International Society for Neuroethology

Newsletter
July 2006

International Society for Neuroethology
P.O. Box 1897
Lawrence, KS 66044, USA
Website: http://neuroethology.org/

Voice: 1-785-843-1235
(or 1-800-627-0629 Ext. 233)
Fax: 1-785-843-1274
E-mail: isn@allenpress.com

ISN Officers

President: Edward A. Kravitz, Dept. Neurobiology, Harvard Medical School, 220 Longwood Ave, Boston MA 02115 USA. Phone: +1-617-432-1753; Fax: +1-617-734-7557; edward_kravitz@hms.harvard.edu

Treasurer: Peter M. Narins, Department of Physiological Science, University of California at Los Angeles, 621 Charles E. Young Drive S., Room LSB 4835, Los Angeles CA 90095 USA. Phone: +1-310-825-0265; Fax: +1-310-206-3987; pnarins@ucla.edu

Secretary: Ian A. Meinertzhagen, Life Sciences Centre, Dalhousie University, Halifax NS, B3H 4J1, Canada. Phone: +1-902-494-2131; Fax: +1- 902-494-6585; iam@dal.ca

Past-President: Albert S. Feng, Dept. Molecular & Integrative Physiology, Univ. of Illinois, Urbana IL 61801 USA. Phone: +1-217-244-1951; Fax: +1-217-244-5180; afeng1@uiuc.edu

President-Elect: Martin Heisenberg, Theodor Boveri Institut (Biozentrum), Lehrstuhl für Genetik und Neurobiologie, Universität Würzburg, Am Hubland, D-97074 Würzburg, Germany. Phone: +49-931-8884450; Fax: +49-931-8884452; heisenberg@biozentrum.uni-wuerzburg.de

Councilors: Andrew Bass; Horst Bleckmann; Thomas J. Carew; Sheryl Coombs; Allison J. Doupe; Martin Giurfa; Ronald M. Harris-Warrick; Eric I. Knudsen; William B. Kristan; Cynthia F. Moss; George D. Pollak; F. Claire Rind; Mandyam V. Srinivasan; Harold Zakon

Next ISN Congress: Vancouver, Canada, in 2007. Local organizer: Catharine Rankin, Univ. British Columbia, Dept. Psychology, 2136 West Mall, Vancouver BC V6T1Z4, Canada. Phone: +1 604-822-5906; Fax: +1 604-822-6923; crankin@psych.ubc.ca

This Issue Includes

The ISN President's Column

Edward A. Kravitz (edward_kravitz@hms.harvard.edu)
Harvard Medical School, Boston, Massachusetts, USA

Getting involved: One of the greatest challenges facing an organization like the ISN, and accordingly facing your elected Executive Committee and Council, is how to keep members involved and active in the Society in the years between Congresses. We have added bonuses for membership during the intervening years including: (i) receiving our excellent Newsletter which comes out three times a year; the availability of Heiligenberg Travel Awards that support student attendance at meetings; and most recently and soon to be formally initiated, the ability to apply for a Bullock Lectureship Award to sup-

port travel by distinguished neuroethologists to deliver lectures. In addition, we have discussed the formation of Chapters of the ISN, and a committee report on that topic will be available soon on our website. Despite these bonuses, our memberships lists dwindle or are static in the inter-Congress years, and surprisingly, members *do not take advantage* of the added attractions of membership. To illustrate, we have had only one application for a Heiligenberg Travel Award each year after the Congress, and both of these have been from the same laboratory. Perhaps our members have sufficient funds to send students to meetings to present papers, but wouldn't the winning of a Heiligenberg Travel Award look good on a student resume, and isn't that an adequate reason to apply?

I, for one, am greatly concerned about the issue of member involvement in our Society. I suspect that few people would want to be president or any officer of an organization whose sole purpose is to have a Congress every third year (well, maybe if we were running The Olympics, or the World Cup, I would feel differently about that). Accordingly, the issue of member involvement and how to increase our membership base will be on the agenda for the upcoming Executive Committee Meeting in Cambridge MA on August 12, 2006. I would love to have input from any of you who are concerned about this issue. Please send me an email (Edward_kravitz@hms.harvard.edu) with your thoughts on member participation in the operations of the ISN, and in general with any suggestions you have on how to improve our Society. I will distribute these suggestions to the EC for discussion before our meeting in August, and we will follow up this discussion on our web page and/or in the Newsletter. In the following few paragraphs, I'd like to start this discussion. Remember, organizations are much more fun when an air of excitement accompanies its operations, when there are lots of activities to participate in, and when folks look forward to active participation in those activities.

So here goes!

The Newsletter again: Ian Meinerzhagen, our Secretary who assembles the Newsletter, has a struggle over each issue in getting members to write articles. Moreover, he receives relatively little feedback on the Newsletter he works so hard to generate. Therefore, we don't even know whether or how thoroughly members read the Newsletter. The topic of the Newsletter was extensively discussed in the March issue. With the July issue, however, Ian again had to struggle to assemble a sufficient number of articles for publication. If you do regularly read the Newsletter, please let Ian know that you do (I.A.Meinertzhagen@Dal.Ca). Tell him which features you find particularly interesting, and most importantly, suggest articles for future Newsletters and consider writing one yourself, or deputizing a younger colleague or trainee to write instead. That certainly is one easy way to get involved!

More frequent meetings: In considering other options for getting us all more actively involved with the ISN, I'd like to reopen the topic of more frequent meetings than our triennial Congresses. I suspect that most investigators agree that our field is growing and that it is a field that is readily understandable to the public. With a meeting once every three years, I believe we are not doing justice to our membership as we have many potentially exciting speakers who cannot all fit on one program. Moreover, with our rule that individuals may not deliver a plenary or symposium talk at two Congresses in a row, investigators can speak at most once every six years at the Congress. That just is not often enough for a rapidly expanding field. With a meeting only every third year we are not communicating progress in our field effectively either to the scientific community at large, or to the public and the required awareness , and understanding of our science and its contribution to humankind. Even smaller societies than the ISN have annual meetings.

In rejecting the notion of more frequent meetings of the ISN the last time around, members raised two main issues: (i) there already are enough scientific meetings to attend each year without adding another one; and (ii) with a Gordon Conference on neuroethology in intervening years, neuroethology already is adequately covered as a meeting topic. I have some objections to these objections. First off, for many of us the annual meeting we regularly attend now is the US Society for Neuroscience Meeting (or possibly a comparable meeting in Europe or Asia). But neuroethology is poorly represented at the SfN meeting, the meeting is enormous with some 35,000 scientists and others attending, the poster halls are the size of football stadiums with posters displayed for only limited periods of time, symposia and plenary lectures rarely deal with topics of direct relevance to our field and these usually run concurrently and are held in massive lecture theaters that are widely spaced from each other. Compare that with our last Congress in Nyborg, which received universal praise for its content, organization, venue, opportunities for discussion and air of congeniality (I've never heard anyone call an SFN Meeting congenial). As to the Gordon Conferences, excellent as they may be, their character is different: these are highly restrictive, with a limit attendance, are usually held in rather Spartan accommodation, and are on a limited range of topics that cannot reveal the full complexity and beauty of our field. They are not like the ISN Congresses, and never will be. In fact, special-topic meetings like Gordon Conferences easily can be attached to an annual ISN Meeting as a satellite conference, as is routinely done at the SfN Meeting.

So here's my proposal. I'd like to see the ISN run annual meetings beginning in 2008, the year after our next Congress. By involving our management company more actively in the business side of running these meetings, the Local Organizers and the Congress Committee could focus on the Program and the writing of any needed

support grants while the business of selecting meeting sites, negotiating hotel rates, registering members, etc. all could be handled by the management firm. Comments please????

Post script: Finally, do please read the Q and A section called "The future of NSF support for neuroethology: Some Questions and Answers" by Dr. James Collins, the new Assistant Director for the Biological Sciences of the US National Science Foundation (NSF). On behalf of all its members, the ISN participated in this dialogue along with the SfN and the responses appear here and in the SfN Newsletter as well. This is important for US scientists, of course, but we feel it is important that non-US scientists read this as well. Without the financial support of funding agencies like NSF, we cannot continue our important research activities.

