.-M. Neuhaus (Université de Neuchâtel)	Génétique
23 January	R. Stettler (Laboratoire cantonal NE)	Rôle et usage de l'eau
6 February	W.Geiger (OFES, Berne)	Conservation de l'environnement
13 March	E.Havlicek (Université de Neuchâtel)	Pâturages boisés
	Assemblée générale	

Location and time: Muséum d'histoire naturelle de Neuchâtel, 8 p. m.

PS News

Editor
Igor Chlebny
NCCR Plant Survival Communication officer

E-mail: igor.chlebny@unine.ch
Tél. +41 32 718 2507 Fax: +41 32 718 2501
www.unine.ch/NCCR

Translation: Sarah Veal

Any questions, suggestions, or events to report?
Contact us. Every remark is welcome.

Organizers and invited speakers of the first Graduate School workshop
Ted Turlings (together with his son) and Martine Rahier
2nd row (from left to right): Karl Gotthard, Maurice Sabelis, Jacques Pasteels, Ian Baldwin and Bob Denno