ECRO

Newsletter 77

in this issue

About ECRO

ECRO is the European Chemoreception Research Organisation and represents a link between scientists woorking in the field of chemical communication. Although most of the members are Europeans, ECRO welcomes scientists from all parts of the world.
To become a member, follow the instructions found at the ECRO website: www.ecro-online.info
Annual fees are from 20 (for students) to 184 euros, according to your options.
Membership may include subscription to the journal "Chemical Senses" and entitles you to:

- ✓ benefit from discounted registration rates at ECRO and ISOT Conferences
- ✓ receive the on-line version of ECRO Newsletters
- ✓ post positions and other advertisements in the ECRO Newsletters
- ✓ be regularly informed of scientific publications by other ECRO members
- ✓ obtain grants for your students (who must also be ECRO members) to attend Conferences or visit other laboratories

ECRO Newsletters are published twice a year. Material for inclusion in the Newsletter should reach the editor by early March for the spring edition and early September for the fall edition.

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ECRO Board and Coopted Members

Editorial

Once again this issue is coming late. I have decided to call it the "*Summer issue*" while it should have been the "*Spring issue*". Of course the editor is to blame for being lazy and occupied in other duties, but again I cannot refrain from noticing a lack of collaboration from ECRO members. All these difficulties are probably related to the poor interest from potential readers. We have a feeling that most of the ECRO members do not read the Newsletters or do not even download it from the ECRO site.

To get a feedback on this important aspect, we ask now the readers to send a message to my e.mail box, indicating the article they most disliked in the last three issues. Of course any suggestion and criticism will be highly welcome, including the proposal that the Newsletters should be ended.

This issue sadly reports another loss in the world of chemoreception: Dietrich Schneider, a great pioneer of olfactory research, the first to apply electrophysiology to insect chemoreception, the head of the most prestigiuos research group of Seewiesen. Two of his former students and collaborators, Karl-Ernst Kaissling and Alexander Steinbrecht report on his successful life and share their memories of this great master. His scientific life spans the all history of olfactory research, from before the identification of bombykol and the concept of pheromones to the discovery of olfactory receptors and the sequencing of genomes.

The present could be regarded in some way as the era of the genomes. The techniques improve continuously and the speed of sequencing increases with exponential rate. In this issue we report on two new genomes that have been published. The first is that of another insect, *Tribolium castaneum*, of great economical consequences, but also of scientific interest, being the first Coleopteran to have all its genes sequenced. The other species is the most unique and interesting *Platypus*, a species so bizarre that when it was first reported, a mix of mammalians, birds and reptilians, was believed to be a hoax. Both genomes contain interesting and in some way unpredictable information on odorant-binding proteins and receptors.

Exciting news regard LUSH, the odorant-binding protein of *Drosophila*, demostrated to be essential for the perception of the male pheromone vaccenyl acetate. In its excellent paper on *Cell*, Dean Smith goes a step forward showing that it is LUSH itself to interact and trigger the olfactory receptor, rather than the pheromone. The evidence is very sound and questions the old view that pheromone molecules would interact with olfactory receptors.

Another revolution in the field of insect olfaction is the evidence, given by two independent laboratories, that olfactory receptors are not G-protein coupled receptors, as assumed so far, but ion-channels, directly activated by the ligand (pheromone or OBP?).

Perhaps we should be prepared for more shattering discoveries, turning our assumptions upside-down. However, some aspect, based on hard evidence, remain unquestionable, such as the fact that odour is related to stereochemical parameters of molecules and their ability to fit into receptor pockets of receptors and/or odorant-binding proteins. But, is this view shared by everybody? Not quite. The old vibrational theory, abandoned for a long time, has been revived and proposed as a valid alternative, in spite of all the contrary evidence. The review on the book of Luca Turin, that Thomas Hettinger has recently published on Chemical Senses, clearly exposes the lack of foundation of such obsolete ideas in front of overwhelming contrary experimental evidence and relegates the vibrational theory in the realm of alchemy. It is hard to understand how such ideas, only produced by imagination and disproved by scientific evidence, still find their way in the media and succeed in attracting interest.

From the President

Dear Members,

The beginning of 2008 was busy with preparing our future congresses.

Our Next ECRO congress will be held in Portoroz, Slovenia, 3 to 7th September 2008, organized by Tine Valentincic, tine.valentincic@bf.uni-lj.si. The address of the congress secretariat is ECRO2008@bf.uni-lj.si or ECRO2008S@bf.uni-lj.si, Website of the congress: http://www.ecro-2008.si/.

You are already about 230 registered members, which is very good for a year with an ISOT meeting on another continent. Attendees are expected from Europe but also from the USA and Japan, some registered members also come from Eastern Europe. This is truly encouraging.