Yours sincerely, Ed Kravitz

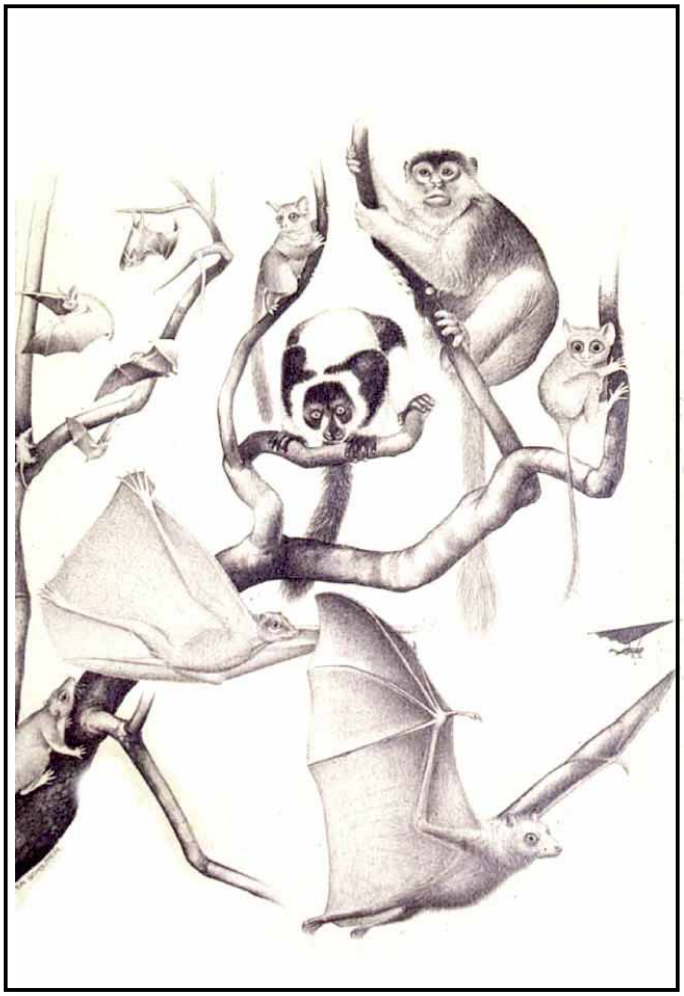
Neuroethology Down-under: The Vision Touch and Hearing Research Centre at the University of Queensland

Jack Pettigrew, (j.pettigrew@uq.edu.au)
Director, VTHRC, School of Biomedical Sciences, University of Queensland, Australia www.uq.edu.au/nuq/jack/jack.html

The Vision Touch and Hearing Research Centre (VTHRC) was established at the University of Queensland in 1988 as one of the Australian Federal Government's Centres of Excellence. The unusual title of the Centre was a result of the intense politicisation of science in Australia and the fact that it was discovered just before submission that the bid would not succeed if "neuro" appeared in the title! Apparently the transgressions by two neuroscientists had come to the attention of the politicians. After the successful opening of the Centre, the horror of some staff at the 'touchie-feelie' connotations of the title soon faded and they began to use the monosyllabic "touch" in favour of the earlier preferred "somatosensory". Although other sensory systems, such as electroreception, were later studied in addition to the major trio of vision, touch and hearing, the title has served its purpose and the Centre has become well-recognised internationally.

Calford and Rama

Early work by Mike Calford and colleagues at VTHRC established some important principles of cortical plasticity using the flying fox, principles that were quickly followed up in humans by V.S. Ramachandran. When Calford *et al*. removed the sensory input from the flying fox thumb, there was no resulting hole in the map of the body surface in somatosensory cortex. Instead, the map had shifted to accommodate the missing inputs. The shift happened quickly, within minutes, implying that pre-existing connections had been unmasked. This result inspired Ramachandran to explore the phantom limbs of human amputees. He discovered that there was a consistent remapping from the hand of the phantom to the lower face. If he stroked the angle of the jaw, the volunteers reported that they could feel a stroke to the thumb of the phantom, for example. This important result, obtained with a cotton wool bud, implied that the hand representation must have been adjacent to the lower face, instead of the forehead as shown in published homunculi. The validity of Ramachandran's observations, compared with the erroneous propagations of the human homunculus in textbooks, was established with brain scanning using the much more expensive technique of magnetoencephalography. It is salutary that the key result did not require the MEG, just the humble flying fox and cotton wool bud.



Flying primates

Intracellular Dye Injection

The late Eberhard Buhl was an early master of the post-mortem intracellular dye injection technique and in 1989 brought it to VTHRC, where workshops were held for

what is now a commonplace widespread technique. One of the surprising results of this technique concerns the organization of cerebral cortex. If one asks the following question of a series of cortical experts (as I did), most of them get it wrong. Will a given cortical neuron class (e.g. layer 3 pyramidal cell) have the same structure whatever the cortical area in which it is located, as predicted from the present leaning toward the "isopotentiality" of different cortical areas? The actual results reveal that dendritic complexity and spine numbers increase dramatically as one proceeds from early to "higher" cortical areas. VTHRC's Guy Elston and colleagues have shown this in a variety of primate species, including humans from whom tissue was provided at operation. The striking increase in complexity, up to three orders of magnitude from primary visual cortex to IT cortex, for example, has important implications for information processing that have yet to be fully understood.

Coupling and Dopamine Un-Coupling

David Vaney discovered that autologous retinal ganglion cells are tracer coupled. At first this finding was rejected because other labs failed to replicate it, but it has now become firmly established as the technical aspects were sorted out. One technical aspect concerns the amount of dopamine remaining in the retinal tissue, as Vaney showed that uncoupling is rapidly induced by the application of dopamine. It seems likely that Vaney's preparation is dopamine depleted, since the retina may be bubbled in the light for many minutes before ganglion cells are dye injected. In contrast, other preparations may be rapidly dissected under IR image intensification and so contain enough dopamine to reduce dye coupling. The implications of the new discovery are many and include the ability of the retina to transform itself from an extensive net (that could pool inputs during dark adaptation) to a collection of more focused paths with fewer lateral interconnections.

Directional Hearing in the Plains Wanderer

If you were to tell a physicist that an antenna 1 cm across could detect the direction of a sound wave whose wavelength was 300 times greater, you would be greeted with scepticism. But this actually happens in a tiny bird that lives on the Australian desert steppe, even though its ancestry indicates that it comes from shorebird stock. The plains wanderer has a mating call like the lowing of a cow, surprisingly deep at 340 Hz (a metric bird with a wavelength of 1 m). It is still a bit of a mystery how such a small bird can generate such low frequencies, but the mystery of how it can localise a sound using a head that is 30 times smaller than the wavelength was solved by VTHRC scientists in collaboration with Danish acoustician, Ole Larsen. The plains wanderer has a large hole through its head, the interaural canal, which results in sound arriving at each eardrum twice, once directly and once from the other side of the head via the canal. The resulting phase cancellation makes the whole system highly directional at certain frequencies. Over that narrow range of frequencies, the plains wanderer can locate its species-specific call much more accurately than a potential predator, despite the

The male plains wanderer has a hole through its head

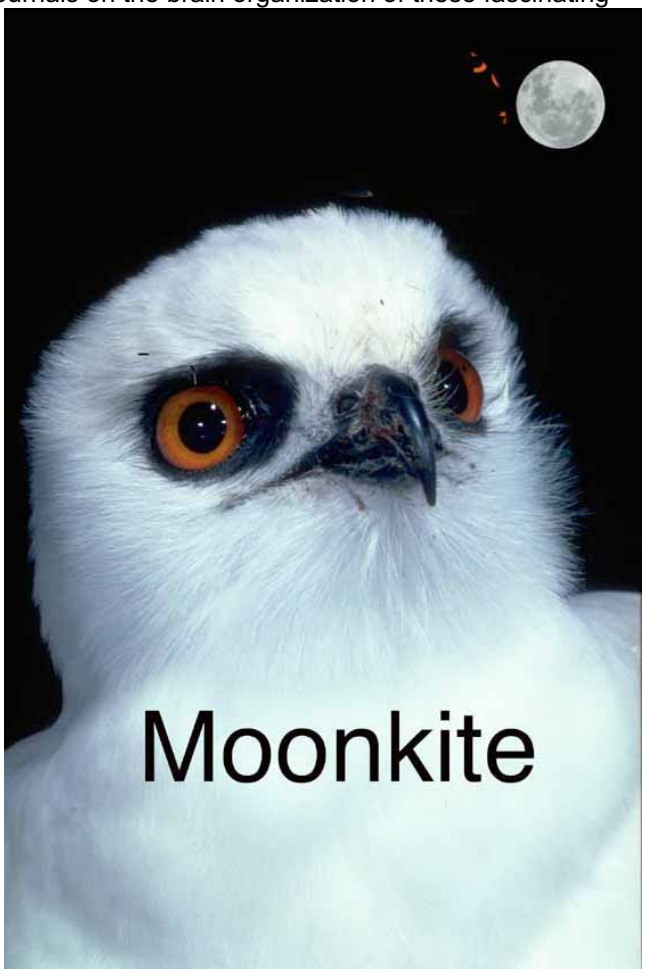
predator's better performance at sound localisation across a wide range of frequencies. Bob Piddington at VTHRC came up with the surprising result that the interaural canal acted to double the effective width of the bird's head. Piddington also invented a new kind of hearing aid based on the plains wanderer that deals with the "cocktail party problem" much more effectively than conventional hearing aids.

