International Society for Neuroethology

Newsletter
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International Society for Neuroethology
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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

Greetings to all!

Although political matters may not be an appropriate item of discussion in the Newsletter of an international scientific society such as ours, some outrageous actions against humankind go beyond politics. Accordingly, I want to add my voice and hopefully, with your approval, the voice of the ISN, in: (i) condemning such senseless acts of violence; and (ii) sending a strong message of support to our colleagues in London and other cities of the world where terrorists have struck. Such attacks on

innocent people represent the worst in human behavior, yet they continue daily in too many countries around the world. There is no excuse for such actions. They cannot be tolerated or supported and we, as men and women of science, particularly behavioral science, must speak out against them.

Now to other concerns of our Society.

Executive Committee Meeting: The first meeting of the New Executive Committee (EC) of the ISN (myself, Martin Heisenberg – *President elect*; Al Feng – *Past president*; Ian Meinertzhagen – *Secretary*; Peter Narins – *Treasurer*) will be held on Saturday August 27 in Boston. An important part of our agenda will be to think about how to make our Society a year round organization rather than a triennial organization. I've asked the Council for input on this issue and also on how to improve our Society and I welcome comments by the membership on these matters as well. Please just email me at <edward_kravitz@hms.harvard.edu > with any thoughts you have and I will distribute them to members of the EC for discussion. We will also have a report at the EC meeting on the next ISN Congress (July 23-27, 2007 in Vancouver, BC – hosted by Cathy Rankin – mark it on your calendars now). If any of you would like to host the Congress following the next one (scheduled for 2010 right now, but I will be exploring the notion of more frequent Congresses with the EC too), please get in touch with me or with Martin Heisenberg about your interest in the possibility. Congresses like ours must be arranged far in advance of their scheduled dates.

Heiligenberg Student Travel Awards and Bullock Lecturers: For the current fiscal year, funds and a committee are in place that will allow the ISN to make 6-8 Heiligenberg student travel awards. These are for student travel to meetings to present neuroethology-related posters or talks. Machinery will soon be in place for Bullock lecturer awards as well. Applications for both programs are made through the Society Office, which distributes the applications to existing ISN committees who make the final funding decisions. Information about how to apply for these awards is available on the ISN web site. Unfortunately the information remains somewhat buried at that site (basically the awards are announced under *membership* and then *member benefits*). We will be discussing ways to list such awards more prominently on the main page of our web site at the EC Meeting. To be eligible for a Heiligenberg award, students and their mentors must be members of the ISN. Remember, student membership is free, but mentors must be dues-paying members of the Society. It is important to acknowledge ISN support on any presentations (talks, posters, seminars) financially supported by the Society.

Payment of dues and maintaining your membership in the ISN: Societies like ours require membership dues to keep operating. Our dues are relatively low compared with many other professional societies, and as mentioned above, student membership is free. Yet, we still see a fall-off in membership in non-Congress years. By increasing the benefits available to members in non-congress years we hope to reverse this trend. That can only happen, however, if when notified, you promptly pay your annual dues. Our Society also accepts voluntary contributions at any time to support ongoing activities. Such funds are used for special items like the Bullock and Heiligenberg awards, although in the future they might be used to offset costs associated with the activities of chapters (when they are formed) or the organization of neuroethology-related symposia at meetings.

A report on the deliberations of the Executive Committee at the August meeting will appear in the next issue of the Newsletter. Until then, I wish all of you a wonderful rest of the summer.

Festschrift for Friedrich-Wilhelm Schürmann

Ian A. Meinertzhagen, (iam@dal.ca)
Dalhousie University, Halifax, Nova Scotia, Canada

Retirement is still mandatory for many of our members. Long-awaited by many, feared by some, it offers a great uncertainty to all. To mark the occasion of the retirement of Friedrich-Wilhelm Schürmann, and his many contributions to insect neurethology, a Festschrift was held earlier this year, at the Institut für Zoologie, Anthropologie und Entwicklungsbiologie of the Georg-August-

Friedrich-Wilhelm Schürmann, at the podium

Universität Göttingen. Thus, on March 11 a Symposion entitled 'Insect Model Animals in Neurobiology: Nerve Cells, Nerve Nets and Behaviour' was organised, with diverse program of talks delivered by visiting friends and colleagues from Germany and overseas. Gerhard Braus; Dean of the Biological Faculty of the University, introduced the event, with the first three presentations, delivered in English, by Dick Nässel (Stockholm University, Sweden) on *G-protein-coupled receptors in Drosophila*; by Michael Bate (University of Cambridge, England) on the *Genetic specification of larval movement in Drosophila*; and by Ian Meinertzhagen (Dalhousie University, Halifax, Canada), on *The synaptic terminal of the fly's photoreceptor: Some lessons from an identified synapse*. The second session was led off by Gerhard Wegener (Universität Mainz) on *flight: neuronal control*

Two neuroethologists discuss the events of the evening
Franz Huber (left) and Jochen Erber (right).

of muscle Locust metabolism- a new paradigm?; and followed by a talk by by Joachim Erber (Techische Universität Berlin) on *From bee behaviour to genes*; and brought to a close in a final talk given by Klaus Schildberger (Universität Leipzig) on the *Neural basis of communication and aggression in crickets*. The lively Symposium was concluded in jovial fashion by closing remarks and a presentation to Friedrich-Wilhelm made by Norbert Elsner, Director of the Institute, and was followed by a wonderful evening reception attended by many neuroethologist and other colleagues and their partners. It would be hard to imagine any more fitting or civilised way to celebrate Friedrich-Wilhelm's contributions to science, particularly his distinguished contributions to insect neuroanatomy. Yet such tribute will surely be premature, as Friedrich-Wilhelm enters the next stage of his career, as a scientist in retirement. We look

One of many presentations. Smiling participants, from left to right: 1. Heribert Gras; 2. Dagmar Schürmann; 3.; Friedrich-Wilhelm Schürmann; 4. Michael Hörner.

forward to seeing many more publications from you yet, Friedrich!