Interested members can still register for Portoroz as the venue is adaptable to the number of

attendees. You can expect eager science, sun and a beautiful sea, plus a wonderful hospitality.

As already announced at the general assembly of 2006, a yearly meeting is now possibly organized. It is the Board's pleasure to announce that the location for the 2009 ECRO Congress has been chosen: it will be organized by the sea in Villasimius, Sardinia, by Prof. Anna Maria Angioy (University of Cagliari). The ECRO meeting will take place just after the ESITO meeting which is also organized, in the vicinity, by Anna Maria Angioy. This will allow members of each organization to possibly attend both meetings.

Grants

The Board has granted 2 students for attending ISOT at San Francisco and 12 students to attend ECRO at Portoroz.
It is important for members to make some advertisement of the granting possibilities so that students may apply early enough before the deadline which is to be found on the website for each event.

Job market and jobfair

We shall organize a job fair at next ECRO congress in Portoroz where PhD students, Post-Docs, etc. may present their profile (5 minutes!) and the time they wish to start in a new position. Institutes or firms are welcome to present proposals (any duration).
Please, enrol by writing to Prof Tine Valentincic tine.valentincic@bf.uni-lj.si
You can also prepare an announcement to be posted at the congress information Board.

Sponsorship

The board was able to attract new sponsors this year and we hope we can do even better, always increasing our fund raising activity. I am sure you will appreciate the presence of new logos on our website home page and join us to earnestly thank our contributors. Without them, no congress could be possible.

ECRO mini-symposia

Any member who wishes to organize a thematic ECRO mini-symposium is welcome to solicit the Board for financial support.

Evolution of our Association

It seems that European ECRO members are not so keen on paying their dues through the internet. However, their number is increasing. We can observe that few of them had paid by January in 2006 and most registered as they registered for the ECRO meeting in Granada;
Fortunately, writing circular emails helped members to remember paying their dues in January in 2007 and 2008.
It is important that the Board knows how many members the Association is rich of: the mission of the Board is to foresee meetings, grants, mini-symposia, etc. and needs to know the wealth of the Association when engaging expenses. Moreover, one of our major donors is the foundation of Ernest Polak who grants ECRO and AChemS on the basis of the number of members known at the turning of the year. Hence it is important that a schedule exist for paying dues. To give a new password also, the Board sometimes has some difficulty to understand the individual deadlines of members paying any time of the year!

Elections

During the time I am writing this Letter, Otto Belluzzi, our web Editor is opening the voting page of our website for the election of the New Board: I strongly encourage ALL OF YOU to vote!

Website improving

The ECRO website is our tool for communicating, informing, organizing events, registering to meetings, etc. Please signal us whenever you do not succeed in using the ECRO website so that we improve it.
Please, fill your profile in: that will be useful to students, and also useful to all members at the time of elections, etc.

European funding

It is not easy to submit a scientific project to the European granting system for Chemorecep-tion scientists. Besides the administrative difficulties, a major point that stops any of us is the total absence of any of our basic scientific keywords in the calls, at present.
To try and improve this, the best way is to write a topic, mimicking the format of the existing ones, not forgetting the "expected impacts" to submit to the Commission. This topic represents the project you could submit, with several foreign collaborators, to the EU, for funding your research.
The scientific delegation to the European Commission welcomes new ideas provided they come from various countries simultaneously. Hence, the protocol is to send such a topic to several of your friends who will all transfer it to their own National Contact Point (the NCP is the sesame!).
The list of the National Contact Points is in Cordis website at:
http://cordis.europa.eu/fp7/ncp_en.html

We did this already once (13 countries) and we had some positive result: the Spanish National Contact Point regularly solicits some suggestion. That is why I solicit your contribution. Writing other topics changing words and ideas may be useful provided olfaction, taste and other relevant keywords be mentioned.
For your information, please, look into Cordis website
1) in Cooperation, look for Food or Health program
A call will be open early in September
2) in ERC, you can propose your own scientific project.

Acknowledgements
I truly thank Otto Belluzzi for his ever good temper at continuously working on our website with the dwb webmaster. I acknowledge the continuous efforts of Anne Abriat to support my search for funding. I greatly appreciate the work of Paolo Pelosi collecting the material for Editing the Newsletter. I heartily thank all the Board members for their excellent contributions and their truly appreciated witty minds and good-humour. I wish to give a special mention to Krishna Persaud for his invaluable continuous contribution as Executive Secretary/treasurer.

I am looking forward to meeting all of you at ISOT, San Francisco 21st-26th July and at ECRO, Portoroz, 3rd-7th September!