Nocturnal Adaptation of the Letterwing

Another mysterious bird of the desert steppe of Western Queensland is the letterwing kite, *Elanus scriptus*, which appears to have recently speciated to take advantage of plagues of the nocturnal long-haired rat, *Rattus villosissimus*. A sister species, the black-shouldered kite, *Elanus axillaris*, provides an unusual diurnal control in the same genus that illuminates the nocturnal adaptation. The letterwing has improved its fitness for the nocturnal niche by enlarging its eye and increasing the brightness of its retinal image with a lower f-ratio. The letterwing also relies heavily on the moon for hunting and synchronisation of its breeding cycle. A book on the letterwing and other unusual species of the Western plains such as plains wanderers, bilbies and min min lights *Moonkite*, is nearing publication.

Flying Primates

Flying foxes are abundant around Brisbane and VTHRC members have published hundreds of pages in the top journals on the brain organization of these fascinating



creatures. Quite a controversy was stirred up by the discovery that flying foxes share many derived brain traits with primates that are not found in microbats. One interpretation of the data, still not convincingly refuted despite the current emphasis on DNA sequence data, is that primates and flying foxes shared a common ancestor that was not shared by microbats or any other mammals, a conjecture that has come to be called the flying primate hypothesis. Despite its explanatory power, the hypothesis copped flak (Austr. for received criticism: Ed) from all sides, including visual scientists guarding their turf, a united community of bat scholars who specifically excluded discussion at their meetings of interpretations that would split the bats, museum staff wedded to the conventional view who would otherwise have to move a lot of specimens around, anthropomorphic primatologists who objected to the inclusion of bats close to humans, molecular phylogeneticists with differing views about the role of convergence of protein and DNA molecules etc. The flying primate hypothesis is supported by protein sequence data (haemoglobin molecules) and also by monoclonal antibodies against serum proteins. In contrast, DNA sequence data splits the bats into three groups (*cf*. the two groups postulated by flying primates). The DNA data hold sway at the moment, with the protein sequence data swept aside, despite other examples in which DNA sequence data have been in error and the protein sequence data more accurate.

Colour Vision: Evolution, Comb Filter

One of the recent areas of concentration at VTHRC concerns colour vision. Many of the results are surprising and counter-intuitive. For example, Justin Marshall has examined the most highly conspicuous fish on the Great Barrier Reef and concluded that their striking colour patterns, like the complementary blue and yellow stripes of the Angel fish, are designed to make them inconspicuous! Marshall's "pointillistic fish" thesis requires an appreciation of the visual acuity of these fish and their potential predators. At a certain distance at which the stripes can no longer be resolved because they lie outside the visual acuity of the fish involved, the complementary colours will "fuse" to give a colour that matches the ambient background light. In this thesis, the design of the complementary stripes is driven by the need for the colours to fuse into a replica of the background. Far from being arbitrary and mysterious, the conspicuous patterns are constrained by the need to fuse to the blue-green spectral properties of the background. Marshall has also attracted international attention to VTHRC for his work on the colour vision of stomatopods, pugnacious crustaceans that can have up to 12 separate photoreceptor colour mechanisms. These colour mechanisms look more like the "comb filters" of auditory systems than they resemble conventional visual systems and the purpose of such a complex colour system is still not clear. Ray Caldwell has shown that an individual stomatopod can recognise, with visual clues alone, a previous combatant that is indistinguishable to human eyes, so perhaps the complex system enables individual recognition of these highly colourful animals. Their environment is also very colourful, so the 12 "cone" mechanism may also be used to orient.

The evolution of colour vision has also provided counter-intuitive results at VTHRC. Shaun Collin has shown that lampreys have at least four different cone mechanisms. Lungfish also have a complex colour system. It seems that vertebrate colour vision is more complex the closer to its origins one looks. VTHRC has not completed its survey of vertebrates using microspectrophotometry to establish the spectral sensitivity of individual cones, but so far it is obvious that older notions of the elasmobranchs may be wrong. Nathan Hart has found that a number of species of ray have colour vision.

Maximov and Maximova in Moscow have proposed that colour vision evolved to solve the problem posed by the strong flicker signal that would drive photoreceptors as a result of light refracted through surface ripples. They proposed that the flicker signal could be annulled if photoreceptors with different spectral sensitivities but the same retinal location subtracted their signals. The new results showing very early and complex colour vision in taxa like lampreys support the Maximov formulation.

A philosophical problem posed by modern colour vision concerns the actual experience of animals that have very different colour vision apparatus compared with our own. Perhaps the most interesting question in this area concerns the tetrachromatic vision of birds and some fish, who have an extra UV cone in addition to the blue, green and red cones that most humans share. Misha Vrobyev is highly skilled at the calculations required to estimate what kind of colour vision another animal experiences, and has also shown that the superiority of avian tetrachromatic vision over our own trichromatic vision actually exists. Uli Siebeck has similar results from damsel fish that have the fourth UV channel.

Heaters in the Marlin Head

The late Volker Henn had a dream that came true at VTHRC. He wanted to test the eye movements of a giant marlin from Australian waters. Marlin have converted a sizeable fraction of each eye muscle to a dark, mitochondria-filled segment that looks like a piece of liver that has been grafted to the lighter muscle. This segment of the eye muscle is a heater that is driven by oculomotor nerve activity. Its enormous size made Volker wonder whether the eye muscles of marlin would be compromised in their function by the non-contractile pieces of 'liver'.

VTHRC already had a good relationship with local marlin fishermen, who had been helped in their debate whether marlin had colour vision. This debate was settled by VTHRC and collaborators using microspectrophotometry (marlin have colour vision). So, Volker soon found himself in a kind of heaven, 6 miles off Queensland's Sunshine Coast with the Glasshouse Mountains, named by Captain Cook, sticking up off the horizon, while he reeled in marlin to the luxury boat. It took three people to manhandle the marlin into the various postures that enabled Volker to test the adequacy of its vestibulo-ocular reflex, but it was soon apparent that marlin have superb oculomotor systems with no sign that their heaters have interfered in any way.

Down-under from up over: VTHRC Group Photo 1999

Subsequently, Kerstin Fritsches from VTHRC, along with colleagues from Lund and Hawaii, have shown that the large photoreceptors of marlin have superb temporal characteristics appropriate for their high-speed chases in dim illumination at depth, but that they are extremely sensitive to temperature changes. This helps to explain the need for heaters to offset the cooling that would otherwise compromise photoreceptor function when marlin dive to the cold depths.

Despite its small size, a pulse-step policy that was actively chosen to avoid willy-nilly expansion after its initial funding, VTHRC continues to make high-quality contributions to the field of sensory neuroscience.

Swedish Eyes: The Story of the Lund Vision Group

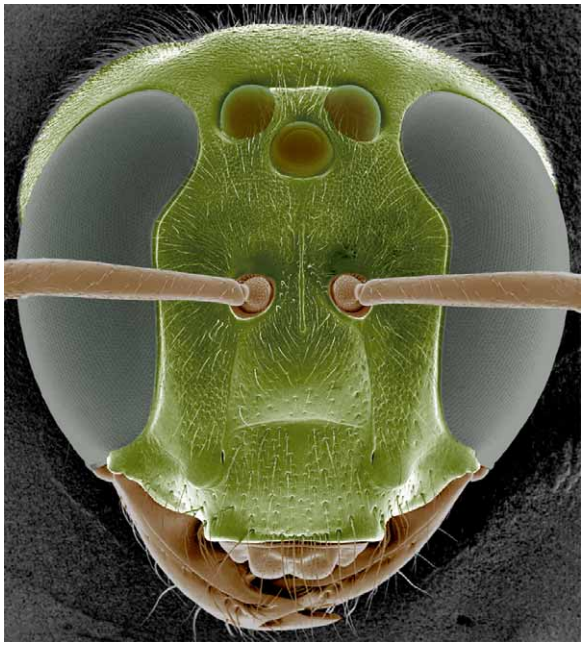
Eric Warrant,
(eric.warrant@cob.lu.se) Vision Group, Department of Cell & Organism Biology, Lund University, Lund, Sweden

I remember my first day in Lund as if it were yesterday. It was a hot August afternoon in 1990, and I was fresh from a PhD in Adrian Horridge's lab in Canberra. As the boat from Copenhagen pulled into Malmö harbour I could see Dan-Eric Nilsson – my new boss – standing on the quay in the heat. I was going to work at the Department of Zoology in the quaint mediaeval university town of Lund, a department steeped in history, and housing one of the oldest zoological collections in the world. Founded by Killian Stobaeus in the early 18th century, the department has had many famous professors, including Retzius, Holmgren and Hanström. Stobaeus also provided lodgings and supervision for the young Carl Linnaeus during his medical studies in Lund.

With little more than a backpack and weary eyes smarting in the sunshine, my embarkation form the ferry marked the start of a two-year postdoc in exotic Sweden. Well so I thought! As I humped my pack across the cobblestones towards Dan's car, I could never have imagined that this moment was in fact the beginning of a (now) very happy 16-year stay in Lund. Nor could I have imagined that it marked the beginning of the Lund Vision Group, which today boasts five senior academics, several postdocs and a small army of PhD students. It has been a remarkable journey from that hot summer afternoon until today, a journey filled with new discoveries, the thrills of exotic field sites and the wonderful camaraderie that has always characterised our vision group from its beginning.

