PS News

No. 10, Autumn 2004

PLANT SURVIVAL
National Centre of Competence in Research

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

Editorial

Combined efforts to protect plants

Induced resistance is based on a plant-mediated action against insects and diseases. Of great importance for both fundamental and applied research as well as for practical plant protection, this field of research is studied by a broad range of scientists, including entomologists, plant pathologists, plant physiologists, molecular biologist and ecologists. In the year 2000, the idea emerged to create a platform in order to foster cross-disciplinary communication.

This led to the formation of a working group within the IOBC (International Organisation for Biological Control) with the title "Induced resistance in plants against insects and diseases". The first conference of this group, held in Wageningen, The Netherlands, in April 2001, attracted well over 100 participants from all over the world. Through the interaction of plant pathologists and entomologists in the same meeting, it became clear that induced resistance against insects and pathogens has to be tackled by both groups of researchers together.

Based on the success of this first IOBC meeting, the organising committee decided to initiate a workshop on the methodological aspects of this research field to be held in Delémont, Switzerland, on November 2 - 4, 2004. This idea was warmly welcomed by the NCCR management who even proposed some financial help and support to ensure a successful event. For this workshop, the organising committee decided to take a bottom-up approach by giving a framework within which it would like to see presentations and inviting researchers in the field to make propositions.

The mission of the IOBC is to promote the development of environmentally safe methods of pest and disease control and their future application in integrated pest management programmes. It is obvious that the aims of both organisations overlap to a considerable extent. Both also are strongly supporting the active interaction between scientists of different fields, thus promoting a culture of tolerance towards other scientific methods and philosophies and opening the way for novel approaches in the pratice.

Another common interest is the commitment to support and promote young scientists. In both NCCR and IOBC, doctoral students and postdocs are integrated in the research process and their participation in scientific meetings, local as well as international ones, is highly desired and promoted. However, the best proof for the common interest of both organisations lies in the fact that many of the scientists affiliated with the NCCR are also members of the IOBC.

But in the end, the real success of this gathering will depend on the participants. As a member of the organizing committee, I invite all the scientists interested by this event to visit our workshop website at www.unine.ch/bota/IOBC/.

Brigitte Mauch-Mani
Director of Research
University of Neuchâtel

Special Event of the NCCR *Plant Survival*

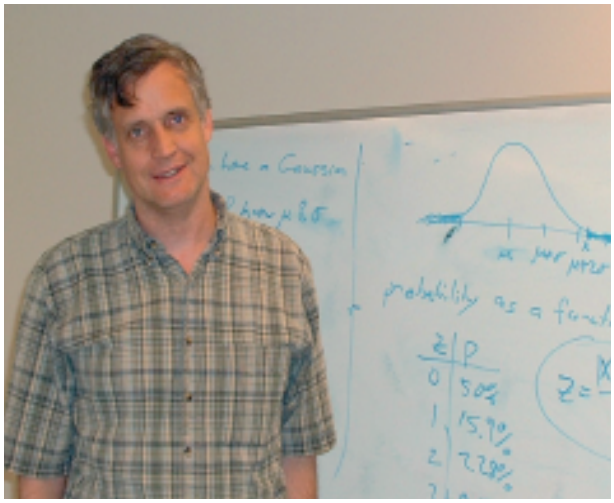
International Conference, Leysin, March 31 - April 3, 2005
Reduced participation rates when registering before December 30, 2004

Information: www.unine.ch/nccr/international

Contents

Scepticism: science's handrail

Eric D. Carlson, Professor of Physics at Wake Forest University, USA, is attempting to awaken our sense of criticism towards phenomenal fields such as astrology, telepathy or the existence of extra-terrestrials. He was in Neuchâtel on September 27th and 28th, 2004 to give a course at the Graduate School of the NCCR. PS News asked his opinion on the way scientific discoveries are validated in our society.



Your course is entitled "Scepticism, Pseudoscience, and the Scientific Method". Are they disciplines where people have to be more alert or sceptical?

Scepticism is invaluable to people in all walks of life, but scientists in particular are required to maintain a sceptical frame of mind when confronted with new claims. It is not restricted to one specific field, but it is especially valuable where someone has a financial or emotional investment in the outcome of the research. When we want to believe something is true, we are far more likely to fool ourselves, or to be fooled by others. Medicine is a field where this is particularly a problem, but it can happen in any field.