Yours faithfully,

Annick Faurion, President

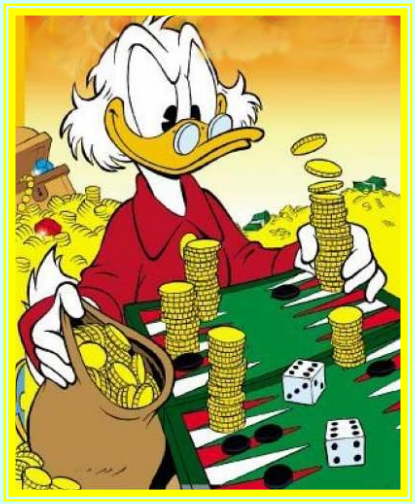
ECRO Finances

Report from the Treasurer

As of July 2007, the total assets of ECRO stood at 61,000 Euro.

This year 160 members paid their subscriptions. Despite this, we are pleased to report that The ECRO board provided grants to 2 students to attend the ISOT meeting in the USA, and 9 students to attend The ECRO meeting in Slovenia this year totalling 6,500 Euro. ECRO also provided support to the ISOT meeting in 2008 and the II Jornadas Olfativas, Pendueles 2008, Spain.

We received donations from the Polak foundation and from Givaudan and this helped us to maintain the level of support to ECRO members.



After some problems the ECRO web site is now functioning correctly, and you will see that it offers many more facilities than previously. Registration now allows you to choose your own password, so that you can hopefully remember how to access the member's area of the web site. We post job offers, news and views, and a host of information in the Chemoreception field, so we encourage you to contribute to making the web site a vibrant living place. Because of problems of accessing data – we had some delays in informing Oxford University Press of some members who had registered for on-line access to Chemical Senses, so for some members there was a delay in access. We apologise for this.

We look forward to meeting you all again in Slovenia in September 2008.

Krishna Persaud

These are the students funded by ECRO

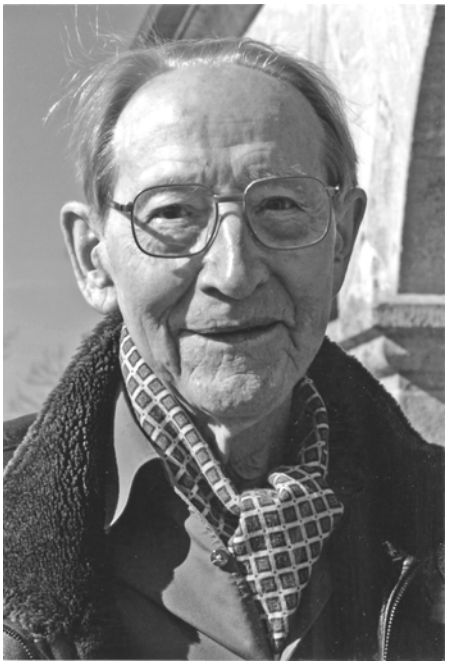
Michele Dibattista
Julie Millery
Alexey Lvovitch Krasnov
Maja Vucnik
Yuichiro Oka
Benjamin Auffarth
Luc Charlier
Anja Froese
Camille Ferdenzi
Federico Tubaldi
Stéphanie Veloso Da Silva

In Memory of Dietrich Schneider

30th July 1919 – 10th June 2008

Karl-Ernst Kaissling and Rudolf Alexander Steinbrecht

On the 10th of June, 2008, Professor Dr. Dietrich Schneider died after a brief period of severe suffering. One of the pioneers of modern olfactory research, he was the first to use electrophysiology to investigate the sense of smell, by directly recording the responses of single sensory neurons to the odour stimulus. His success depended crucially on his choice of the silk moth as experimental animal, because its males are very sensitive to the sexual attractant released by the females — as by now not only experts in the field but also every educated layman knows. This proved to be a model system for olfaction that offered many advantages. The adequate stimulus, the pheromone bombykol, is a relatively simple molecule with obvious biological relevance, and the receiving organ, the male antenna, is optimized to capture even the slightest amounts of odorant. Furthermore, each of the many thousand sensory hairs, which are arranged on the antenna to form an odorant sieve, is readily accessible to the physiologist's electrodes. For the first time a quantitative analysis of the olfactory sense became possible, and the school that Schneider established in Munich, at the Zoological Institute, and then expanded at the Max-Planck-Institute for Behavioural Physiology in Seewiesen, was soon pointing the way towards research that would be carried out by students of olfaction worldwide.



Dietrich Schneider was born in 1919 in Berlin. Having qualified for university admission in 1937, he first studied biology at a teachers' college in Frankfurt on Oder and then in 1938 moved to the University of Berlin, but as early as 1940 he was drafted into military service. In North Africa, in 1943, he began four years as a prisoner of war, during which period he was transferred from Algeria to the USA and England. While a prisoner he was nevertheless able to spend some time continuing his studies, so that in 1949, only two years after returning home, he obtained a PhD in Göttingen with specialties in zoology, botany and physiology. His thesis research, on the electrophysiology of saltatory nerve conduction, was carried out in the laboratory of Hansjochem Autrum. In the same year he married Heidwig Intemann, with whom he had three children. Soon thereafter he was appointed scientific assistant to Alfred Kühn at the MPI for Biology in Tübingen; among the things he investigated here were the field of view of frogs and their escape and predation behaviour, and finally the light-oriented growth of marine Bryozoa.