In the early years it was just Dan and I, and a couple of Dan's PhD students – Jan-Olof Seyer, who was unravelling the optics of gastropod eyes, and Alf Inge Ro who was investigating the pupil dynamics of compound eyes. We were all young (actually I was the youngest), and we

all had a lot of fun – I quickly learnt the dangers of the regular Swedish party festivals, such as mid-summer and crayfish season, which invariably ended in a liver-collapsing haze of aquatic oddities and schnapps. My



Megalopta genalis, a nocturnal sweat bee from Panama, which is capable of learning visual landmarks at night. Photo: Rita Wallén

struggling Swedish always seemed to improve at these parties…. In the lab, I set about building a brand-new

Deilephila elphenor, the nocturnal animal known to possess colour vision. Photo: Michael Pfaff

electrophysiology lab, with a new type of ophthalmoscopic stimulus. It was a fabulous time, and research money was easy to come by. I had a ball teaching myself programming, fine mechanics, electronics and optics, and then using it to build nearly everything in my lab. Before it was finished, the Swedish Research Council awarded me a 6-year research fellowship, which was hard to turn down. This allowed me to recruit my first PhD student – Peter Nordström – to work on superposition eye pupil dynamics. Dan in the meantime had recruited two more – Pär Brännström, who worked on weird superposition eyes, and Lotta Järemo-Jonsson who continued with pupil dynamics. By 1995 Dan and I realised that we had a small core group that was growing larger. Together with a bird migration group (led by Thomas Alerstam) and a large insect olfaction group (led by Christer Löfstedt and Bill Hansson), both at the Department of Ecology, we became an integral part of a new "sensory profile" in Lund. Dan and I began to discuss the possibility of organising a new senior-level lab-intensive undergraduate course that drew on the sensory expertise across the university. Now in its tenth year, our "Sensory Biology" course is one of the most successful biology courses in Lund, and has provided a continuous and rich source of PhD students, Masters students and summer students. Three of our recent doctoral graduates – Marie Dacke, Anna Gislén and Anna Balkenius – were recruited from this course, and between them their work resulted in three papers in *Nature* and two in *Current Biology*. At about the same time Bill Hansson and I founded "Sensory Ecology", an international course for PhD students, with lectures given by the world's leading lights in sensory ecology.

The box jellyfish, *Tripedalia cystophora*, with 24 eyes of three different designs: a sophisticated but simple visual system in a primitive animal.

The course runs every second year in Lund in the middle two weeks of October – in fact it runs again this year, and there are still vacancies (www.biol.lu.se/cellorgbiol/sensecol/)!

At about this time, my own research became increasingly focused on trying to understand how nocturnal and deep-sea animals see in very dim light. Dan became interested in the evolution of eyes and soon published what I think is his best paper to date – and certainly his most controversial – on the modest number of generations required for the evolution of an eye. Amazingly our building has so far escaped being fire-bombed in a rage of creationist fury. Dan was appointed Chair of Zoology following the retirement of his predecessor Rolf Elofsson, and his old job – a permanent senior lectureship – went to me. Now we were both permanent, and able to build. I was desperately keen for a postdoc, and so applied for a second lab of electrophysiology equipment and a postdoc to run it. The Swedish Research Council happily forked out for the equipment, but refused the postdoc salary. At about the same time this all happened, I was corresponding with Almut Kelber, a friend from Tübingen who was a Humboldt Fellow at my old lab in Canberra. She was busily using von Frischian behavioural methods to discover that day-active butterflies and moths have colour vision. I had by this stage been working on a beautiful nocturnal hawkmoth – *Deilephila elphenor* – and was keen to find out whether this had colour vision, as Almut had found for its day-active relatives. She, I knew, was the only person in the world who could find out, and after a lot of arguing to and fro with the Research Council, I finally persuaded them to convert the electrophysiology money into a postdoc salary. Reluctantly they agreed, and Almut, Micha and their two children arrived in Lund at the end of 1998. Almut determined that *Deilephila* had colour vision, and it was quite a sensation – the first nocturnal animal known to possess it. What followed was a long stream of Research Council funding, first a research fellowship, and afterwards their most prestigious fellowship of all – Senior Research Council Fellow, which brings with it permanency. I don't think in hindsight that the Research Council regrets exchanging a few amplifiers and manipulators for Almut ….

While all this was happening, Dan somehow managed get himself another permanent position allocated to the group. How he did this still has me bluffed. Ronald Kröger – also from the Tübingen tradition – arrived in 2000 to take up the post, bringing with him an entirely new animal model: vertebrates, and in particular fishes. Ronald had already made a reputation for his work on multifocal lenses in fishes, and their role in correcting chromatic aberration (for which he won the Rank Prize in 2004). This work now continues in Lund. His introduction of vertebrates opened our horizons considerably, so much so, that even I began to work on fishes, truly fascinating creatures with nearly as many adaptations to habitat and lifestyle as are found in arthropods! This, and my interest in dim light vision, opened a wonderful new collaboration with Kerstin Fritches at the University of Queensland. She and I have spent many happy weeks at sea working on the vision of giant tunas and swordfishes, and more lately, deep-sea fishes and cephalopods.

In August 2001 Dan and I – with a massive amount of help from my PhD student Anna Gislén – held the first International Conference on Invertebrate Vision at Bäckaskog Castle outside Lund. It was a fantastic friendly week-long event that gathered the entire field – one big happy family! The book that resulted from the Conference, *Invertebrate Vision* (Cambridge University Press), is due out later in the year. Here Dan (far left), myself I (third from left), and our (then) PhD students (left to right) Marie Dacke, Birgit Greiner, Anna Gislén, Anna Balkenius and Christel Thunell. Without their help, the day-to-day running of the conference would have been in tatters!

With Ronald's arrival we had now grown to four senior academics. About two years ago we were joined by Peter Ekström, an expert on visual pathways in the brain, who was already a tenured member of the department and who moved over to join Dan in his latest quest to unravel the remarkable eyes and nervous system of the jellyfish. Each of the five of us has our own research topic and our own students. But despite this we feel more like a single group, looking out for each other, collaborating, exchanging ideas, helping with the supervision of each other's students and even going on holidays together. It's an amazing atmosphere. One of the things we all share is our love of the animals we study, and the joy we have in seeing them in their natural habitats. We are all big fans of taking sophisticated methods to the field, such as electrophysiology and optics. Dan's group is now working on jellyfishes in Puerto Rico, Hawaii and Australia. Almut and I are working on nocturnal bees in India and Panama, and I am working on dung beetles in South Africa. By observing an animal in its own habitat one obtains an unparalleled appreciation of the types of sensory information that it requires to support its behaviour, and the limitations the animal operates under. This information then helps in the design of better laboratory experiments, and to correctly interpret physiological data. A case in point is one of our favourite experimental animals, the Central American nocturnal sweat bee *Megalopta genalis*. To stand in the profound darkness of a rainforest at night while this little bee is nevertheless flying to and from its nest using re-

membered visual landmarks is a sobering experience indeed.

Now we are a large group of around 30. Three of the five senior academics are non-Swedes, as are many of our postdocs and students. In addition to many Swedes, a steady stream of Austrians, Australians, New Zealanders, Argentineans, Danes, Americans and Germans have all passed through our doors. And most have gone onto excellent jobs. It is hard for Dan and I to look back over all the years – back to that sunny cobble-stoned square in Malmö – and to imagine, back then, that a Lund Vision Group would evolve from our friendship. But it did. And the result has been almost miraculous.

The future of NSF support for neuroethology: Some Questions and Answers

In this article, Dr. James Collins, the new Assistant Director for the Biological Sciences of the US National Science Foundation (NSF), provides his views on the future of support from the NSF for the funding of research in neuroethology, as answers to a series of questions submitted by members of the ISN Executive Committee. The same questions and answers were also submitted to the Society for Neuroscience. Ed.

James Collins, (jcollins@nsf.gov)
NSF Assistant Director for Biological Sciences
National Science Foundation

What is your vision for biological sciences at NSF? What do you expect the BIO Directorate's key research priorities to be in the near future?

Within any scientific discipline, the fastest way to advance understanding is to expand conceptual frameworks. Since biology is perhaps the fastest growing science of the late 20th and early 21st centuries, opportunities for development of new conceptual frameworks are nearly limitless.

The BIO Directorate is the center of biological research funding at NSF with a central focus on research that makes conceptual and theoretical advances, but many parts of the foundation are rapidly integrating the life sciences, including neuroscience. Biological research occurs across NSF directorates and programs: in biophysics, bioengineering, biomathematics, geobiochemistry, computational science applications to biology, and neurobiology in the social and behavioral sciences.

Increasingly, NSF will be seeking to support research that pushes the boundaries of the traditional areas of biology, efforts that will require forming collaborations both within NSF and with other partners. For example, support for neuroscience can be found in each of the NSF Directorates, at NIH, and at other agencies.