Western scientific research is based on peer-reviewed publication, a system where each article is reviewed by peers before publication. If they want their paper to be accepted, the researchers are obliged to follow a path more or less agreed upon by consensus, all in producing new results and opening new perspectives. How do you judge this rather paradoxical situation?

The peer-review process is designed to guarantee that new ideas receive a deservedly healthy scepticism. Although the system is imperfect, it is generally better than the alternatives. Unfortunately, peer-review does tend to more easily accept ideas for publishing that are non-controversial. There is only so much time for all of us to review new claims, and we naturally devote more time to finding flaws in documents with remarkable or unlikely conclusions. By using more than one reviewer, new ideas are less likely to be suppressed because of a single reviewer's reluctance to considering new ideas. And it does work.

Let's take the example of prions. Stanley Prusiner was the first to announce that defective proteins are capable of transferring disease, for example mad cow disease. This revolutionary theory brought him the Nobel Prize, even though it was very controversial during the 1980's...

Yes, but the essential point is that the new claim, here the role of the prions, do end up getting published over time. Having said that, new ideas need a large amount of support before they become common knowledge. This is not necessarily bad. Even when new ideas are suppressed for a time, they can still become widely known because they are discussed in conferences and are often distributed informally over the internet.

Scientists are evaluated by their publication rate, submitted to this "publish or perish" pressure. The media are following this trend, giving often priority to sensational results in order to attract a larger audience. What do you think about that?

Publish or perish has always been the rule in academia, but I don't think it particularly encourages sensational results. The trend towards premature publication, or a publication bypassing normal controls is a relatively small occurrence. In the end, we as scientists should be prepared to publicly condemn such tactics. When asked our opinion about work that has not been checked due to the desire for hasty publication, we should make it clear that such an approach is sloppy and irresponsible. As scientists, it is also our duty and obligation to speak up when ridiculous claims are made, rather than offering implied agreement by remaining silent.

To know more about scepticism according to Eric D. Carlson: **www.wfu.edu/~ecarlson/** , then click on Links button.

A Hunter of Ticks, Bugs and Butterflies

A graduate in Zoology, specializing in Marine Biology, a PhD in Zoology, fascinated by herbivorous insects and the plants that attract them, by the chemical relationships that these protagonists entertain between themselves, by ticks and other ectoparasites craving the blood while transmitting deadly diseases. Patrick Guerin knows all of these domains pretty well.

A voluble spokesman, both passionate and fascinating, it was in 1987 that this Irishman was hired as Director of Research for the University of Neuchâtel, where he undertook up the research interests of his predecessor Ernst Hess, and devoted himself to the study of ticks. Not at all surprising, when one considers that these arthropods are vectors of diseases such as Lyme disease and that Neuchâtel's nearby forest contains a site rich with these ectoparasites and happens to be largely responsible for the reputation of its parasitology lab. However, Patrick Guerin is more ambitious: he also studies other ectoparasites, that are more of a problem in Africa or Latin America, where they bite cattle and feed off their blood. Since the mid-nineties, he has added to his research programme the tsetse fly (vector of sleeping sickness), bugs that transmit Chagas disease which can damage the heart and the sand flies, vectors of leishmaniasis, a skin and visceral infection than can become deadly.

The Irish researcher's knowledge of sensory physiology, in other words the analysis of the relationships between insects and their hosts, will prove to be decisive. Since, just like pollinating insects that are sensitive to the scent of flowers, the arthropods that require blood to feed themselves are also attracted by odours. According to a recent discovery by Patrick Guerin and his colleagues, ticks are attracted by odours emitted when herbivorous mammals belch. This research has provided ideas for diminishing the population of another pathogenic insect. “The tsetse fly for instance, explains Patrick Guerin, is distinctive by the fact that it cannot give birth to more than six larvae in its lifetime. This signifies that if we install traps that imitate the odours given off from belching hosts, it would help in the eradication of tsetse fly populations by preventing those females that are trapped from giving birth to larvae.”