At this time Peter Karlson and Adolf Butenandt were also working in Tübingen, on the isolation of bombykol, the first chemically characterized insect pheromone. Schneider's interest thus aroused, he began to make electrophysiological measurements of the silk-moth antenna. He recorded the summated responses of the olfactory cells, the electroantennogram, which enabled him to make the first quantitative analysis of the olfactory sense. Soon he began to record the responses of individual, identified olfactory cells. It should not go unmentioned here that the faculty of the University of Tübingen failed to recognize the broad significance of these discoveries and hence did not accept them as grounds for an academic career (habilitation) there. Therefore in 1958 Schneider transferred to the Zoological Institute of the Ludwig-Maximilians-Universität in Munich, where he obtained a professorship in 1959 with his study on the growth and phototropism of the Bryozoa.

In 1962 the Department of Comparative Neurophysiology was established for Dietrich Schneider at the MPI for Psychiatry. In 1964 he became a scientific member of the MPG and was appointed Director of the MPI for Behavioural Physiology in Seewiesen. Then in 1965 he was given the title Honorary Professor at the Ludwig-Maximilians-Universität in Munich. Foremost among his research subjects were insects' peripheral identification and discrimination of odour substances and mixtures thereof, as well as the physiology and structure of the olfactory organs. However, his multifaceted approaches

to research and the broad spectrum of methods employed also led to work on the production by insects of their own odorants, the structure of the odorant-producing glands, the enzymatic decomposition of odorants in the olfactory organ, the phylogenetic relations between insect species with respect to their pheromones and how they are identified, which nerve centres are used to process the olfactory signals, and the odour-controlled orientation behaviour of insects. Later Schneider again turned to an area, which at that time was largely ignored, the relationships between insects and plants, and became one of the pioneers of chemical ecology. He devoted himself to this fascinating subject with special intensity even after acquiring emeritus status in 1985.

Dietrich Schneider was always a critical and committed partner in discussions of questions related to the politics of science. He spent an especially large amount of time and energy on setting up the International Center for Insect Physiology and Ecology (ICIPE) in Nairobi, Kenya, and was one of the international members of its Governing Board for many years. Until the end, he observed the development of the Max Planck Society with great interest. Although he was rather sceptical about the planned establishment of new Max Planck Institutes in distant foreign countries, he was very much in favour of international collaboration. This is evidenced not only by his many, often several-month research visits abroad, to Sweden, Yugoslavia, many places in the USA, and in Kenya, but also by the impressive number of scientists from all over the world who undertook research as visitors to his institute in Seewiesen, with more than a few of whom he developed close friendships.

Schneider's achievements were soon recognised, and he was offered positions abroad, e.g. in Utrecht or Los Angeles, but these were declined. Throughout his long research career he was honoured in many ways. For instance, beginning in 1962 he was among the organisers of the first International Symposia on Olfaction and Taste; he was a member, e.g., of the American Academy of Arts and Science in Boston (from 1971), the Leopoldina (from 1975), which later awarded him the Cothenius Medaille, and the Bavarian Academy of Sciences (from 1977). He was chosen to be the John Prather Lecturer at Harvard University in Boston, became the First Distinguished Visiting Professor of the Center for Insect Science at the University of Arizona, Tucson, and in 1991 was awarded the Silver Medal of the International Society for Chemical Ecology. In 1992 he became an Honorary Doctor at the University of Regensburg.
He himself, however, never regarded these many awards as very important; grandiloquence and pathos were not his style, and with his mischievous Berlin humour he reduced quite a few big shots — and he encountered many of those — to human proportions. This humour also defused tense situations and created the relaxed professional environment that everyone who had the privilege of living and working under his roof still remembers so fondly today. At the same time he was relentless towards himself in his personal commitment to research, and the same was required of his colleagues. He was not a strict supervisor, believing that incentive must come from within; this was ensured by his own passion and boundless curiosity, combined with his joy and enthusiasm for communicating new findings, opening them to critical discussion and exploring their implications. Thus we, his students and coworkers, enjoyed a degree of freedom in the choice of our research goals, approaches and methods that is hardly imaginable today; all that counted was the result. We are also grateful to him for sending us early onto the international stage, and thus ensuring that we met the major contributors to our field.

A very special experience was going on "safari" with Dietrich Schneider. Prof. Franz Huber, to whom he was bound by a friendship lasting over 50 years, writes "whoever has seen Dietz hunting his butterflies with hat and net, or seen him sitting at the table in his hotel room at 3 a.m. while preparing the pheromone-loaded hair pencils of a moth, will get a slight impression of the commitment of this man, who was driven by curiosity and to whom finding something new meant everything." His wife Heidwig also became "hooked" on Africa, and it was she who while there made the crucial observation that *Danaus* moths acquire the alkaloid precursors of one of their sexual pheromones from wilting heliotrope plants.

Much more could be reported here, because Dietrich Schneider was a sociable man and lively storyteller, and brought his rich research career to life for us with his consistently humorous tales. For — in the words of Gabriel Garcia Márquez — *"life is not what we have lived, but what we can remember, and how we remember ourselves, in order to tell about it."* Our sadness over the death of Dietrich Schneider, which we share with all his family members and friends, is alleviated by the happy knowledge that we were allowed to spend so many years together with him.

Prof. Dr. Karl-Ernst Kaissling
Prof. Dr. R.A. Steinbrecht
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Translated with permission by Ann Thorson from "Mitteilungen der Deutchen Zoologischen Gesellschaft 2008"

The platypus genome: more mammal than bird

Genome analysis of the platypus reveals unique signatures of evolution

Nature 453, 175-184 (2008)

The platypus (*Ornithorhynchus anatinus*) is one of the most puzzling and fascinating species and probably the most difficult to classify. Now, the sequencing of its genome will certainly help in finding the correct place in evolution for this most strange and fascinating animal, and establishing filogenetic relationships with other species.

The platypus presents features characteristic of mammals, reptilians and birds. Its flat beak and the absence of teeth in the adult are reminiscent of ducks, while its coat of fur, similar to that of mammals, helps keeping its body temperature while swimming in cold waters, being a semi-aquatic animal foraging under water. The female lays eggs, but lactates the youngs, which suck their milk through the skin of their mother, that, unother strange feature, lacks nipples. Quite unusually among mammals, the platypus produces venom proteins similarly to reptilians. These are delivered not trough biting, but with their hind legs and include at least

19 different substances, such as defensin-like peptides (vDLPs), C-type natriuretic peptide (vCNP) and nerve growth factor (vNGF). It is interesting the observation that these sequences derive from duplications of genes encoding peptides with very different functions.

The repertoire of genes encoding milk protein is similar to mammals. This fact and the observation that the arrangement of such genes seems to have been preserved since the platypus split from our common ancestor about 166 million years ago, indicates that milk evolved long before the capacity of giving birth to live youngs.

Chemoreception seems to be an important activity in the platypus with 700 genes encoding olfactory receptors and 80 for vomeronasal receptors of type V2R. Most of these, however, are pseudogenes, with only 333 functional olfactory receptors and 15 V2R. Greater is number of genes for vomeronasal receptors of type V1R, 950 sequences, with only 270, however, possibly encoding functional receptors, while the others present frame disruption. This number is still 50% greater than in the mouse and, as the Authors have suggested, could be related to its aquatic foraging habits. In the platypus V1R

receptors, dedicated to pheromone perception in mammals, could be utilised to smell water-borne chemosignals.

No mention is found of odorant-binding proteins (OBPs) nor of other lipocalins, except a single one, secreted by the epididymis, as in reptilians, and endowed with proteolytic activity, that however was lost in higher mammalians.

In fact, a BLAST search through the genome, using mammalian OBPs, returned a single sequence with significant homology to OBPs. In addition, a gene for another lipocalin has been annotated as β-lactoglobulin, although the encoded protein is much longer than other mammalian β-lactoglobulins.

The genome of the model beetle and pest *Tribolium castaneum*

Tribolium Genome Sequencing Consortium *Nature* (2008) 949-955

Another important insect has unveiled its repertoire of genes. The red flour beetle, widely present where grains are stored, represents a major pest for foods and has proved so far resistant to all kinds of insecticides.

Together with *Drosophila*, *Anopheles*, *Aedes*, *Bombyx* and *Apis*, the genome of *Tribolium* adds information related to another order of insects, being this the first coleopteran to be sequenced.

In Tribolium, RNA interference is systemic and silencing of genes can be efficiently obtained in all tissues and developmental stages, as well as in offsprings by injecting females with double-stranded RNA.

Particularly interesting for our work is the very large repertoire of olfactory and gustatory receptors

The Authors responsible for this part of the genome, Kimberly K. O. Walden and Hugh M. Robertson, have identified and annotated 265 functional genes encoding odorant receptors, 42 full-length pseudogenes and 34 pseudogene fragments. Most of these are in tandem gene arrays, created by gene duplication within the *Tribolium* lineage in the last 300 million years.

Very large is also the family of gustatory receptors with total of 245 genes, including only 25 pseudogenes.