NSF is currently working on an updated Strategic Plan for the agency. How does neuroscience fit into the plan?

The next NSF Strategic Plan will guide the foundation through fiscal year 2011 and is still being formulated. The plan will be integrated with the National Science Board report *NSB 2020 Vision for the National Science Foundation* (NSB-05-142).

NSF has a long and continuing commitment to supporting neuroscience as the key to understanding the biological bases of behavior. The agency is in a unique position to facilitate the development of conceptual frameworks in neuroscience, particularly in areas that have been traditional emphases of NSF's biology programs, such as the evolution of the cellular and molecular mechanisms that underlie the evolution of complex behaviors, and for understanding the basis for differences in behavior among individuals and within species.

NSF's commitment to neuroscience takes the form of support for initiatives and programs that span levels of analysis and complexity, and involves collaboration across disciplines including computer and information science, engineering, physics, chemistry, mathematics as well as the social and behavioral science. Indeed, it's the integration of innovative techniques used by multidisciplinary researchers that are at the heart of the most exciting neuroscience research supported by NSF. The advice of scientists in the community will be essential to NSF's current and future success in funding research in these areas.

How can the neuroscience community be helpful with the strategic planning process at NSF?

A public comment period on the new NSF strategic report is planned for this summer. The information on how to make comments will be forwarded to the Society and we welcome inputs from its members. We hope that SfN's members will assist all of us at NSF in developing plans for future neuroscience funding by identifying new and promising areas of research, many of which will be at the boundaries of disciplines.

Approximately how much is NSF spending annually on basic neuroscience research? Now that there are no "neuro" programs in BIO, how do you assess granting activity in the field of neuroscience? Are there plans to increase, decrease, or not change the level of spending in that area?

In fiscal year 2005, NSF spent more than $82 million on basic neuroscience research, distributed across all directorates. BIO's investments were the largest, at just over $33 million, with the SBE directorate's second, at almost $24 million.

There are several review panels for basic neuroscience awards at NSF. For example, panels in BIO that met this spring to consider grant proposals related to neuroscience were in the fields of developmental neuroscience; integrative cellular neuroscience; behavioral neuroscience; neuroendocrinology; animal sensation and movement; animal behavior; and computational neuroscience. BIO's organization into clusters allows for more opportunities for neuroscientists since grant proposals that formerly could only be considered by one area now have a wider range of opportunities for review. Neurscientists are also involved across the Foundation, including in our instrumentation, Centers programs, and international activities. NSF's BIO and SBE Directorates will sponsor a workshop this summer—"Frontiers in Neuroscience: Understanding the Biological Bases of Behavior"--to bring together a group of social, behavioral, and neuroscientists to make recommendations about the best ways for NSF to encourage creative, dynamic and innovative research that leads to an understanding of the biological bases of behavior.

In the past, research funding from the NSF was generally limited to $100,000 per annum. With ~40% of the award going to the institution for indirect costs, the direct cost could cover the stipend for one postdoctoral fellow or one student, leaving little money to do the research. Will future funding be commensurate with research needs so that investigators can focus on the research, rather than scrambling to find extra funds to cover the shortfall in NSF funding?

NSF continually works to find new ways of addressing this issue. The subject is one of general discussion at NSF, as it applies to all fields of science, engineering, and education that NSF funds. There is an inverse relationship between award size and funding rate, given the relatively stable overall agency budget and constant, or increasing, proposal pressure. NSF is working hard as an agency to find new ways of addressing this challenge. The Foundation would welcome ideas from the SfN membership on how best to address this issue.

Are there new or emerging funding opportunities related to neuroscience that might interest the neuroscience research community?

This summer's NSF workshop will, it's hoped, lead to new opportunities in neuroscience funding. In addition, NSF is currently recruiting a number of neuroscience program directors. We hope that SfN members will consider serving the community by becoming rotating program directors at the agency. There is also an NSF working group on neuroscience initiatives, chaired by the BIO and SBE Assistant Directors, whose members would welcome SfN's input to decisions about future funding directions. The working group has members from across NSF's Directorates. Moreover, there are neuroscientists serving on several of our prestigious Advisory Committees, including BIO's, SBE's, and the newly formed Cyberinfrasturture Advisory Committee. This is an excellent avenue for community input into the decision making process.

The field of neuroethology, which emphasizes systems-level neuroscience under dynamic conditions in the context of animal behavior in biologically realistic circumstances, is an important and growing area of investigation. At NIH neuroethological projects often have fallen through the cracks, as they typically do not relate directly to disease. NSF has supported studies in this field in the past. Are there plans to continue or expand support for research in these directions? What about related areas such as comparative and evolutionary neurobiology, neurobiology of invertebrate and non-mammalian vertebrate models, etc.?

NSF has a long history of investing in the field of neuroethology, and plans to continue to invest in this area. We are particularly excited about proposals that cross traditional boundaries. NSF encourages investigators to submit proposals that bring new techniques to bear on existing questions. Neuroethology fits this description well.

A related question is what might be the same or different about the kinds of neuroscience-related grants that are likely to be funded by NSF over the next several years?

One of the greatest conceptual advances in modern biology is based on the finding that dramatic changes in structure and function can result from minor mutations in genes coding for regulatory factors. The structure and function of the nervous system are susceptible to these same considerations. Whereas 30 years ago it was difficult to conceive how structural genes could have evolved to underlie the vast expansion in size and complexity of the brain through vertebrate evolution, it now appears that comparatively small changes in regulatory genes can affect these parameters. Mutations whose outcome confers a selective advantage may persist in the species.

Comparative studies have revealed a remarkable conservation of these regulatory pathways among species, providing new insights into how organisms perceive, learn, remember, express emotions, and behave.

These processes must be studied in simple model organisms—where the neurons are few and pathways limited—as well as in complex organisms, including humans, where both the brain and activities are more highly evolved. Each of these areas is on-target for NSF funding, and each involves biological, behavioral, and social aspects. NSF encourages proposals that will advance our understanding of these processes by advancing conceptual frameworks that apply to their study.

In the past, interdisciplinary research that doesn't fit squarely in one of the programs in BIO has been disadvantaged for funding. Is that problem being remedied, and if so, how?

Consideration of this question was one of the major motivating factors for BIO's reorganization into clusters. By allowing more opportunities for proposals that cross traditional fields, the current organization dissolves many formerly narrower boundaries.

Through the upcoming summer workshop, NSF plans to develop funding mechanisms for studies that creatively integrate genetic, biochemical, developmental, physiological, imaging, and behavioral techniques with mathematical modeling to understand the behavioral repertoire and capabilities of a single organism. Research in this area is at the heart of NSF's plans for neuroscience.

NSF has received strong support from President Bush, especially in his FY 2007 budget. How would the proposed influx of additional funds be channeled to the biological sciences, and neuroscience, in particular?

NSF is very excited by the strong support from the Administration for its FY 2007 budget. It's very early in the budget process to know how Congress will appropriate funds. NSF has welcomed, and will continue to welcome, the input of the community to this process.

How does NSF see its role in the American Competitiveness Initiative (ACI), as outlined by the President in his budget and State of the Union message?

NSF is extremely pleased to be one of three agencies singled out for increased funding to meet ACI research goals. As the report, *American Competitiveness Initiative: Leading the World in Innovation*, states: "Because the sciences—and especially their applications—are interconnected, research in physical science and engineering provides tools and technologies for all other fields."

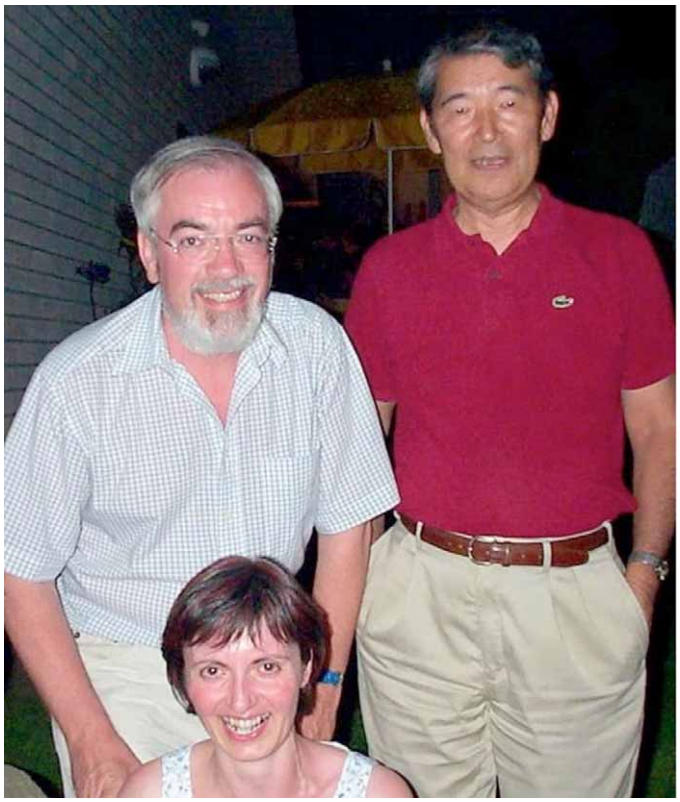
The report continues, "basic techniques for imaging, manipulation and simulation of matter at the atomic scale are of value for applications in every field. To use the information in the human genome, for example, it is necessary to understand the functions of the proteins whose blueprints are encoded in DNA, a feat that is enabled by tools that visualize the immensely complex structure of these building blocks."