In fact, it is this same approach that Patrick Guerin is developing within the framework of NCCR Plant Survival, along with Pierre Charmillot and Thomas Degen at Agroscope Changins. The beginnings of this interest can be traced back to the mid eighties. Patrick Guerin and Heinrich Arn were both doing research at the Wädenswil Federal Research Station. At the time, he was already interested in moth pests that were causing considerable damage to grapes and apples. This led to the identification of pheromones, that are volatile substances responsible for attracting males to females of these pests. “This is when I hooked up with Pierre Charmillot, who went on to test all the pheromones found on grapes and apples, as a means of controlling insect pests.” The innovative factor of this approach was to link chemistry and sensory physiology to develop novel methods of pest control.

The success was such that today the study of pheromones has brought about new protection methods for the grapevine. In fact, more than half of the vineyards in the French-speaking part of Switzerland, from Neuchâtel to Aigle, are benefiting from this, building on Charmillot's initiatives. The idea consists of disrupting the mate finding of two moth pests that cause damage to the grapevine, i.e. grapevine moth and grape berry moth, using a procedure called sexual confusion. This is achieved by distributing dispensers in the vineyard that imitate the olfactory signal of females. This confuses the males who follow false trails instead of encountering the female in which to deposit sperm. The result: deposition of infertile eggs to the great satisfaction of the grapevine.

However, Patrick Guerin and his colleagues are not resting on their laurels. They are already developing an even more efficient method called 'attract-and-kill'. In this case, the pheromone dispensers attract the male moths towards lures containing an insecticide: by contaminating itself with the poison, the insect dies. This research appears to be very promising, since it has just received funding from the Innovation Promotion Agency CTI / KTI, a federal organisation that aims to put the scientific potential of academic institutions to better business use. The CTI / KTI backs joint Research and Development projects involving research institutions and industry.

News from the labs

Networking

In the age of the internet, one might think that networking becomes commonplace and natural. Nothing could be more wrong. Caroline Gueissaz, ETHZ engineer, consultant and teacher at the Haute Ecole de Gestion de Neuchâtel, shows how to put value in your professional address book. In the course that she will give on December 10th (note date changed) to the members of the Graduate School, she insists on the need to adopt a "networking attitude" that necessarily implies physical contact between people. "Nothing could replace a chance encounter, no matter how short it is", upholds Caroline Gueissaz. "You can exchange more information in ten minutes of face-to-face conversation than by computer screen as intermediary".

But once the ground is prepared, all the management work remains to be accomplished following specific well-established rules. One of the most important consists of knowing how to express your needs to the person you are in contact with. "This is not obvious, especially for young people who would like to be better known for their intrinsic qualities than for their relations", says Caroline Gueissaz. In other terms, they fear that this step is perceived as having strings pulled for them.

This is a question dear to the consultant from Neuchâtel who admits of having the same concern. "If the pulled strings consist of simply getting a job by knowing someone, the network serves to put all the possibilities on your side to achieve your goals by using normal pathways", says Caroline Gueissaz. "Your acquaintances allow to introduce yourself to others, or to present a project in the most targeted way possible, knowing which arguments people will be most sensitive to."

With this distinction done, the participants in the course will learn not only how to establish their network, but also how to structure and maintain it.

Spotlight on the *Nuit de la Science*

Under a radiating sun, the crowd pressed itself by mass to attend the fifth annual Nuit de la Science in Geneva last July 3-4, where more than 30,000 visitors packed the park of the Perle du Lac. The NCCR Plant Survival manned a stand there entitled "The plant and its environment" that presented two principal subjects. The first treated sustainable management of wildflower strips, these zones managed by farmers to maintain some biodiversity between fields. One was reminded of the menace represented by thistle in these areas of ecological compensation and the natural means to combat it.

The second subject covered the factors of stress on grapevine (disease, lack of nutrients or water, etc.). Visitors could discover a non-invasive method measuring the consequences of these stresses on the metabolism of the plant. This was good pretext to taste Solaris, a variety of grape resistant to mildew. All our thanks go to the small team of the NCCR who planned, set up and manned the stand, with special mention to the Botanical Garden of Neuchâtel for preparing the wildflower strip.

Standing, from left to right: Bernard Jean-Denis, Sharon Carty, Danilo Christen. Seated: Soraya El Kadiri-Jan, Claire Arnold, Odile Pfaehler. Lying: Igor Chlebny. Missing: Lisèle Crémieux, Britta Tschanz and Patrick Jäger.

Invasive plants

The invasion by non-native species has become one of the major causes for the reduction of biodiversity with both ecological and economic consequences. In an article published in August in the prestigious journal Trends in Ecology and Evolution (TREE), Heinz Müller-Schärer and Thomas Steinger (University of Fribourg), together with Urs Schaffner (CABI Bioscience Centre in Delémont) stated their concern about this phenomenon. Surprisingly, there is still relatively little known in Europe about why plants in their new habitat can suddenly form dense monocultures spreading over large areas.

Japanese Knotweed, Giant Hogweed or Goldenrod: hidden behind these harmless sounding names are in fact three important weeds. Introduced in Switzerland for ornamental purposes, these species, originating from an entirely different region of the planet, have rapidly found fertile soil. In the United States, where the devastation caused by exotic plants is alarming, the agricultural losses amount to around 50 billion Swiss francs per year!

The three researchers of the NCCR have put forth several hypotheses to better understand the ecological causes of this proliferation. They also want to identify insects or pathogenic agents capable of slowing down the spread of the invasive plants while at the same time limiting as much as possible the impact on non-targeted species. This is what is called biological control, a research area specialised by CABI Bioscience Centre in Delémont.

Present at Neobiota

This work has also been presented at the Third International Conference on Invasive Species that was held from September 30 - October 1 in Bern. With two members of the NCCR Plant Survival among its organizers (Wolfgang Nentwig and Sven Bacher), Neobiota brought together some two hundred participants coming above all from Europe, but with representatives from America and Asia.

Far from their original surroundings, animals and plants find themselves without specific predators and profit by conquering the space to the detriment of local species. To these ecological risks are sometimes added dangers to health, such as exotic plants known for their allergenic effects. Climate changes also appear among the causes favouring the phenomenon. They would explain how palms from Mediterranean regions can be grown in the Alps.

Swiss Microbial Ecology in Neuchâtel

The first meeting of the Swiss Microbial Ecology (SME) was held from 23-24 September at the University of Neuchâtel. Strong points of the meeting? The study of bacterial communities living in soil and the rhizosphere (the interface between soil and plant), to those that evolve in aquatic environments, with the cleaning up of polluted water as background.

Born from the initiative of young researchers in microbiology and supported by the NCCR Plant Survival, this symposium envisions uniting people who work in this domain, and bring forward new collaborations. “We wanted to give voice to the PhD students and post-docs so that this meeting becomes a springboard for the future of young researchers in Switzerland, explains one of the instigators, Jérôme Hamelin, post-doc at the University of Neuchâtel. “Our objective is reached since two thirds of the 83 participants are effectively part of these two categories of scientists”.

Congratulations

Helene Wagner, researcher at the WSL in Birmensdorf, has been named as a member of the editorial committee of Landscape Ecology. Published by the IALE (International Association for Landscape Ecology), this journal has been around for 15 years, publishing 8 issues annually. The themes go from biogeography to economic factors influencing regional development, with a particular interest towards application in the conservation of nature and management of the environment.

Clarification

In our article dedicated to the first Scientific Café in Neuchâtel (PS News 9, p. 5), it was stated that in Switzerland, some transgenic varieties of maize and soya are authorized. The sentence meant to give the impression that it concerns only an authorization to import, but not to grow, which still remains prohibited in our country.

Graduate School

When extremes meet

For this Fall, two courses from the NCCR Plant Survival have been organised in collaboration with the 3e Cycle romand en sciences biologiques. One is oriented towards plant physiology and the other towards the relationships between parasites and their hosts, including the role of plants in such relationships. They touch upon two areas situated at both extremes of the NCCR's research activities: molecular biology and ecology.

Diving into chloroplasts or flying with insects towards their preferred food sources, these were the general themes recently offered to students of the 3e Cycle romand en sciences biologique in Neuchâtel. Coordinated by professors Felix Kessler (University of Neuchâtel) and Christian Fankhauser (University of Geneva), the Environmental Control of Chloroplast Biogenesis and Function course was presented by no less than 15 invited speakers last October 7th and 8th.