Sergio Angeli, Sylvain Foret , Gregor Bucher, Stefan Schuetz, Ryszard Maleszka and Ernst A. Wimmer have identified 47 Odorant-binding proteins (much more than the 21 of the honeybee, but comparable to the 51 of *Drosophila* and to the 70 of *Anopheles*), and 20 Chemosensory proteins.

The very large increase in odorant receptors (relative to Diptera, but not so much to the honeybee) is accompained by a reduction of opsin genes, indicating that during evolution along this line the selection pressure was for a wider use of chemoreception rather that colour discrimination.

A robotic mouth

Arvisenet, Billy, Poinot, Vigneau, Bertrand, Prost
J. Agric. Food Chemistry 56, 3245-3253 (2008)

Chewing is an important factor in determining the flavour of what we eat. The mechanical disruption of the food structure can release volatiles, that are normally trapped and protected inside the intact food, the aqueous vapour of saliva helps odorous molecules to reach the olfactory area from the palate and the enzymatic activity of the salivary enzymes can produce profound changes in the chemistry of odorants and tastants. Just think of the sweet taste developing in our mouth while we chew a piece of bread, thanks to the amylases degrading starch into glucose. Finally, we should not overlook the effect of temperature, that may increase the volatility of odorants when a piece of food at room temperature is slowly warmed to 37° in our mouth. In the end, the flavour of the food we perceive after mastication can be quite different from the original one.

To address these problems, Gaëlle Arvisenet of ENITIAA in Nantes, France, has developed a robot that chews food, a sort of artificial mouth. Pieces of food are inserted in the jaws of this machine, artificial saliva is added and the robot starts chewing, mimicking the activity of the mouth, following a programme whose parameters can be adjusted.

Directing the attention to the importance of the mechanical action of chewing and the chemical effects of saliva when evaluating the flavour of foods is not a new idea. Since 2001 Andrea Büttner at Garching, Germany, who is a pioneer in these studies, has been investigating the effects of chewing on the perceived aroma of foods.

The availability of this machine will certainly make research of this type easier and more objective and reproducible.

Your colours look familiar...

C. Estrada,C.D. Jiggins
J. Evol. Biology, 21, 749-760 (2008)

Two beautiful butterfly species, *Heliconius erato* (in the picture) and *H. melpomene* present the same brilliant colours on their wings as a warning signal against predators.

This increases the surviving chances, but may create problems when finding females of their own species. In fact, males were confused when presented with model females equipped with real wings. The males were indeed attracted by the colour patterns of the wings and spent some time trying to recognise their mate. In most cases, they could not make a choice and decided not to waste precious sperm.

Once more, the research supports the stronger and clearer messages of olfactory cues, but indicates that also visual signs should not be overlooked, particularly over long dinstances and in the first phase of attraction behaviour.

Are OBPs the true soluble receptors?

Laughlin, Ha, Jones and Smith
"Activation of Pheromone-Sensitive Neurons Is Mediated by Conformational Activation of Pheromone-Binding Protein"
Cell, 133, 1255–1265, 2008

Passive carriers or active detectors? This is the main question still opened in olfactory receptors (ORs) and refers to the role of odorant-binding proteins (OBPs) in pheromone and odour perception.

Too simple saying that OBPs are carriers for hydrophobic compounds, such as odorants and pheromones, across the olfactory mucus of vertebrated or the sensillar lymph of insects.
We have been used to model olfaction under a general scheme, valid for all animal species. However, vertebrates and insects could be very different in such respect, as very different are their OBPs and olfactory receptors.
While for vertebrates the question on the role of OBPs might be still open, in insects a different model is acquiring credit, while it becomes more difficult to accept the idea that OBPs are passive non specific carriers. That OBPs could be involved in odour and pheromone recognition was first suggested by the electrophysiological work of Blanka Pophof, then working with Karl-Ernst Kaissling at Seewiesen, indicating that both ORs and OBPs were required for the correct response to the pheromone (*Naturwiss. 89, 515-518, 2002*). Later, Dean Smith provided clear evidence that LUSH was directly and specifically involved in the perception of the male pheromone vaccenyl acetate, showing that mutated flies, that had their LUSH gene silenced, could not give electrophysiological nor behavioural response to the pheromone. Interestingly, reinsertion of the gene or of the protein restored both responses.
The specific role of OBPs in discriminating different odours was again demonstrated by Takashi Matsuo, who succeded in switching some behaviour aspects between two *Drosophila* species by switching the genes for two OBPs (*PloS Biol., 5 e118, 2007*).

In his last paper, Dean Smith provides clear evidence that it is LUSH to interact with the OR, without the need of the pheromone molecule. He noticed that the structure of LUSH in the absence of the pheromone is locked in a particular conformation stabilised by a strong electrostatic interaction between the carboxy group of aspartic acid in position 118 and the amino group of lysine 87. When the pheromone enters the binding site it unlocks the protein by breaking this bond and forcing LUSH into a different conformation. Under the hypothesis that only this conformation can interact with the receptor, he prepared a mutant of the protein replacing the acidic aspartic acid in position 118 with the small neutral alanine. In other words, he removed the lock and found that the mutated protein spontaneously adopted a conformation similar to that observed in the presence of the pheromone.
As predicted, this LUSH mutant was able to elicit strong electrophysiological response from the pheromone-sensitive neurons in the total absence of pheromone!
Is this the final proof that the pheromone does not interact directly with the olfactory receptor, but only through its OBP? The evidence is certainly very solid and convincing, but the consequences are disastrous.
What is then the meaning of all those experiments where ORs were expressed in herologous systems, therefore in the absence of OBPs, and stimulated with odours and pheromones? Next time we model the interaction of ORs with their potential ligands, should ve use odorants or OBPs as ligands?
Novel and original as might seem this system, it is far from new in chemoreception. It strongly reminds us of bacterial chemotaxis, where soluble binding proteins (by the way called receptors, soluble receptors) recognise and make complexes with sugars and amino acids, to eventually interact, as complexes, with membrane-bound proteins. This was in fact the first model proposed for the action of vertebrates' OBPs soon after their discovery, but did not receive much credit and was completely forgotten after olfactory receptors were identified and assumed to be the only proteins interacting with odours.
At least in insects it is now clear that olfaction cannot function without OBPs.

Ion channels as receptors

Wicher, Schafer, Bauernfeind, Stensmyr, Heller, Heinemann, Hansson
Nature, 452, 1007-1012 (2008)

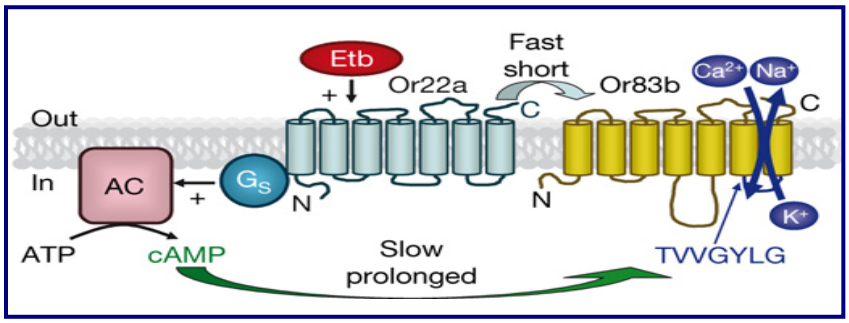
Sato, Pellegrino, Nakagawa, Nakagawa, Vosshall, Touhara
Nature, 452, 1002-1006 (2008)

Insect olfaction still holds unexpected features and continues to surprise with original mechanisms. Not only OBPs seem to act differently from vertebrates, receptors also seem to be different from those of vertebrates and function with an unpredicted novel mechanism.

The current view has been – until now – that olfaction follows common mechanisms and utilizes similar tools all through the animal kingdom. Olfactory receptors (ORs) are well conserved from worms to humans, suggesting that similar proteins should also mediate insect olfaction. However, many attempts to discover ORs in insects based on predicted similarities with those of vertebrates failed and insects OR were finally uncovered only using a bioinformatic search through the genome of *Drosophila*. But differences in the sequences of OR, as well as of OBPs, still leaves the possibility that similar mechanisms could be utililised by all animal species. After all, even in bacteria chemoreception is mediated by soluble binding proteins, present in the periplasmic space, and receptors spanning the inner bacterial membrane. Why should insects be different from vertebrates? In vision, the same system is conserved from unicellular organisms to mammals and rhodopsin, thanks to its highly successful structure, has been kept across evolution as the sensor for light. Why should olfaction be different? After all, all organisms sense the same chemicals, although their variety is enormously large. But it is not the the stimuli that have selected different sensing systems. There are several curious cases of pheromones (the same or very similar) acting on insects and mammals. To cite only the best known examples, the elephant pheromone dodecenyl acetate is also a pheromone component of several moths; dihydro-exo-brevicomin, one of the mouse pheromones, is only a double bond far from the bark beetle pheromone, and nepetalactone, the aphid sex pheromones, show powerful attraction for cats.

Still, insects have evolved different systems for analysing the environment. Odorant-binding proteins (OBPs), according to the most recent pieces of evidence, seem to be the biomolecules interacting with the receptors in insects, rather than odorants and pheromones. But now the receptors themeselves reveal a nature and a mode of action completely different from olfactory receptors in vertebrates.