Those statements provide jumping off points for the NSF workshop on "Frontiers in Neuroscience." We hope SfN's members will assist us in discovering and defining those frontiers.

End of an Era in Munich

Geoff A. Manley (geoffrey.manley@wzw.tum.de)
Technische Universität München, Garching, Germany

The spring of 2007 will see the winding up of the *Auditory Neuroscience* research group at the Technische Universität in Munich, Germany. Geoff Manley (Mark Konishi's first doctoral student), who after six years in Canada at McGill University in Montreal had moved to the Chair of Zoology in Munich, set up the group in 1983 and has led it since then. In 2007, Geoff will be going into a form of early retirement and most of the last of the other group members will by then have taken up positions at other universities.



Three scientific generations. From top to bottom: Mark Konishi, Geoff Manley, Christine Köppl.

The group has spent the last 23 years researching the hearing of birds and lizards, with special emphasis on the hearing organ itself. Of great help in this was the establishment in 1983 of a Collaborative Research Center in Hearing, initially with groups centered around Eberhard Zwicker, Gerhard Neuweiler and Geoff and expanding to up to 15 research groups that were jointly funded for 15 years. Over the years, there have been about 140 publications from the Manley group that range from detailed questions regarding the function of vertebrate hair cells to questions on neural processing of sound stimuli in the cochlear nuclei of the barn owl. His co-workers in these areas have been Jutta Brix, Franz Peter Fischer, Lothar Gallo, Otto Gleich, Alex Kaiser, Christine Köppl, Horst Oeckinghaus, Geert Runhaar, and Grit Taschenberger. Most recently, the group began a study of the development of the chicken's cochlea with co-workers Ulrike Sienknecht and Michael Henn. In addition, continued productive collaborations were maintained with Geoff's post-doc lab in Western Australia, especially with Brian Johnstone, Don Robertson and the

late Graeme Yates and Des Kirk in Perth; with Jakob Christensen-Dalsgaard in Denmark, Pim van Dijk in the Netherlands and with colleagues in U.S. labs, in particular Peter Narins, Bob Dooling and Catherine Carr (all

A time when the lab was full and Catherine Carr (front, second from right) was visiting (Garching, 1995)

three of whom were winners of Humboldt awards and worked in Munich).

Geoff's main interest has always been centered on questions concerning the structure and function of the inner ear and their relevance for the evolution of the hearing organ in terrestrial vertebrates. Whereas in birds there has never been any question as to the relevance and importance of hearing for communication and prey capture (barn owl), the importance and function of hearing in lizards is not easy to discern and describe.

To approach questions of the evolution of structure and function in birds, the group studied a wide variety of species: starling, zebra finch, canary (including the *Waterslager* mutants), budgerigar, chicken, tufted duck, emu and barn owl. Of course, due to the "unwieldy" and indeed intimidating nature of adult emus, hatchlings were

An Emu chick, University of Western Australia, 1994

used for the physiological studies in Perth, W. Australia!

Anatomically, even the most primitive bird of this group, the emu, showed what can now be regarded as a "typical" avian auditory papilla, although emu sensory hair cells are unusually tall and densely packed.

One of the most dramatic discoveries in the avian hearing organ was Franz Peter Fischer's finding that a substantial number of short hair cells – even in papillae such as those of the Emu - have no afferent connections at all. Otto Gleich's electrophysiological work had shown that no auditory responses could be traced to this cell group. As far as we know, these are the only sensory cells that lack afferent connections to the brain. This unique feature of avian papillae clearly indicates that such short hair cells receiving exclusively efferent innervation have a function that is restricted to the papilla. The short hair cells of birds evolved independently – but in parallel to - the outer hair cells of mammals, whose function is also restricted to the organ of Corti. During the time spanned by these studies, and partly through the research activities of the Manley group, it had also become obvious that hair cells in all vertebrate ears have active processes that enable them to enhance their sensitivity – the so-called cochlear amplifier. Both mammals and birds have evolved a division of labor among their hair cells, the abneural hair cells likely being specialized to enhance the sensitivity of the neural hair cells, which then communicate the result to the brain via their afferent innervation. The discovery of active processes in hair cells led to many studies of otoacoustic emissions, sounds from the ear that result from these processes. These emissions have been especially useful in the non-invasive study of the ears of more than 30 different lizard species.

There still remain some curious features of avian papillae that need explaining, for example the very typical pattern of oblique orientation of the hair-cell stereovillar bundles across the papilla. There are some indications that this may produce range fractionation of the sensitivity of hair cells at different locations, and thus broaden the range of encodable sound intensities, but this needs further confirmation. Despite the large differences in the complexity of communication signals between different bird groups, however, there are no anatomical features of their inner ears that clearly correlate with these differences. The "basic, typical" avian ear is obviously capable of dealing with these signals without obvious specializations.

An exception to this statement is, however, the barn owl. This remarkable bird not only has enlarged and specialized centers in its auditory pathway, but its inner ear is dramatically different to that of other birds – and this not only in its remarkable length. A barn owl colony was established in Munich after Geoff Manley and Christine Köppl were both guests in Mark Konishi's lab in 1988 and carried out a study of the central hearing nucleus VlVp of the barn owl's auditory pathway. At that time, there were few studies of the owl's hearing organ itself

and the Manley group decided to make this a priority. Franz Peter Fischer, Otto Gleich, Christine Köppl and Geoff Manley were later able to show that the barn owl hearing epithelium contains a kind of acoustic fovea such as that known from CF-bat ears. Fully half the length of the cochlear epithelium is devoted to the upper frequency octave of the barn owl's hearing, the range that it depends on for catching its prey. In addition, Christine showed that the auditory nerve of the barn owl is very large and, remarkably, that phase-locking in the owl's auditory nerve is maintained up to a full octave higher in frequency than that of the best mammal, the cat, a feature that is of supreme importance for sound localization. Thus in contrast to the lack of influence of communication signals on bird ear structure, prey-capture signals have led to really pronounced specializations of the hearing organ in at least some owls.

Lizards are a completely different kettle of fish. Evidence that sounds play a role in the neuroethology of lizards only exists for geckos, which are generally noc

The light shining through this leapard gecko's head and seen through both eardrums shows that their middle ears are widely open to the mouth cavity and coupled. Geoff's work wirh Jakob Christensen-Dalsgaard showed that these animals have a very well-developed pressure-gradient receiver system

turnal and overtly vocal. There are even reports of geckos hanging around the holes of stridulating crickets to mop up other crickets attracted to the sounds. For the vast majority of lizards, however, sound plays no role in communication. This is in fact surprising, since data from the Manley group over the last 20 years clearly show that many lizards hear about as well as many birds.

Among terrestrial vertebrates, the lizard ear shows by far the largest variety in its size and structure. From tiny auditory papillae with only 50 hair cells up to those with over 2000, just about every constellation of structural variety imaginable is represented, especially with regard to the tectorial membrane. There are even ears with two sub-papillae, ears with scattered hair cells and ears with highly organized hair-cell groups. The structure is so varied and group-specific that an expert can tell from which family and even subfamily a given ear came from by just looking at its structure. Through a careful comparison of many lizard papillae, it is now possible to see what the most primitive lizard papilla must have looked like and how the evolution of the hearing organ proceeded in the various families. Remarkably, this enormous structural variety is not represented in an equivalent variety of physiologies: Structure has an unexpectedly small influence on what is measurable in the physiology of the auditory nerve. Some generalizations are, however, possible. For example, those species whose ears partially lack a tectorial structure (iguanids, agamids) are less sensitive than others. And the best frequency selectivity is found in those species that have a chain-of-pearls tectorial structure (skinks, geckos and their relatives). Not surprisingly, the hearing of geckos is really good and their frequency selectivity very high indeed. But it isn't that different from skinks, which are not renowned for their auditory communication. Here again, as in birds, there is no clear correlation between hearing-organ development, specialization and acoustic communication.

The owl colony – which has recently made it possible for Christine Köppl to carry out an extensive study of the anatomical and physiological development of their hearing - will be wound up this fall when Christine leaves the group to take up a position in Australia, at Sydney University. After 2007, Geoff will have more time to write up the data masses that are awaiting manuscript status. He will also continue gallivanting around the Australian bush

The western Australian pygopod lizard *Pygopus lepidopus*

looking for pygopod lizards, relatives of geckos about whose hearing we know almost nothing. With the kind of variety provided by lizards, there will always be interesting questions to answer!