Heiligenberg Student (Travel) Award recipients

Last year the Society made the first of its Heiligenberg Student (Travel) awards (HAS) to six students, all of them to attend the ISN Congress in Nyborg, Denmark; their reports from this meeting appear below.

Noopur Amin (noopur@berkeley.edu)
University of California, Berkeley, CA, USA

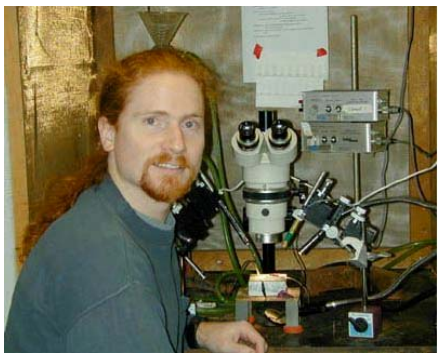
It was an honor to be awarded a Heiligenberg Student Travel Award to attend my first neuroethology meeting, the 2004 ISN Congress in picturesque Nyborg, Denmark. Thanks to this travel grant, I was able to present my poster "Selectivity for natural sounds in the auditory system of songbirds develops during vocal learning" at the conference. This work was carried out in Frederic Theunissen's songbird laboratory at U.C. Berkeley. One of the major goals of the lab is to understand how natural or behaviorally-relevant sounds (i.e. conspecific songs) are processed in the auditory forebrain of these little creatures. I am particularly interested in understanding how selective neural responses to natural sounds arise in higher areas of the auditory system. To address this issue, I recorded from

the auditory forebrain of juvenile songbirds and compared their selectivity for natural sounds to the robust selectivity found in adults. The results I presented at the meeting showed that, when compared with the adult auditory forebrain neurons, juvenile auditory neurons are less selective for natural sounds over synthetic sounds than are adult neurons. This suggests that the robust selectivity found in adults develops ontogenetically. My current studies are aimed at elucidating the role of plasticity in shaping the selectivity for behaviorally-relevant sounds that is characteristic of adult auditory forebrain neurons.

It was a stimulating experience to present my research to other graduate students and interested faculty and postdocs and, in return, receive their invaluable feedback. I was highly impressed by the quality and depth of the posters. The talks also illustrated impressive neural studies of unique and diverse behaviors, from foraging bees to echolocating bats, from "singing" crickets to color discriminating butterflies, all of which left me in awe of our natural surroundings. Before I attended the conference, I was unaware of the diversity and complexity of these various animal models, and have since developed a greater appreciation for the inherent beauty in all living things, big and small. Indeed, for me, the 2004 ISN Conference has become a benchmark for all future conferences – rigorous and interesting science combined with a friendly and relaxing atmosphere, leading to a refreshing and thought-provoking exchange of ideas. In fact, I am looking forward immensely to the next Neuroethology Congress in 2007 in Vancouver!

James Newcomb (biojnn@langate.gsu.edu)
Georgia State University, Atlanta, GA, USA

I am honored to have been offered a Heiligenberg Student Travel Award to attend the International Society for Neuroethology (ISN) meeting in Nyborg, Denmark last year. I am a Ph.D. candidate in the lab of Dr. Paul Katz at Georgia State University in Atlanta, USA. We are undertaking research on the evolution of nervous systems by comparing electrophysiological properties (recorded as in the accompanying illustration) in homologous neurons in nudibranch molluscs that exhibit different modes of locomotion. (Yes, slugs do move!) My poster presented our recent findings that specific homologous neurons in species with divergent modes of locomotion retain some basal properties and functions, despite the addition of new functions in some of the species. Our work demonstrates how neural circuits evolved from pre-existing networks. Our poster was fortunate enough to win one of the "Best Poster" awards at the meeting. Participating in the ISN conference was an invaluable experience. This was my first time attending this meeting (and going to Denmark!) and I was able to make contacts with a number of researchers whom I had not previously met, including at least one potential future collaborator. I was also able to witness some of the other stunning neuroethological research currently going on in labs around the world. Overall, this was an extremely invigorating and enriching experience and I would like to thank the ISN for awarding me this opportunity.



Lior Rosenberg (liorro@bgumail.bgu.ac.il)
Ben Gurion University, Beer Sheva, Israel

I am currently in the last year of my PhD studies in Frederic Libersat's laboratory in the Ben Gurion University, Bee Sheva, Israel. My Ph.D. title is "Molecular and cellular effects of wasp venom neurotoxins on prey CNS and behavior".

I am studying the effect of venom injection of the solitary wasp *Ampulex compressa* (illustrated), which instead of paralyzing, modifies the behavior of its prey. The injection of wasp venom induces a transient paralysis, then grooming behavior followed by long-term lethargy. I am focusing my research on deciphering the neuronal modifications the venom induces in the CNS of its prey, to bring about the long-term lethargy. To investigate the venom's effect on specific neuronal circuits that control the expression of specific behaviors, I am using a combination of biochemical, pharmacological and electrophysiological techniques.

Wasp stinging the cockroach into its CNS

In the project I presented at the ISN conference, I showed that the activity of octopaminergic neurons in the thorax of stung cockroaches is altered. These neurons secrete octopamine, which has an overall arousal effect in the cockroach's nervous system and muscles. I am currently writing this data for publication.

The ISN 2004 Seventh International Congress in Nyborg, Denmark was an intriguing experience. I have learned both from the lectures and from having the opportunity to consult with scientists in the field of neuroethology, and in return received feedback on my own work. If I had one disappointment it was that the conference was over so soon.