Two independent papers, recently published in the same issue of Nature, shed new light on their strange behaviour. First, it has been established that they are heterodimers. One member of the receptor family, highly conserved across species (unlike all the other receptors that are stronly divergent) and called 83b in *Drosophila*, is always coupled to one of the specific receptors to form cation channels activated by cyclic nucleotides as well as by odorants (or rather by odorant-OBP complexes?). Moreover, insect olfactory receptors have an unconventional inverted position in the membrane, with their N-terminus inside and C-terminus outside the cell. The next step is to understand how they interact with OBPs (or with odorants?).



Students' reports

Irene Ibba,
Cagliari University, Italy

on the

10th European Symposium on Insect Taste and Olfaction

I would like to thank ECRO board which granted me a fellowship to let me have the opportunity to attend the X^th^ E.S.I.T.O.(European symposium for insect taste and olfaction) congress held in Roscoff in France last September.

Attending the 10^th^ ESITO meeting offered me an excellent chance to learn about all new and very important information in various fields of insect taste and olfaction. Moreover, ESITO meeting gave me a unique opportunity to meet current collaboration partners and get in contact with leader Professors in the field of insect taste and olfaction.

The scientific program of high quality allowed me to get a good opportunity to get acquainted with recent progress and a range of techniques used in this field.

There are many interesting topics which covered the molecular mechanisms, peripheral olfactory coding, central coding, etc. For example Richard Newcomb from Auckland, New Zealand used a calcium imaging system to characterize odorant receptors in different *Drosophila* sibling species. Giovanni Galizia from Konstanz, Germany and Silke Sachse from Jena, Germany both showed recent progress concerning how the olfactory information is coded and processed in the *Drosophila* antennal lobe. Emanuelle Jacquin- Joly, INRA presented how they identify the clock genes in the antennae of *Spodoptera Littoralis.*

I was also given the opportunity to present part of my Ph. D. work during the talk session.

I'm studying the olfactory system of a *Drosophila melanogaster* sibling species: *Drosophila sechellia.* Particularly I'd like to better understand how the olfactory system can mediate fruit flies unique preference for its solely host, *morinda citrifolia* fruit, which is toxic to its sibling species. I was very happy to notice that there was interest in it and with the following discussion some researchers gave me some new ideas about my work.

Moreover, I enjoyed not only the scientific experience, but also the nice social program, and I'm very grateful I had the opportunity to visit for the first time in my life such a beautiful place in France.

Finally, I sincerely thank ECRO board again for helping me and other young scientists to attend this meeting.

Forthcoming Meetings

ECRO XVIII

Portoroz, 2-6 September 2008

XIX ECRO Congress

Villasimius (Cagliari), Sardinia, Italy
September, 24-27, 2009

Next year the ECRO Congress will be held in Sardinia at the beautiful seaside place of Villasimius, well known to those who attended ESITO Meetings.

For information contact Anna Maria Angioy at the University of Cagliari (e.mail: amheart@unica.it) or visit the ECRO web-site.

8th Pangborn Symposium 2009

Firenze, Italy

July 26-30

www.pangborn2009.com

Abstract submission deadline:

31 January 2009

Join the conference email list to receive deadline reminders…

On the behalf of the Italian Society of Sensory Science and all members of the Organising Committee, it is our pleasure to welcome scientists from all over the world to the 8th Pangborn Sensory Science Symposium. This meeting, to honour the work and contribution of Rose Marie Pangborn to the field of sensory science, continues the tradition based on the previous seven symposia and encourages young sensory scientists to present their research on a global platform.

The Florence symposium will be an opportunity for:

- **The presentation of new knowledge regarding fundamentals of sensory perception**
- **The integration of different scientific backgrounds, knowledge and experiences in consumer research**
- **The presentation of new challenges in the effective use of sensory evaluation**
- **The presentation of possible future trends in sensory and consumer science**
- **Networking among all attendees aimed at stimulating new contacts**
- **Exploring Florence and Tuscany**

The Pangborn meeting has continued to grow and is recognized as the most important scientific symposium for the disciplines of sensory and consumer science. The main task of the organising team is to ensure for delegates a high quality scientific programme. The opening reception, plenary and concurrent sessions as well as poster presentations will be planned to deliver an exciting scientific programme representing the best of sensory research today. The symposium will also be an occasion to visit with old friends and meet new colleagues in an almost unique framework.

Florence, in fact, is one of the most beautiful cities in the world, famous for its Renaissance masterpieces. A remarkably well-preserved small city, all its great monuments and most famous museums are concentrated in a small area, within easy walking distance of one other. The 8th Pangborn Sensory Science Symposium will be held at Stazione Leopolda, a huge and impressive structure, and the only one of its kind in Italy that hosts events related to contemporary culture and creativity. Built in 1848 it is a piece of industrial architecture recently opened to the public.

We are confident that Florence will provide a unique experience for this scientific community

Mario Bertuccioli and **Erminio Monteleone**
Chairs of the Organising Committee