References can be pulled from the web at:
http://www.wzw.tu-muenchen.de/zoologie/english/index-e.html (links to Geoff and Christine's groups and publication lists).

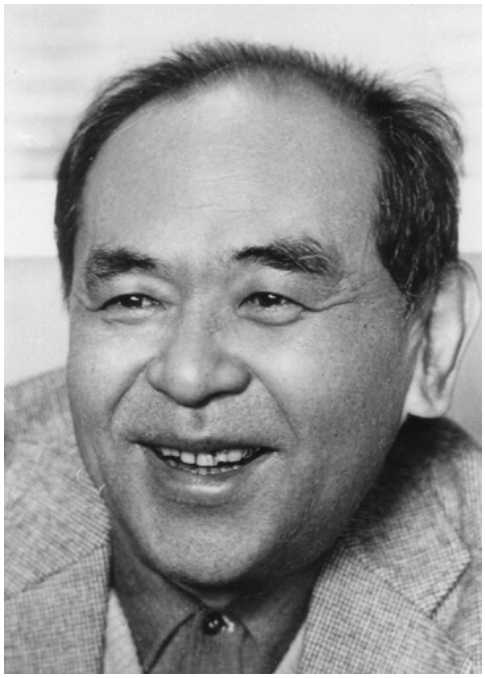
Anyone interested in a copy of Geoff's (now out-of-print) 1990 monograph Peripheral Hearing Bechanisms in Reptiles and Birds. Springer-Verlag. (288 pages) can order one from him by email for the price of the postage and packing and a beer at the next meeting!

Masaki Sakai to receive Yoshida Memorial Prize

Ian Meinertzhagen, Secretary, ISN
(iam@dal.ca) Life Sciences Centre, Dalhousie University, Halifax NS, Canada

Congratulations to past-ISN Council member Masaki Sakai, who is this year's recipient of the "Yoshida Memorial Prize" from the Japanese Society for Comparative Physiology and Biochemistry.

This award was founded in the memory of Dr. Masao Yoshida, who was a fascinating biologist working on in-



Masao Yoshida (1926-1988) with a characteristic cheerful smile

vertebrate vision at the Ushimado Marine Laboratory of Okayama University. Dr. Yoshida spent his early years in the United States and China, four years in New York and six years in Shanghai. He entered the Zoological Institute of the Faculty of Science at the University of Tokyo, and there became a student of the late Professor Kiyoshi Takewaki with whom he pursued studies on the ovulation of the anthomedusa (*Spirocodon saltatrix*) and the maturation of the sea urchin (*Diadema setosum*) at the Misaki Marine Biological Station. Between 1956 and 1960 he was a research associate in the laboratory of Professor Millott at Bedford College of the University of London, where he devoted himself to studies on the extraocular photoreception of sea urchins. In 1972 he won the Zoological Society of Japan Prize for excellence in his studies on the photoreception of lower invertebrates. His later work was devoted mainly to the study of the functional structure necessary for cell photosensitivity and for photoreceptors in various invertebrates (anthomedusan, scyphomeducan, cubomedusan, starfish, cuttlefish, ascidian, arrow-worm, holothurian, amphioxus), especially from an evolutionary aspect. In 1982 Professor Yoshida was elected to a member of the Board of Okayama University and in 1985 he was appointed Dean of the Faculty of Science in the University. The Yoshida Memorial Prize is given annually in his honor.

Masaki Sakai, who will receive this year's Yoshida Prize

This year's recipient, Dr. Sakai, a professor at the Graduate School of Natural Science and Technology, Okayama University, receives this award for his long-standing work on the neural mechanisms of reproductive behavior in crickets. He established that copulation in the cricket is performed by a chain reaction. He found that there are special mechanoreceptors in the male genitalia whose stimulation causes a behavioral switch-over from the sexually active to an inactive state via spermatophore extrusion. He also elucidated functions of the identified genital motoneurons responsible for copulation and spermatophore formation, and demonstrated that the reproductive timer underlying the 1-hour sexual refractory stage is located in the terminal abdominal ganglion. In addition to research work, Dr. Sa-

kai has encouraged many students to work in the fields of behavior and physiology for 25 years, guided some to become excellent young neuroethologists and contributed a lot to the development of the Society. The prize lecture and ceremony are scheduled for the 28th Annual Meeting of the Japanese Society for Comparative Physiology and Biochemistry to be held in Hamamatsu, Japan on Jul. 28, 2006.

Start Planning Your Trip to Vancouver for ISN 2007!

Barbara Beltz
(bbeltz@wellesley.edu) Wellesley College, Wellesley, USA
Catharine Rankin
(crankin@psych.ubc.ca) University of British Columbia, Vancouver, Canada

The 8th International Congress of Neuroethology will be July 22-27 2007, in Vancouver, Canada. One of the world's most spectacular cities, Vancouver offers a remarkable combination of natural beauty and urban sophistication. Outstanding scenery serves as the backdrop to your visit here - no matter the type of activities you enjoy. The meeting will be on the campus of the

UBC's spectacular campus in Vancouver, Canada

University of British Columbia. Only 30 minutes from the heart of downtown Vancouver, the University of British Columbia holds an international reputation for excellence in advanced research and learning.

UBC's Museum of Anthropology

The spectacular UBC campus is a 'must-see' for any visitor to the city, where snow-capped mountains meet ocean, and breathtaking vistas greet you around around every corner. The meeting will begin with an opening reception on Sunday July 22, and will end at noon on Friday July 27th. There will be a wonderful banquet on Thursday July 26 at the Museum of Anthropology on the UBC Campus. Located on the cliffs of Point Grey, the Museum of Anthropology houses one of the world's finest displays of Northwest Coast First Nations art in a spectacular building overlooking the Strait of Georgia and North Shore Mountains. The Museum will be open for touring prior to the banquet! This will truly be an experience you will never forget!

The scientific content of the meeting is shaping up very nicely. We have received a record number of symposium proposals and they promise to make for an interesting and exciting meeting. Stay tuned for the call for abstracts for poster presentations, which will occur early in 2007. .

Meetings and Courses

30th International Ethological Conference

Halifax, Nova Scotia, Canada, August 15-22, 2007
Local organiser: Richard E. Brown (rebrown@dal.ca)
Dalhousie University, Halifax, NS, Canada

The 30th International Ethological Conference will be held on Canada's Atlantic coast, at Dalhousie University in Halifax, Nova Scotia from 15-22 August 2007. Focussing on the importance of Ocean studies and Neuroscience at Halifax, the themes of the meeting will be "Ocean Life Ethology" and "Neuroethology". Invited speakers and symposia on these and other topics will be organized in 2006. Information on the meeting will be available on a website linked to the main website of the International Council of Ethologists (http://www.zoo.ufl.edu/ice/).

Halifax is a popular summer destination offering a range of recreational pursuits. Further information on these may be found on the Destination Halifax website (http://www.destinationhalifax.com/). Rooms have been reserved at both Dalhousie University residences and local hotels. The organizers hope you will plan to attend this meeting

Sensory Ecology: An International Course for Postgraduate Students

Almut Kelber
(almut.kelber@cob.lu.se) Lund University, Sweden

The senses of animals are essential for every aspect of daily life. Whether detecting a mate or a prey, escaping

the attentions of a predator or simply monitoring the surrounding habitat, an animal's senses are critical to its survival. To respond to the opportunities and dangers of the world quickly and effectively, each species must possess a sensory system that is uniquely optimised to its particular ecology. This "sensory ecology" has driven the remarkable range of sensory systems we find in Nature today.

Now in its second decade, the international postgraduate course Sensory Ecology is known throughout the world. The two-week course – which is limited to 30 participants – is organised by the Department of Cell & Organism Biology and the Department of Ecology at the University of Lund, and the Department of Crop Science at the Swedish University of Agricultural Sciences. The course is held every second year in October. The world's leading authorities in sensory ecology are invited to Lund to deliver an outstanding program of lectures covering all animal senses. The next course will take place in Lund from October 9-21, 2006. The deadline for applications is August 1st 2006.

Please see the course web site for application procedures, details of the course contents and other practical information:

www.biol.lu.se/cellorgbiol/sensecol

One can also contact the organisers via the following e-mail address: Sensory.Ecology@cob.lu.se

'Evolution of Vision' Symposium, 29th European Conference of Visual Perception

Yuri Shelepin

(ecvp@yandex.ru) I.P.Pavlov Institute of Physiology, St. Petersburg, Russia

A symposium entitled "Evolution of Vision" will be held as part of the 29th European Conference of Visual Perception (ECVP) in St. Petersburg, Russia, 20-25 August 2006. Papers are invited on topics related to visual perception and physiology in invertebrates and to the evolution of vision. The aim of the whole-day symposium is to offer a discussion forum on comparative aspects of visual perception and physiology and their implications for evolutionary scenarios and trends.