The objective was to explore the role of light in not only plant growth, but also in chloroplast development. These organelles are the hub of photosynthesis, a process by which plants use light energy to fix carbon dioxide present in the air and to synthesize carbohydrates that are necessary for their metabolism (see PS News 9, p.2).

Into the light, but not too much

“In the absence of light there is no chloroplast formation”, explains Felix Kessler. “But on the other hand, if leaves receive too much light energy, then the organelles must protect themselves”. This phenomenon was presented by one of the invited speakers, professor Masamitsu Wada, of the Tokyo Metropolitan University in Japan, who is renown for his contributions in this area. In an environment with acceptable light levels, the small egg-shaped bodies of 5 microns in length that contain the precious chlorophyll cover the side of the cell wall that is exposed to the light rays. However, as soon as the light level is too high, they quickly migrate to the perpendicular cell walls, protecting the chlorophyll from an excess of photons.

Therefore, controlling the impact of light and regulating it, is of primordial importance to all plant organisms. Dependant on theses regulations are the biochemical signals that go from the photoreceptors (proteinic antennae that capture light) to finally reach the cell nucleus. Once there, they influence the genes involved in the plant's adaptation to light, which ensures a proper photosynthesis.

Recognition processes

The second course, organised one month earlier by Ted Turlings, Bruno Betschart and Martine Rahier (University of Neuchâtel), dealt with the host recognition processes for parasitic insects and parasitoids. The idea was to bring together scientists from different disciplines that rarely come together to discuss parasite-host interactions in various systems. The PhD students who took part in the course were also offered the possibility to present their work and practice their oral presentation skills.

Among the five invited speakers was Jim Tumlinson, professor at Pennsylvania State University (USA) and also Ted Turlings' former PhD thesis supervisor. It's not surprising then that his main interests deal with parasitic wasps, an area of research included within the framework of NCCR Plant Survival. It concerns the study of insects useful to farmers, since these wasps deposit their eggs in the larvae of herbivorous caterpillars that attack plants, which is the case, for example, with the Spodoptera caterpillars that feed on maize.

As for the relationships between plants and insects, the NCCR is conducting soil research in order to control Diabrotica virgifera (western corn rootworm), a beetle that devours maize roots. Among the more efficient natural enemies, we find the entomophagous nematodes such as Heterorhabditis and Steinernema. This explains the presence of Randy Gaugler at the workshop. He is a professor at Rutgers University (USA) and a specialist in the biological control of insects with the use of nematodes. He gave a talk about the way that hosts are selected, largely due to the attraction properties of certain chemical compounds in order to optimise the attack on the targeted pests.

Other renowned speakers were Wilfried Haas of the Friedrich-Alexander University in Erlangen-Nuremberg (Germany), Hanna Mustaparta of the Norwegian University of Science and Technology, and Patrick Guerin representing the University of Neuchâtel (see p.3).

Tiny seeds and field crops

As a fundamental part of agriculture, the seed production industry is multifaceted. Its activities include the selection of new varieties, the sale of seeds, as well as the import and distribution of foreign varieties throughout the country.

What would you say to steamed 'Zera Fino' fennel or perhaps 'Berac' Swiss chard au gratin? If these vegetables end up in your plate, then it's quite probable that Delley Semences et Plantes from the canton Fribourg had something to do with it. This is because one of its main tasks consists of the large-scale production and sale of new varieties chosen by the Federal Research Stations in Agriculture (Agroscope). The choice of seed varieties is not just limited to horticultural crops: cereals, maize, and traditional forage crops are also listed alongside lawn seeds in most Swiss seed producers' catalogues.

"Final users are also the amateur gardeners, adds Joséphine Gretillat who is responsible for the special crops section at the seed producer in Fribourg, to whom we supply certified organic seeds. Our product list includes parsley, carrots, string beans, garden peas, endive, lettuce, zucchini, and chives." These certified organic products often originate from ancient local varieties that the specialists rediscovered and then reintroduced them in the market.

However, apart from foodstuffs, there are also wild flowers, an area that is of particular interest to the NCCR Plant Survival. This is because the choice of species will eventually determine the success of ecological compensation areas, which are the cultivated surfaces along the borders of fields that serve to maintain the biodiversity and of which the NCCR researchers are studying the ecological impact in rural zones.

Hence, one of the country's leading suppliers of seeds, UFA Samen, attends the same meetings as NCCR's representives to stress the importance of wildflower strips as part of Switzerland's agricultural landscape. And that's all the more so since 1996 when the agricultural cooperative chose to only commercialise native wildflower plants, which demonstrates their interest in defending local species. Such a mission requires the participation of farmers to produce seeds. For the propagation of wildflowers alone, UFA Samen relies on around 20 of those farms.

This is also the number of partners that work for Delley in the special crops section, where we found aromatic plants. "This represents a relatively small market, but one that is in full bloom", states Joséphine Gretillat. Seedlings of thyme, sage, melissa, oregano or artemisia, which grow into plants for the food and drink industry or which are used for aromas and perfumes. The Swiss company sell these products mainly to France, Italy, Spain and even exports to the USA and Brazil.

Solid as a rock

Look up longevity in the dictionary and you will probably see the name Eric Schweizer Samen, a supplier of seeds based in Thun and operating for the past 164 years! In 1999, the reputable company even acquired Samen Mauser in Winterthur, its elder by twenty years. That is certainly something to be envied, especially at a time when many new companies are closing down. The secret? "A healthy, stable growth, with management practices based on product quality rather than on maximizing sale output", answers Franz Stadelmann, head of agriculture and market gardening section.

Mainly active in the import and distribution of foreign seedlings, the company maintains a close link with the academic world, in search of optimal crop protection solutions. In fact, it is with this in mind that field trials are regularly conducted on its site by Agroscope FAL Reckenholz. "For example, we have developed a biological control method to protect barley against cockchafer", explains Franz Stadelmann. The barley is inoculated with a selected fungus and then inserted into the fields that need treatment. When in contact with the plant, any cockchafer that happens to be around is infected by the fungus and killed in the process.

Upcoming events

Special NCCR Event

International Conference of NCCR Plant Survival
March 31 - April 3, 2005 in Leysin
Arrival on March 31, 2005
Lectures April 1-2, 2005
Facultative excursion on April 3, 2005

First registration deadline: December 30, 2004
For more information: www.unine.ch/nccr/international

Graduate School courses

Savoir communiquer et argumenter
Edith Slembek, University of Lausanne
November 11-12, 2004

Woman! Marketing yourself and jobhunting beyond the glass wall
David Veenhuys, DDC consulting, Montreux
November 19, 2004

Kommunikation und Argumentation
Edith Slembek, University of Lausanne
November 25-26, 2004

How to develop and maintain your professional network
Caroline Gueissaz, M Sc. EPFZ, Neuchâtel
December 10, 2004

Microarrays - Bioinformatics: 3 modules
Philippe Reymond, University of Lausanne (Switzerland)
Otto Hagenbuchle, University of Lausanne (Switzerland)
Philip Zimmermann, ETHZ (Zurich)
Jean-Pierre Renou, INRA, Evry (France)
Darlene Goldstein, EPFL (Switzerland)
Mauro Delorenzi, SIB/ISREC (Switzerland)
January 14, 20-21, 27-28, February 4, 2005

Integrated Management of Pests and Diseases
February 10-11, 2005
Information and registration: www.unine.ch/nccr
then click on Education>Graduate School>Courses

NCCR event

Review Panel Site Visit
January 31-February 1, 2005
University of Neuchâtel

Other events

International Organisation for Biological Control of Noxious Animals and Plants (IOBC)

Organisation internationale de lutte biologique contre les animaux et les plantes nuisibles (IOLB)

Workshop on methods in research on induced resistance against insects and diseases

November 2 - 4, 2004, Delémont, Switzerland
Information: www.unine.ch/bota/iobc

New press releases

The hunt for phosphorus: lupine better than wheat
(29.09.2004)

What makes invasive plants so successful?
(10.08.2004)

Présence neuchâteloise à la Nuit de la Science à Genève
(06.07.2004)

Clean roots, healthy shoots!
(21.06.2004)

Further information: www.unine.ch/nccr, then click on Press> Press releases

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: Denis Nobert / Jason R. Grant

Université de Neuchâtel unine

The leading house of the NCCR *Plant Survival* is the University of Neuchâtel
Head of NCCR Plant Survival: Martine Rahier

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