Nadja Spitzer (bionns@langate.gsu.edu)
Georgia State University, Atlanta, GA, USA

I am Ph.D. student with Donald H. Edwards and Deborah J. Baro in the Department of Biology at Georgia State University in Atlanta, USA, and a scholar in the Center for Behavioral Neuroscience and the Brains and Behaviors Program. My dissertation research centers on cloning and characterization of crustacean serotonin receptors. Crustacean systems offer relatively simple circuits with identified neurons in which basic mechanisms of neural function can be elucidated. The biogenic amine serotonin can have different modulatory effects in crustacean circuits, depending on factors such as the social status of the animal (the lateral giant escape response in crayfish) or the species (identified cells of the stomatogastric nervous system). I am generating pharmacological profiles for two serotonin receptors from the crayfish and spiny lobster in order to begin to investigate the mechanisms underlying differential cellular responses to serotonin in the lateral giant escape circuit and the stomatogastric nervous system. In the summer of 2004 I received a Heiligenberg travel award to attend the Seventh International Congress in Nyborg, Denmark. I presented a poster with detailed immunocytochemical mapping of the crustacean 5-$HT_{1\alpha}$ receptor throughout the crayfish nervous system and quantitative RT-PCR analysis of expression levels of this receptor in dominant and subordinate animals. Attending this conference was an excellent experience, allowing me to present my work to the neuroethology community and to interact closely with leading researchers in a constructive and informal setting. In particular, I found the Young Investigator Lectures very inspiring and motivating. This conference was relatively small and allowed me the chance to interact with investigators working on diverse and fascinating model systems. Thank you for your support in allowing me to attend this excellent meeting.

M. Jade Zee (mcz8@cornell.edu)
Section of Neurobiology & Behavior, Cornell University, Ithaca, NY, USA

I am very grateful for receiving the HSA travel award. At the ISN meeting, I presented some data from my dissertation work from the lab of Dr. Janis Weeks, which dealt with species-specific differences in the neuromuscular system of Lepidoptera. My poster was met with great enthusiasm and I received a lot of constructive feedback, of a sort that I otherwise might not have received at a more general meeting, such as the Society for Neuroscience. It also impressed upon me the international nature of scientific research these days - data that I had collected in Japan and analyzed in the USA, was now being presented at a meeting in Denmark. Shortly after ISN, I joined the lab of Dr. Andrew Bass in the Section of Neurobiology and Behavior at Cornell University, as a postdoc, and am further developing my skills and interest in steroid-mediated effects on behavior, now in a vertebrate model (teleost fishes). The opportunity to attend the ISN meeting at the transition point between graduate school and postdoctoral studies was especially helpful since it allowed me to meet other scientists and start immersing in my new research field of vocal communication.

Two HSA recipients, Jade Zee and Shiva Sinha enjoying the hospitality of Denmark

"Better a bottle in front o' me than a frontal lobotomy"

(anon: Ed)

Shiva R. Sinha (srsinha@indiana.edu)
Biocomplexity Group, Dept of Physics, Indiana University, Bloomington, IN, USA

First and foremost I am honored to have received an HSTA, not only because it is an award named in honor of one of Neuroethology's greatest scientists but also for the wonderful opportunities it afforded me in attending the Congress. The meeting in Nyborg, Denmark, was idyllic in locale and in intellectual discourse. I would like to thank our Danish colleagues for a meeting that was splendidly organized and that allowed for a great wealth of information exchange and discussion.

My graduate work was conducted at the University of Maryland, College Park, USA, in the lab of Cynthia Moss. Within this institution of eminent neuroethologists, I became interested in the lofty question of how neuronal circuits changed their mode of operation in relation to behavior and behavioral context. To that end my dissertation research was focused on making neural recordings from neurons in the superior colliculus of tethered, unrestrained and freely echolocating bats. I devised neural and behavioral recording techniques to record from SC neurons while bats actively tracked a

swinging target (the behavioral paradigm I co-developed with Dr. Marc Holderied). Micro-stimulation of the SC in echolocating bat species interestingly elicits sonar vocalizations. However, no actual recordings had previously been made while bats freely engaged in echolocation behavior. The results of these experiments demonstrated pre-motor sonar vocal activity in the SC, and identified changes in the temporal characteristics of discharge in relation to sonar duration. These experiments not only provide a comparative approach to understanding SC functionality in goal-oriented behaviors, that for example complement studies of eye movements and planning in monkeys, but they also open the window to questions of internal valuation and adaptive behavioral choice during uncertainty (i.e. to neuroeconomics).

Since March, after completing my dissertation, I have been a post-doctoral fellow in the Biocomplexity group at Indiana University. My research here is with Robert de Ruyter van Steveninck, and is still motivated by my interest in the coordination of behavior and neuronal operation. It involves estimating the statistics of the visual scene encountered by blowflies. This is accomplished using a "fly camera" we are developing for field recordings. Once we have a statistical understanding of the fly's visual input, subsequent neurophysiological experiments will aim to explore the impact of changing and deviant statistics on neuronal response properties.

Named in honour of Walter Heiligenberg, a reminder that these awards are made upon application to the ISN. A student applicant must be a member of the Society (student membership is free), with a supervisor who is also a member. Heiligenberg Student (Travel) Awards (HSA) are for travel or other expenses associated with attending neuroethology-related meetings to present a platform talk or a poster. Each award is for up to $600 and the ISN anticipates being able to make 8-10 such awards each year. A committee chaired by Mark Konishi will review applications up to three times a year. The committee encourages qualifying student members to apply for these awards, and the supervisors of such students to bring these awards to their students' attention. Further information is available on the ISN website.

Peregrinations of a Neuro-anatomo-ethologist

Nicholas Strausfeld,

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The editor has asked me to write something about my professional development, along the lines of "how a neuroanatomist became a neuroethologist." The truth is I never underwent such a metamorphosis, which is not surprising considering the pedigrees of my tutors at University College, London, where I received my undergraduate and graduate education. My Ph.D. advisor was David Blest, a wonderfully gifted ethologist who had done his postgraduate work in Tinbergen's laboratory at Oxford. When I started my graduate work, David, already internationally recognized for his work on animal ritualization, was pioneering recordings from moth visual systems. David was a most unusual tutor who introduced me to a great deal more than just neurobiology; particularly an appreciation of modern literature and film. He also did his best to asphyxiate himself, me, and the rest of the Zoology Department with the most horrible effluvia given off by cooking serial sections in pyridine or one of its derivatives. The resultant silver stains were so spectacular that they made our nausea worthwhile. Just down the corridor from where I worked was Brian Boycott, who had spent years observing the behavior of cephalopods and who was then embarking on neuroanatomical studies that would revolutionize our knowledge about the organization of the primate and human retinas. These gifted and unusual people had been two of my undergraduate teachers and it was because of them that I chose graduate studies in neurobiology thinking that animal behavior and electrophysiology would be my game. Instead, I became a neuroanatomist, more by accident than intent.

This was mainly Brian's fault, who had encouraged David and me to try a new Golgi method on moth brains that he was using on human retinae. We then used this method on butterflies, blowflies, honey bees and all sorts of other insects. We were completely stunned by the exquisite beauty of these preparations; the first to reveal detailed neuronal morphologies in insect brains since Cajal and Sánchez made their pioneering studies between 1910 and the 1930s. Crucially, David and I recognized that the study of neuroanatomy would be where I could best employ talents received from my parents: my mother a weaver and tapestry maker, my father a graphic artist, to both of whom I owe my deepest gratitude. And although my father never said as much, it must have been ironic for him that I spent the next 18 years in Germany, the country of his own birth. But he was relieved that I would not live in penury, which is what many artists experienced in those days, particularly as a refugee in Britain.

Professor Dietrich Burkhardt, affectionately known as "Bu" who had pioneered intracellular recordings from fly photoreceptors, was my postdoctoral host at Frankfurt University's Zoology Institute where I was funded by the Alexander von Humboldt Foundation from 1968 until 1969. This was quite an experience, sometimes spiced up by the Zoology Institute and the US Embassy sharing the same small street that was a local focus for student protests, driven by moral outrage of the kind sadly lacking today. The Institute also backed onto a small and intimate botanical garden where I could indulge in a childhood passion, watching insects behave.

In 1969 Kuno Kirschfeld invited me to give a lecture at the Max Planck Institute for Biological Cybernetics, which astonishingly offered up a staff scientist position. Thus, I spent the next 6 years in placid Tübingen working in Valentino Braitenberg's Department. This period brought me head on with a reductionist approach to the study of animal behavior that, in some quarters, was largely dismissive of the existence of actual nerve cells. Although initially very foreign to me, that intellectual approach played a significant role in driving my own search for the neuronal basis for visual behaviors. Later visits to Franz Huber's laboratory at the Institute for Behavioral Physiology at Seewiesen were a relief, for they exposed me to the study of animal behavior appropriately rooted in neuroanatomical observation. Seewiesen was also the venue for riotous times with Les Williams and a stream of foreign visitors, too many to name, some of which forged lasting friendships. One such was with Jonathan Bacon who one evening persuaded me to at

On board the Friday Harbor Laboratory's "Nugget," about to trawl for crustaceans. David Duggins, the skipper, is readying the sledge.

tend a party in the “Birkenhaus” (designed by Erich von Holst, one of the founders of neuroethology) where I met Camilla, with whom I instantly fell in love and with whom I have been joyously married ever since. This all occurred while I was at the European Molecular Biology Laboratory in Heidelberg, leading its sole neurobiology group - that is, until a new regime decided to do away with us. One consequence of this was that Friedrich Barth, then Professor of Zoology at Frankfurt University, sponsored my Habilitation - a rite of passage required before someone could become a German professor. But that was not to be. In the following year, despite a generous offer from Randolph Menzel at the Freie Universität in Berlin, and in response to John Hildebrand’s invitation to join his group in Tucson, Camilla and I reluctantly left Old Europe. This was in 1987 and has proved to be a happy decision. As well as Arizona being a wonderful biotope with many and marvelous insects, my working in a place where the faculty all use bugs for cutting-edge neuroscience research continues to be an irreplaceable pleasure.

I have enjoyed intense intellectually and professionally rewarding times, to which many people and organizations have contributed. Camilla, before all others, whose nudging led me to a Guggenheim Fellowship and on whom I always rely to purge my manuscripts of gibberish; Ron Hoy, who spent a sabbatical in my laboratory and who imparted much enlightenment; the MacArthur Foundation's extraordinary support, which permitted a certain amount of what Germans call “Narrenfreiheit” to pursue comparative and evolutionary studies. And I am continuously grateful for funding by the U.S. National Institutes of Health and the National Science Foundation, for research is not cheap, and the former has sustained my studies of insect vision since 1987.

I will conclude by thanking John Hildebrand for his steadfast support; also those students and postdoctoral colleagues who have enriched my laboratory. My gratitude goes to that most venerable of British Institutions, the Royal Society, for including me in its ranks despite my having left Britain two days after receiving my Ph.D. Events are almost going full circle: a generous Prize from the von Humboldt Foundation has recently enabled us to spend time in Martin Heisenberg’s Institute in Würzburg, Germany, to where we return each year to experience approaches to neuroethology about which I knew next to nothing; to where we meet colleagues and friends, old and new, and with Reinhard Wolf indulge in the not too occasional glass of trockene Sylvaner. It is said that it adds some years to one's life. I hope so, for I feel I'm still just beginning.

The Neural Systems and Behavior course at the MBL, Woods Hole, Mass., USA

Sarah Bottjer (bottjer@usc.edu)
University of Southern California, Los Angeles, CA, USA
Michael Dickinson (flyman@caltech.edu)
California Institute of Technology, Pasadena, CA, USA

Course Directors of NS&B

Jacques Loeb, the great developmental biologist and protein chemist of the early 20th century, is perhaps best known for his work showing that pin pricks could initiate development in unfertilized sea urchin eggs. But Loeb’s early interests focused on animal motion, and laid the groundwork for what at the time was a radically mechanistic view of behavior. Borrowing concepts from botany, Loeb proposed that the directed motion of animals could be explained by their reflexive responses to sensory stimuli. Loeb’s diagrams, completed before Ramón y Cajal published his masterpiece heralding the cellular theory of neurobiology, are remarkably modern. The flow of information from sensory organs to muscle is in-

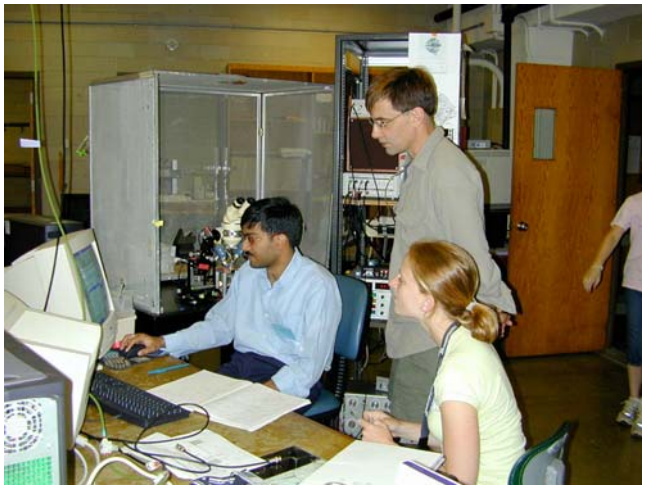
dicated by arrows depicting defined pathways in a flatworm's brain. Loeb's arguments also imply that behavior is an emergent property of a complex feedback loop in which what an animal experiences is determined by its prior motor reactions – another astonishingly prescient concept. Loeb is unfortunately little known by modern students of animal behavior and neurobiology. There is, however, one place where Loeb's contributions to our understanding of behavior are appropriately memorialized. Each summer, the Neural Systems & Behavior course convenes for eight weeks in Loeb Hall at the Marine Biological Labs at Woods Hole. The research performed in this 30-year old course illustrates how extensively Loeb's ideas have blossomed in 125 years.

Both the scientific and recreational climate of Woods Hole in the summer months are legendary, and students

Becky Markham and Michiyo Kinoshita recording from the leech nervous system. Every student is successful in making beautiful recordings from Retzius cells on the first day of the course!

in the Neural Systems and Behavior (NS&B) course have an unparalleled opportunity to interact with world-class scientists in an intensive laboratory setting. The central focus of NS&B is the investigation of how properties of individual neurons come together in neural circuits to generate behavior, perception, and learning – an emphasis that should endear the course to Loeb's ghost as it roams the main lab, inspecting the on-going experiments being conducted by the 20 students who participate each summer. Laboratory and lecture components combine state-of-the-art neuroscience techniques with behavioral and developmental analyses. The stimulating and collegial atmosphere encourages students to develop their own ideas and employ their newly-learned techniques to test novel questions.

A characteristic feature of NS&B, compared with other neurobiology courses, is that it combines cutting-edge techniques with a neuroethological approach. Neuroethologists exploit the tremendous diversity of both



Course Co-Director Michael Dickinson assists Kaushik Ghose & Cara Hampton in analyzing their data.

simple and complex behaviors found in nature to extract general principles of brain function. For example, barn owls hunt at night using their superb auditory skills to localize prey. The neural substrate underlying auditory localization in these nocturnal hunters is extremely well developed – the amount of "brain space" devoted to neural pathways for this behavior is hypertrophied, reflecting the importance of this behavior both over evolutionary time and in the animal's current ecological perspective. This makes the neural circuitry for auditory localization especially amenable to experimental investigation, thereby providing an excellent example of the principle first elaborated by Nobel laureate August Krogh, that for "for many problems there is an animal on which it can be most conveniently studied". The approach of using different model systems to exploit natural behavioral repertoires has achieved notable success in advancing our understanding of the neural substrates underlying behavior, a feat due in no small part to the efforts of NS&B in propagating this productive experimental philosophy to the generations of students that have taken the course over the years.

As the current Course Directors of NS&B, we invite students, postdocs, and faculty members to apply for the opportunity to spend a summer within the rooms of Loeb Hall, continuing the long-standing effort to link behavior to its mechanistic roots.

Modest recollections of a neuroethologist

G. Adrian Horridge, Emeritus Professor (horridge@rsbs.anu.edu.au) Visual Sciences, RSBS, Australian National University, Canberra, Australia

As a boy I lived on the western edge of Sheffield in northern England, and every Sunday we would go out

into Derbyshire and picnic. I would take a fishing net and come back loaded with frogs and lizards and crayfish – all kinds of wildlife. Then, when war broke out and rationing came in, I decided to keep rabbits. As a result, I learned a lot about animal physiology and we had rabbit meat regularly. When Sheffield was bombed, school was closed until 1943, so I spent a great deal of time in the public library, where there was a fine reference collection on all aspects of science and engineering which served the industry of the city. I used to buy chemicals for experiments that I could do at home. I was a stinks and fireworks nerd, but it served me well later.

I took four subjects at Cambridge, which meant two or three lectures and two practicals every day, with some on Saturdays also. Life was extremely hectic, but we were young and had a long attention span, if necessary, for work all night. In the vacations I went on expeditions, camping. Only 10 per cent of the students in Cambridge in my year had come straight from school. The others were ex-servicemen with interesting experiences who had seen active service. My tutor advised me to concentrate on biology, taking advantage of the fact that I already knew chemistry, but in the first year I was interested mostly in biochemistry, physiology and animal function.

In the summer of 1950 I organised an expedition to the island of Gomera in the Canary Islands, where four of us surveyed the birds. I got back to find that I had an offer of a Ph.D. studentship. When I turned up at the lab, not knowing exactly what to expect, I went to the chief technician's office and was given a key to a room on the second floor – and that's all I got. The room was quite empty. As a research student in Cambridge in those days, you had to find yourself a topic and also find somebody who would supervise you in it. Then you had to collect your apparatus. You built it yourself or scrounged it from somebody who had just finished or some other member of staff who had got some stuff in the cupboard, and collected things from various places in the lab such as the chemical room in the corridor, the workshop and the electronics workshop. So, having assembled everything you thought you wanted, you might start some experiments. Initiative and self-reliance were the keys to success, and one had to pay the small expenses of the research out of a small student grant.

I had no topic, so I went down to the Plymouth laboratory of the Marine Biological Association of the United Kingdom, which in those days was an independent body that was funded by the government. This laboratory had two good-sized ships with which it explored the western fringes of Europe, the Atlantic Shelf and the English Channel, kept an eye on fisheries and ocean productivity, and supplied marine animals to the universities. The Director allowed me to work at the lab, and I discovered that Norman Berrill, a famous Canadian zoologist, had worked there in the '20s on the regeneration of the head or tail of marine worms, until the whole worm eventually returned to a normal body. I thought that if I could go back and look at the problem again, using electrophysiological techniques, I could follow the process of regeneration. In the marine laboratory there was a Polish refugee professor, Alexandrowicz, who had been given sanctuary during the war. He was staining – with methylene blue and other rather nice methods – the neuron structure of the nervous system of the crustaceans. This is very much an art, with lots of tricks in the technique. He taught me very well how to handle nervous systems in invertebrate animals, and showed me the literature in the extensive library.

Then I went back to the Cambridge Zoology Department, where (Lord) Victor Rothschild had just purchased some microscopy equipment out of his own private money. I was able to use a phase-contrast microscope for the first time to look at transparent jellyfish, which I collected by going on my motorbike to Brancaster Staithe, on the Norfolk coast. The nerves of jellyfish are completely transparent but can be seen under phase contrast. A very lucky break, I thought. In those days the experiments had to be designed so that they were simple and cheap. I spent the whole of that year building electronic equipment and recording from snails and odd things that had some nerves in them. I first built a power pack, then a multivibrator stimulator, then a DC amplifier that gave me enormous trouble because it was totally unstable. I got a radar oscilloscope, which had a blue screen and fast time bases, and produced circles on the screen, but I changed the time base and the amplifiers inside so I had a new oscilloscope with a green screen that gave a long fluorescence. I had help from several people in all this hard work. For example, there was a good physiology lab across the road – Hodgkin and his assistants – and I got lots of instruction from Willie Rushton about how to make microelectrodes. One result was that later whenever we had a problem in the lab I was able to solve it. Once you've made all the equipment and discovered the little details of exactly how to do the experiments, you become more confident. When I had successfully recorded the nerve impulse from jellyfish and identified the synapses, I wrote a thesis in 1952 for a fellowship for St. John's College.

I was then obliged to look for work of national importance in lieu of military service. By good fortune, I went to the Royal Aircraft Establishment (RAE), Farnborough, to a remarkable group that had built the Mosquito aeroplane out of balsawood. (It turned out to be radar transparent and, because the frames were negligible in weight, had superb acceleration.) I worked on new materials for the rockets which were being invented at that time. Ground-to-air rockets were being made out of anything from steel to aluminium to glass fibre to asbestos. We were looking very hard at ways of using the covalent bond to maximise the strength of materials based on carbon, boron and silicon because if you use these light elements instead of metals, the specific strengths, dividing by the specific gravity, jump by a factor of about 10. One of the things I did there was to

invent the material for the venturi, the bit at the back end of the rocket where the high velocity gases come out. I was invited to join a big company making rockets, simply on the strength of that invention, but turned them down because they used asbestos. We pulled our own fibres, we persuaded glass companies to make peculiar weaves of glass fabric. We built helicopter blades out of fibreglass, linen fibre or silica fibres, and spun them until they bust – which makes a lot of noise! – and we filled rockets with all kinds of explosives and then fired them to see what the structural material would withstand. It was a very practical kind of science, and a great learning experience.

I got back to Cambridge with an 1851 Senior Award and a research fellowship at St. John's College. From there I continued going to Naples at Easter, when it was cold in England. The Stazione di Napoli was supported by universities all over Europe who paid a fee and in exchange had table rights. (That is, they could send people to work there.) The lab was one of the great laboratories of the world until the 1960's or so. At lunch – served in the lab – you could hear six to ten languages being spoken around the lunch table. I got to know quite a number of people from European labs while there. I spent a lot of time working in the magnificent library dating from the 1880s onwards, holding every possible journal and book and monograph you could hope to find. I went to work on jellyfish, hydromedusae and Ctenophores, a group of animals that are hardly known. They have the most primitive nervous system of any group of animals. There is no major concentration of nerves anywhere, no 'brain', yet their behaviour is well organised. For example, the genus *Beroe* is carnivorous. It puts a million cilia into one cell, all packed tight side by side, and makes them into teeth. I used that to show that cilia move by the sliding of microtubules. Another ctenophore, called *Mnemiopsis*, has little bits sticking out. If one of the cilia on the ends of these detects a vibration, it expands by contracting circular muscles. It leaps out and sticks on to any copepod or anything similar that approaches it.

In the spring of 1955, I was in Naples while the Cambridge Professor of Zoology, Carl Pantin, was there. He said to me one day, 'I have a letter from a friend of mine in St. Andrews University (in Scotland). They are looking for a lecturer who will work with marine animals. Would you like me to write to Callan and suggest that he appoints you?' I said, 'Oh yes, by all means do that.' I did write a letter myself to Callan, and learned afterwards that he'd thrown it in the wastepaper basket, but when Pantin's letter arrived he changed his mind and gave me a lectureship in the Gatty Marine Laboratory. (The latter was named after the Rev. Gatty who presented £2000 for a new building in 1896.) My job was tenured; those were the days!

In 1955 I had written from Cambridge – on College notepaper – asking the Shell Oil Company whether they could help me to go and work on the coral reefs in the Red Sea. I had a very helpful letter back to say yes, if I presented myself at the Shell office in Port Said, they would look after me and take me down the Red Sea coast to the Egyptian marine laboratory at Hurghada. That is about 200 miles south of Suez on the Egyptian coast of the Red Sea – lots of reefs everywhere, and a very good place to work on corals. I took my equipment in a rucksack.

Before I left Cambridge, Pantin had asked me to read a chapter of a book being written by Ted Bullock, who was a professor at UCLA. Ted had started to write a book, which eventually had the title "Structure and Function of the Nervous System of Invertebrates" – a two-volume work, with hundreds of illustrations and thousands of references. The chapter I read was on Coelenterates, the group of animals I had been working on for five or six years. I knew the literature, and because I had worked on coral reefs and at Naples, Millport and Plymouth, I'd seen lots of material that Bullock was unaware of. So I

4 decades ago: Nerve Net Symposium, ASZ meeting, Nashville TN, USA. Dec. 1964.
Left to right, top: Tardent, Prosser, Passano, Horridge, Lyke, Fraser; Row 3: Boettiger, Pavans de Cecatty, Mackie, Ewer, Miller, March; Row 2 Wuman, Lentz, Ross, Goreau, Rushforth, Josephson, Lenhoff, Chapman; Front: Leghissa, Bullock, Hernandez, Robson, Arai, Batham, Pantin.

rewrote that chapter completely, and sent it back. The result was that Ted Bullock invited me to be a co-author in the great work, and he arranged for us both to have fellowships at the Center for Advanced Studies in Behavioral Sciences, on the Stanford campus in Palo Alto, California. The fellowship meant full return fares, plus a full salary from the Center for Advanced Studies. My wife, Audrey, and I went in 1958, with two children, at first to the house of Steve Wainwright in Berkeley, up on Euclid Street, above the campus. So for a summer, I worked in the Berkeley library while Ted Bullock was still in Los Angeles. Then for the 12 months of the fellowship he and I went to Palo Alto, and we lived in Menlo Park. I was still a lecturer at St Andrews and was supposed to give my courses, so somehow I managed to shuttle to St Andrews. At the end of 1963, back at the Gatty, we had all the students doing the index, with cards spread in

rows on the floor. Writing, checking and indexing those volumes was so much work that it was said I never need work again – which was totally untrue!

When I went back to the Gatty in 1959 after California, I found that the Director, Jimmy Dodd, was in the final stage of departing, leaving about 15,000 square feet of vacant lab space. I was appointed Director, soon attracted a number of bright and enthusiastic young students, and started a golden decade of research on the neurobiology of invertebrates. In 1966 I published 26 papers. That's one a fortnight. We had a great deal of money coming in, because in a marine laboratory you can apply to the White Fish Authority, to the Nature Conservancy and to the National Development Commission, as well as to the various research councils. Getting money from all these sources was learned from Ted Bullock, who schooled me, American-style. He made me go to labs all around America and give seminars. As a result, the Gatty just boomed. Everything we touched seemed to turn to gold. Everybody was very happy, and students were excited by the work. If you have a marine laboratory, you have an enormous variety of challenges for a biologist.

So began the great procession of students who passed through over the years. They have been an enormously entertaining and productive lot. It was my custom in the middle years not to publish with my students, but always to insist that they publish their own papers in their own name, as I had done. There must be a couple of hundred such papers. That is unusual now, because these days a professor has to put his name on the papers to keep up the flow of grants, an iniquitous system.

While I was at the Gatty I got a telegram from Clem Market, chairman of the biology faculty at Yale University: 'Our member of staff' – 'has unfortunately run off with someone else's wife and is not likely to come back. The course on comparative nervous systems is due to start in one week's time. Would you please come and give the course? What are your terms?' I named a sum plus the air fares in order to commute about every three weeks back to St Andrews – and he immediately agreed. I rented a room in New Haven and commuted from Scotland. If you teach American students they demand extensive class sheets and literature. So I wrote these up as a book – 'Interneurons'.

When I was at Palo Alto I had talked with experimental psychologists about learning. When I went back to St Andrews and was working on locust eyes, I remembered that Pavlov had done an experiment with dogs, sounding a bell and then shocking or feeding them. So I thought: 'Let's see if we can teach locusts to avoid a shock at the sound of a noise.' The locust's ear is on its thorax, and I didn't believe that the learning would be in the locust's head. The circuit was arranged so that the plate was divided up into segments, and if a locust had a leg on one and the other leg on another, then it would get a shock. They never responded to the sound. But the locusts would stand on one leg and support themselves on the roof of the cage or in some other posture such that there was no return circuit and they didn't get the shock. Then I found that if a locust was suspended above a water surface and got a shock whenever it touched the water, in five minutes it would learn to hold its foot above the water. What's more, if you cut the head off after it had learned, the learning persisted. And if you taught a headless locust to hold up a leg up, and then tested it on the other leg, the learning was transferred. So we had a very simple learning preparation in an insect ventral ganglion with a few thousand nerve cells. I published this in 1962 as 'Headless learning in insects'. It got into the elementary psychology textbooks to show that learning does not require a large brain. A number of other scientists took this up, although I don't think they advanced very far. But for a psychologist, headless learning was quite something!

Although many insects have ears – crickets, cicadas and so on sing to each other – the story was that they did not have pitch discrimination: they detected only the amplitude of the wave-form, not its frequency. So, in 1961 I set to work recording from nerve cells in the central nervous system of the locust, and showed that different nerve cells were responding in a way that demonstrated pitch discrimination. The discovery really annoyed at least one senior professor who was committed to the old story. I also discovered how easy it is to get into a new topic when you have the basic skills and have read the literature. These experiments illustrate that the field is wide open for those who try. It was not the last time that I trod on toes on someone else's patch, but more of that anon.

Gene Robinson elected to National Academy

Ian A. Meinertzhagen, (iam@dal.ca)
Dalhousie University, Halifax, Nova Scotia, Canada

On May 3, the US National Academy of Sciences announced the election of 72 new members and 18 foreign associates from 14 countries in recognition of their distinguished and continuing achievements in original research. Among these was University of Illinois' neuroethologist Gene E. Robinson, the present incumbent of the G. William Arends Chair in the Department of Entomology, and Director of the Neuroscience Program, at the University of Illinois, Urbana-Champaign. Election to the Academy's membership, which currently numbers 1,976, is one of the highest honours that can be accorded a U.S. scientist or engineer. With a doctorate from Cornell University, Dr. Robinson is an internationally recognized entomologist whose work has focused on the honeybee and on the relationship between genes

Gene's bees, their genes, and Gene

the Academy's membership, which currently numbers 1,976, is one of the highest honours that can be accorded a U.S. scientist or engineer. With a doctorate and social behavior. In investigating a wide range of honeybee behaviours and their underlying genetic bases, Gene and his colleagues have discovered that an individual bee's caste activities can be predicted by knowing the profile of its gene expression in the brain. He is currently involved in a new project, BeeSpace, as part of the University of Illinois Institute of Genomic Biology, that will help analyse social behavior on an unprecedented whole-genome scale, using databases on the honey-bee to study the mechanisms of social behavior.

Congratulations, Gene, on behalf of the Society, for this truly outstanding mark of recognition.

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.

2006 4th Gordon Research Conference on Visual System Development, Il Ciocco, Barga, Italy, May 14-19, 2006

Chair: Pamela A Raymond
(praymond@umich.edu) University of Michigan, Ann Arbor, USA
Vice Chair: Ross Cagan
(cagan@pharmdec.wustl.edu) Washington University School of Medicine, St. Louis, USA

The 4th GRC on Visual System Development will be held next year in Tuscany. A tentative list of session topics includes:
Seymour Benzer Lecture
Eye Determination
Ocular Growth and Polarity
Evolution and Organization of Photoreceptors
Retinal Degeneration and Regeneration
Interacting Signaling Pathways
Complex and Novel Developmental Regulatory Mechanisms
Cell Cycle Regulation
Axon Guidance and Plasticity

For further information take a look at the GRC website:

http://www.grc.uri.edu/grc_home.htm

Positions Available

Postdoctoral positions. Two postdoctoral positions in birdsong physiology are currently available. They are both at the **University of Minnesota**, which has a strong and dynamic neuroscience group with expertise across a wide range of disciplines.

1. Neurophysiology of vocal learning
A postdoctoral research position is available to study the cellular bases of song learning in the zebra finch. Our research program uses an integrative approach to address how memory and sensory feedback are used to shape behavior. We are particularly interested in (1) the role of neuronal excitability in regulating the ability to learn vocalizations; (2) the role of sleep in learning; and (3) a neural signal that may result from the comparison of memory and sensory information. We use a wide array of techniques, including chronic multi-electrode recording in awake animals, whole cell patch clamp in brain slice and in vivo, and behavioral analyses. Applicants should have an M.D. or Ph.D. and significant ex-

perience in neuroscience. Quantitative analysis and/or electrophysiology experience preferred. This position is available immediately and is supported by the John Merck Fund. This position is open to foreign citizens, as well as citizens of the United States.

2. Birdsong in translation
A unique training opportunity is available in translational neuroscience. We are seeking a M.D. or Ph.D. scientist with experience in electrophysiology and strong interests in developmental disorders. The successful candidate will receive intensive, interdisciplinary training in neurobehavioral development, including several cutting edge techniques, direct experience in translation from basic to applied science, and a required developmental neuroscience seminar series tailored to this integrative program. The first half of the 3-year research program will focus on the developmental electrophysiology of the zebra finch song system with Teresa Nick. The second half of the program will address the development of human learning and memory, using insights from the songbird model, with Kathleen Thomas. Techniques will include fMRI, high-density EEG, and multi-electrode („tetrode‰) recording. This position is funded by a postdoctoral "road map" training grant from the NIMH and begins July 1, 2005 or after.

For either position, please submit CV and the names of three referees to: Teresa Nick (nickx002@umn.edu). For more information please check the following website: http://www2.neuroscience.umn.edu/tnick/

Postdoctoral position. A postdoctoral position is available at the **Institute of Neuroinformatics in Zürich** for the behavioral analysis of mechanosensory flight control pathways in the fruit fly *Drosophila***.**

The objective of the project is to reveal the functional role of mechanosensory pathways for free-flight control in the fruit fly. For this, wild type and transgenic flies with specific mechanosensory deficiencies will be behaviorally tested for their ability to perform stable free flight in a wind tunnel equipped with virtual-reality display techniques. In particular, the roles of certain parts of the mechanosensory pathways from the wings and halteres for flight control and maneuvering will be explored. These experiments will be complemented with measurements of wing kinematics and flight forces performed with flies of various genotypes flying tethered in a 'flight simulator'.

This postdoctoral position will be based at the Institute of Neuroinformatics (INI), a joint institute of the Federal School of Technology (ETH) and University of Zürich, Switzerland. The research is part of a collaboration with the MPI in Dresden and is jointly funded by the Volkswagen Stiftung. The behavioral studies will be closely linked with analyses of the neural physiology and circuits performed in Dresden and behavioral experiments addressing visual flight control performed at INI.

The successful candidate is a true team player with excellent experimental skills, a broad and profound technical understanding (e.g. with a background in engineering or physics) and a keen interest in biological systems (insect physiology and behavior, flight control, aerodynamics, biomechanics). Excellent communication skills and command of English are required. The position can provide a regular postdoc salary for up to 3 years.

Contact and further information from Dr. S.N. Fry at: steven@ini.phys.ethz.ch, for further information on the lab and current projects, see: http://www.ini.unizh.ch/~steven/?loc=Research/Projects

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

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