The speaker list includes:

J. Zeil (Australian National University)
L. Fleishman (Union College)
M. Wicklein (University College London)
D. Osorio (University of Sussex)
D. Stavenga (University of Groningen)
M. Kinoshita (Yokohama City University)
J. Marshall (University of Queensland)
J. Niven (University of Cambridge)
A. Kelber (Lund University)
D. Hunt (University College London)
T. Cronin (University of Maryland),
D. Nilsson (Lund University).

The conference is to take place in the most fascinating town of Russia, a show-place of European (scientific) history and culture. Updated information is available on the conference website: http://www.ecvp2006.ru.

For further information please contact: Dr Natalie Hempel de Ibarra (University of Sussex, e-mail: nh45@sussex.ac.uk) or Dr Misha Vorobyev (University of Queensland, e-mail: m.vorobyev@uq.edu.au)

The website of the 29th European Conference on Visual Perception (ECVP2006) is still open. Please go to http://www.ecvp2006.ru to sign up!

The conference will take place August 20-25th, 2006, in St-Petersburg, Russia, on the banks of the river Neva. Registration of attendants will take place in the Main Conference Hall of the Military Medical Academy from 10.00 onwards on Sunday August 20. Later that day, the opening session will be held 3 miles down the river in the Academy of Sciences' historic building, which has stood on the banks of the River Neva since the Eighteenth Century. There the Perception Lecture will be given by Professor J. D. Mollon of Cambridge University. The lecture will be followed by a visit to the Monument and Museum of M. V. Lomonosov (1711-1765), the founder of the trichromatic theory of vision and wave theory. On the same evening, a reception will be held near the palace of the first Russian member of the Royal Society of London and first Governor of St. Petersburg, Duke Aleksander Danilovich Menshikoff (1673-1729), at nearby St-Petersburg University (1725). The scientific meetings, sessions and symposia from August 21 to 25 which cover the full range of visual science and will take place in the Main Conference Hall of the Military Medical Academy. This Hall is only 100 m far from the Hotel St-Petersburg. The final symposium will be devoted to Art and Imagination in Human and Computer Vision. On Wednesday August 23, a Banquet will be organized.

Tourist attractions will include: an excursion to the Hermitage and Russian Museum, the famous Peterhoff fountains and Pavlovsk landscape park, Russian Ballet, Opera and Philharmonic classical music. A boat trip along the famous St-Petersburg rivers and canals will reveal to you the charm of this, the Northern capital of Russia! We hope to see you with us! Please book the hotel as soon as possible. St-Petersburg hotels are filled by tourists in August. The simplest way is to go to http://www.ecvp2006.ru

Yuri Shelepin, MD, PhD, DS, Professor

Executive Chair, European Conference on Visual Perception 2005

I.P.Pavlov Institute of Physiology
Makarova emb.6
199034, St. Petersburg, Russia
Tel: +7 (812) 3284571
Fax: +7 (812) 3280501
Email: ecvp@yandex.ru

Positions Available

Assistant Professor Position in Neuroscience /Psychology Dalhousie University

The Department of Psychology at Dalhousie University invites applications for two tenure-track faculty positions at the Assistant Professor level. We are seeking candidates in one of two areas: neuroscience or clinical psychology, one to be hired for 1 July 2007, and one for 1 July 2008. The successful applicants will have a PhD degree, and will join a department with a strong tradition in neuroscience, cognitive, developmental, and clinical psychology. He/she will have a superior record of published research, with the capacity to develop an independent, funded laboratory, will be expected to participate actively in undergraduate and graduate teaching as well as supervision of undergraduate honours and graduate student research. Further information about the research activities and courses offered in the department can be found on our website psychology.dal.ca. Further information about Dalhousie and the Neuroscience Institute can be found at www.dal.ca and http://neuroscience.dal.ca/
NEUROSCIENCE. Applications are sought from those employing modern neuroscience techniques that integrate behavioural, cellular, and molecular approaches to the analysis of either vertebrate or invertebrate nervous systems. Areas of particular interest include, but are not limited to, neural development, neuropharmacology, neurogenetics, plasticity and/or sensory systems.

To apply for a position in one of these areas, send a letter of intent, a curriculum vitae, copies of at least three publications, a statement of teaching and research interests, and three letters of reference to Dr. Richard E. Brown, Chair, Department of Psychology, Dalhousie University, Halifax, Nova Scotia, Canada B3H 4J1 by 30 October 2006. All qualified candidates are encouraged to apply; however, Canadians and permanent residents will be given priority. Dalhousie University is an Employment Equity/Affirmative Action employer. The University encourages applications from qualified Aboriginal people, persons with a disability, racially visible persons and women.

Postdoctoral position in Computational Neuroscience laboratory. The laboratory of Christiane Linster and Thom Cleland at **Cornell University** in Ithaca, NY is looking to hire a postdoctoral associate for a project on the role of noradrenergic modulation for olfactory processing and memory.

The project involves *in vivo* electrophysiology, computational modeling and behavioral pharmacology studies. We are looking for an accomplished electrophysiologist with interests in computational neuroscience. The postdoctoral associate will be expected to perform *in vivo* electrophysiology in rodents and will have the possibility to be trained and participate in Computational and Behavioral techniques.

Please contact Christiane Linster if you are interested in this position. The position is open to non-US citizens and can start as early as July 1st, 2006.

Christiane Linster
Associate Prof. Neurobiology and Behavior
Cornell University
607-254-4331
CL243@cornell.edu

Research Associate or Junior Research Associate in Auditory Neuroscience, School of Neurology, Neurobiology & Psychiatry, £21,467 - £23,457 per annum

Based in the School of Neurology, Neurobiology & Psychiatry (Auditory Research Group) you will support the MiCRAM project (ESPRC funded), which aims to use new and existing knowledge about the neuronal circuitry in the midbrain to build a biologically realistic computational model that can be implemented in a biomimetic robot. The project is a collaboration between Newcastle University and the University of Sunderland (Dr Harry Erwin and Prof Stefan Wermter).

You will be responsible for the biological elements (acquisition of experimental data and literature analysis) required for developing the midbrain model. You should have at least a 2:1 degree in a neuroscience related subject, and ideally a PhD or equivalent in auditory neuroscience. Experience of neuronal recording *in vivo* and of using MATLAB would be advantageous. Excellent written and verbal communication skills are required to interact closely with the modelling team to exchange information across disciplines.

The research will include single-unit electrophysiological recording *in vivo* with the presentation of sound stimuli, together with literature and bioinformatics based approaches. An appointee without a higher degree will have the opportunity to register to study for a PhD.

Tenable for 36 months.

Informal enquiries can be made to Dr Adrian Rees (adrian.rees@ncl.ac.uk)

Closing date: 12th July 2006. Job Ref: A678R. For further particulars follow the links at: http://www.ncl.ac.uk/vacancies/vacancy.phtml?ref=A678R

To apply, please send a CV, covering letter and completed employment record form to: Dr Adrian Rees, School of Neurology, Neurobiology and Psychiatry, The Medical School, Framlington Place, Newcastle upon Tyne, NE2 4HH, UK.

Tom Smulders, Ph.D., Lecturer, School of Biology and Psychology (Division of Psychology). The Henry Wellcome Building for Neuroecology, University of Newcastle Newcastle upon Tyne, NE1 7RU; Tel: +44-(0)191-222-5790; Fax: +44-(0)191-222-5622

http://www.staff.ncl.ac.uk/tom.smulders

Material for Future ISN Newsletters

The Editor would welcome, indeed wholly depends upon, material for future newsletters to fill the various sections of each issue. Reference to past issues will reveal the scope and style of contributions, the breadth of their variation and the depth of their originality. Material is solicited for meetings, courses, and job opportunities which might include some aspect of neuroethology and therefore be of interest to readers of the Newsletter. Advertisements for positions (faculty or trainees) are limited to 150 words. Announcements of new books (copyright 2005) *written or edited by ISN members* should include the full citation information (including ISBN) *plus* a 40-50 word description of the book. (Note that books containing chapters contributed by an ISN member are not appropriate for inclusion.) We also welcome announcements of courses and future meetings, reports on recent meetings, discussions of research areas or topics of interest to neuroethologists, laboratory profiles, and editorials. Regretfully, we also publish occasional obituaries and memorials.

Material should be submitted no earlier than one month before the next issue (in this case, November, 2005). We also welcome announcements of future meetings, discussion material about research areas or topics of interest to neuroethologists, and similar types of material. Word limits depend on the type of article. Have an idea for an article that you or someone else would write? Contact the Secretary prior to submission to determine the length and suitability of material to be submitted. All material must be submitted electronically, preferably as an attached file to an e-mail prepared in MS Word and sent to Ian Meinertzhagen at iam@dal.ca

Add our Link to Your Website!

Adding a link to ISN (http://neuroethology.org) on your website helps raise our profile in the scientific community.



International Society for Neuroethology
P.O. Box 1897
Lawrence, KS 66044
USA

PRSRT. 1ST CLASS
U.S. POSTAGE
PAID

PRINTED MATTER

TO: