International Society for Neuroethology

Newsletter
March 2002

International Society for Neuroethology
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Next International Congress: August 9-13, 2004. Hotel Nyborg Strand, Nyborg, Denmark

THIS ISSUE INCLUDES

The ISN President's Column

Albert S. Feng, ISN President (a-feng@uiuc.edu)
Univ. of Illinois. Urbana, Illinois, USA

2002 has brought new excitement to the society. Foremost, the newly elected officers began their terms as of the first of the year. The new Executive Committee started working immediately; the committee had a conference call in February to address various issues and the recommendations of the Council and the membership at large. The one-hour long conference call was too short to cover all of the issues on our agenda, but we managed to discuss the financial status and policy to decide what steps are necessary for meeting our operating expenses and what new initiatives are within our financial reach. Some decisions were reached (summarized below) and others require further deliberations and additional information.

- Publish the society newsletters electronically (for a while members will have the option of requesting printed copies).
- Send dues notices and accept payments electronically (the first dues reminder will be sent by surface mail, however).

- Jazz up our homepage to enhance the society's visibility, public relationship and education in neuroethology.
- Increase the allocation for student travel awards.
- Hold the current membership dues to their current low level and solicit voluntary donations from members for targeted funds (*e.g.*, to support student travel to meetings).

Second, we now own our own web domain (http://neuroethology.org)! Michael Lampman (lampman@panassoc.com) at Panacea Associates is our webmaster. He has completed copying our old website from the University of Arizona site and added some new features in the process. He will be working closely with the Web Oversight and Education Committee (WOEC) to jazz up the society homepage. I am also pleased to inform you that Zen Faulkes has agreed to chair the WOEC, and Mark Nelson and Caroly Shumway to serve on the WOEC. We are looking for additional members (especially non-US members) to serve on the WOEC. Please let me know if you have an interest to participate in this exciting undertaking. On behalf of the society, I would like to thank John Hildebrand for creating and maintaining our website for the past 6 years at no cost to the society!

Third, beginning in 2002, our service contract with Panacea Associates is more extensive and includes many of the new electronic services we are now able to offer. They have served us well and will be doing more for us in the future.

Fourth, for the past decade the society has considered the possibility of affiliating with a journal, or establishing a new journal in neuroethology. Over the past two years, an ad-hoc committee evaluated this issue again, and towards the end of 2001 its recommendations were presented to the Council for an advisory vote. The councilors have voted, and the two top choices will be presented to members shortly for a final vote, along with the detailed analysis of the pros and cons of the two options.

The ISN is your society. The society officers would be delighted to hear from you regarding new directions you would wish to pursue. Please let us know. ◆

About the Newsletter

Janis C. Weeks, ISN Secretary
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Having become ISN Secretary in January 2002, this newsletter represents my first major undertaking in this role. I'd like to thank Art Popper, our outgoing secretary, for his years of service and newsletter production. As Al Feng notes above, we are planning to move to an electronic version of the newsletter in PDF format. Further details will be forthcoming but the plan is to make the electronic version the default option, with members able to request a mailed copy if desired. Moving to an electronic format will permit us to include color images while saving on printing and postage costs.

This is your newsletter; I'm looking forward to input from ISN members on topics and features that you'd like to see covered in these pages. I'd particularly like to increase coverage of up-and-coming members of the neuroethology community, such as the ISN Young Investigators who are highlighted in this issue. Send me your ideas!

2001 ISN Young Investigator: Elke Buschbeck

Elke Buschbeck (ekb8@cornell.edu)
Cornell University. Ithaca, New York, USA

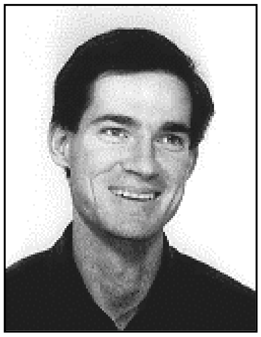
My interest in Neuroethology was triggered as an undergraduate student at the University of Vienna, where Friedrich Barth gave me the chance to participate in spider research. It was then that I developed a curiosity for sensory systems, especially for modalities that are not immediately accessible to us humans. Later, at the University of Arizona in Tucson, I became fascinated by evolution and how it has shaped the design of insect eyes. While working on my Ph.D. with Nick Strausfeld and Wayne Maddison I explored neural circuits that underlie motion vision and flight control in a variety of flies whose flight behaviors differ dramatically. Using a strict phylogenetic framework, I inferred connections between specific neural organizations and flight behaviors and could deduct valuable information about the evolution of specific neural characteristics.

> ***I became fascinated by evolution and how it has shaped the design of insect eyes.***

I am currently working with Ron Hoy at Cornell University where my interest in insect visual systems has intensified. My research profits substantially from the knowledge of fly visual systems, flight control and visual processing that has accumulated within the last century. It is against this background that I like to take advantage of the infinite experimental arena of evolution, which has brought forth great diversity in form and function. Insects with unusual visual systems often exhibit nervous systems that have been driven to limits that tell us about fundamental principles in neural function. In this context I am currently working on two remarkable insects that have led me to quite different structure-function related questions. The eyes of the Malaysian stalk-eyed fly (Diopsidae; Diptera) are separated by stalks and connected to the brain via long optic nerves. This organization is fascinating in terms of limits on the transfer of visual information. Currently, however, I am especially interested in the stalk-eyed fly's unusual developmental mechanism that allows for axonal elongation without apparent physical tension. My second project focuses on the eyes of twisted-wing insects (Strepsiptera) which represent their own very unusual insect order, the neurobiology of which is almost completely unexplored. While strepsipteran eyes superficially resemble the compound eyes of other arthropods, they function in a fundamentally different way. In a compound eye, each small lens only resolves a single point in space (one pixel). In the Strepsiptera however, each lens depicts an entire partial image, a "chunk" of the visual environment. This variant of an insect visual system is quite unexpected and causes dramatic changes within central processing areas. I am now able to maintain these peculiar parasitic insects in a laboratory culture and plan to further explore their fascinating neuroethology. ❖

2001 ISN Young Investigator: Andreas Nieder

Andreas Nieder (nieder@mit.edu)
MIT. Cambridge, Massachusetts, USA



As an undergraduate student, I worked for several years in the laboratory of Georg M. Klump (now University Oldenburg) at the TU München, where I learned a lot about operant conditioning and conducting thorough psychophysical measurements. The skill I was most anxious to learn from Georg was radiotelemetric recording of brain activity in freely moving birds, a method that would accompany me in the following years. Luckily, Georg offered me the opportunity to do my Diplom-thesis about the neural correlates of the detection of masked acoustic signals in the starling's forebrain (field L). I hope the obtained neurophysiological results contributed to explaining some of the bird's perceptual abilities in a natural, noisy environment.

After having acquired some knowledge about the auditory system, I was ready to learn more about the visual system. Much to my delight, Hermann Wagner offered me a position in Aachen to carry out my Ph.D. project about binocular information processing in the visual forebrain (visual Wulst) of awake, behaving barn owls. I built a tiny stereo-transmitter that was able to record unit activity from barn owls while they performed a visual fixation task. The responses of Wulst neurons to computer-generated random-dot stereograms were compared to responses of disparity-selective cells in the independently-evolved visual system of mammals. Like horizontal disparity cues, illusory contours give rise to sharp borders without any luminance contrast gradient. Interestingly, barn owls spontaneously interpreted illusory contours as real figure borders, and a huge proportion of Wulst neurons responded to illusory contours. Barn owls are famous for their hearing abilities, but don't underestimate their excellent vision!

> ***My vision is that some day it might be possible to free the experimental animal completely from restraint and the encumbrance of connecting wires.***

After working several years on purely sensory systems in birds, I became more and more interested in the neural basis of cognition. Fortunately, Earl K. Miller at MIT liked my idea of studying the representation of numerosities in monkey prefrontal and parietal cortex and offered me a position as a postdoctoral associate. (Some friends considered my departure from birds as a 'betrayal' to neuroethology, but aren't monkeys animals, too?) My current work deals with the representation of the number of visual items in monkeys that are performing a numerosity discrimination task.

The next step in my career will be the establishment of my own research group. I am planning to continue combined behavioral/physiological experiments about the formation of numerical categories and concepts in behaving monkeys. In my opinion, listening to the spikes through an audio-monitor while an animal is performing a certain task (let's not talk about the days when the animal is not cooperating…) is as close as one can get to see the brain at work. My vision is that some day it might be possible to free the experimental animal completely from restraint and the encumbrance of connecting wires. ❖

2001 ISN Young Investigator: Lee Morris

Lee Morris (lmorris@biology.emory.edu)
Emory University. Atlanta, Georgia, USA

When I was younger, I had a romantic notion that science was done in the style of Ed Ricketts and John Steinbeck in Steinbeck's *The Log of the Sea of Cortez*: scientists spent their days observing the wonders of nature and their evenings drinking beer and discussing the nature of life, the universe, and everything. While I have since realized that science doesn't quite work that way, I still love it.

I began in Joe Ayers' lab at Northeastern University, doing electromyography on gastric mill muscles in live Maine lobsters. These critters were fascinating, but frustrated me by eating the expensive electromyography wire. After a few years, I moved to Scott Hooper's lab at Ohio University and worked on the spiny lobster pyloric system. One of my first discoveries was that reduced preparations aren't necessarily less finicky than live animals; while the muscles didn't consume the equipment, they did often refuse to contract.

> ***These critters were fascinating, but frustrated me by eating the expensive electromyography wire.***

My dissertation describes the responses of the dorsal dilator muscles to pyloric-timed stimuli. These muscles differ from vertebrate muscles: they are slow, non-spiking muscles, with relaxation times in the tens of seconds (the pyloric rhythm ranges between 0.5s to 2s *in vitro*), and the isotonic amplitude of single contractions is coded by spike number, not spike frequency. Temporal summation occurs when the muscles are driven rhythmically, with the phasic contractions coded by spike number and the tonic contractions coded by overall spike frequency. Thus, predicting the muscle response to neural input is possible, if complex.

I had observed that the dorsal dilator muscles changed contraction patterns when the cardiac sac rhythm was active. Meanwhile, Jeff Thuma, a research associate, had found that pyloric neurons vary their spikes in conjunction with the gastric mill rhythm. So, after my dissertation defense, I began stimulating these muscles with real-time stimuli from *in vitro* pyloric rhythm recordings. Since pyloric muscles are slow, they extract the lower-frequency rhythms of the cardiac sac and gastric mill rhythms. Thus, even though these muscles are innervated only by "pyloric" neurons, they actually express three different rhythms.

I am currently a postdoc with Ron Calabrese at Emory University, quantitatively measuring the CPG output of the leech heartbeat system. I am in a postdoctoral program (Emory's Postdoctoral Research and Education Program) funded by the NIH to train postdocs in teaching and professional skills. Currently I am co-teaching two courses at Morehouse College here in Atlanta. Although I have a strong commitment to teaching and mentoring, I also plan to have a strong research program in invertebrate neuroethology. I feel strongly that the neural basis of behavior is best studied at a variety of levels, thus my research plan will address questions from cellular to behavioral neurobiology. ◆

2001 ISN Young Investigator: Stephanie White

Stephanie White (swhite@physci.ucla.edu)
University Of California, Los Angeles, USA

My research focuses on how social interactions influence the brain. I study an African cichlid fish and an Australian songbird, two species in which sexual maturation is influenced by social encounters between males, presumably to synchronize reproductive behavior with opportunity. In the fish, *Haplochromis burtoni*, agonistic interactions between males reversibly regulate both reproductive maturation and body growth. I began studying social control of reproduction in *H. burtoni* during my graduate studies in Russ Fernald's lab at Stanford. Being a member of the Fernald lab was an inspirational learning experience in bi-directional brain and behavior interactions which I highly recommend to any current or aspiring neuroethologist! My first experiments focused on female *H. burtoni*. We found that female neurons change soma size with reproductive state, similar to the neural plasticity seen in the more commonly-studied males. Perhaps not surprisingly, males pay attention to external social cues while females pay attention to endogenous stimuli for reproductive regulation. Among males we found interesting relationships between stress hormones, social stability, dominance and reproductive state, while among females nutritional status regulates reproduction.

I began studying songbirds during my postdoctoral training with Rich Mooney. In the songbird *Taeniopygia guttata*, a.k.a. the zebra finch, interactions between young and adult male 'tutors' determine when and how well a maturing finch learns its courtship song. Rich had pioneered the use of brain slices in zebra finches to study changes in synaptic transmission associated with auditory and hormonal experience. Again, this was a rewarding time for me as I learned about the great logic-puzzle that is the 'song system' and how to apply electrophysiological techniques to these neural circuits that subserve the development and production of learned song. Using this naturally-occurring behavior, we were able to show that song learning does not depend, as previously implied from more indirect work in mammals, on a developmental regulation of the NMDA-receptor, a specialized transmitter receptor on postsynaptic neurons. This result hinged on the behavioral richness of this model, and together with molecular work from the Nordeens, provided an early clue that developmental changes in NMDA receptor subunits might not close critical periods for learning, a theme that currently receives much attention in the mammalian literature. A second exciting discovery was that auditory experience regulates peripheral levels of androgens, and that androgens, in turn, modulate the speed of synaptic maturation. This work culminated in my Young Investigator award from the ISN and I was honored to speak at the symposium in Bonn last summer.

Perhaps not surprisingly, males pay attention to external social cues while females pay attention to endogenous stimuli for reproductive regulation.

Now I find myself among a wonderful collection of neuroethologists in the Physiological Science Department at UCLA, including members of the Arnold, Glanzman, Grinnell, Narins, Metzner, and Schlinger labs. In my lab, I am applying all of the approaches I have learned, including genetic interference, electrophysiology and behavioral techniques, to zebra finches. We investigate how social experiences activate hormones to shape gene expression patterns in the brain and modulate neuronal and circuit excitability, and ultimately, how this constellation of change influences behavior. In the future, I hope to take these studies back to the fish and to perform comparative studies among a few of the 4,000 species of songbirds to develop an evolutionary as well as real-time and developmental picture of how social interactions between conspecifics affect reproduction and learning circuits in the brain. ◆

Remembering C. Ladd Prosser

May 12, 1907 – February 3, 2002

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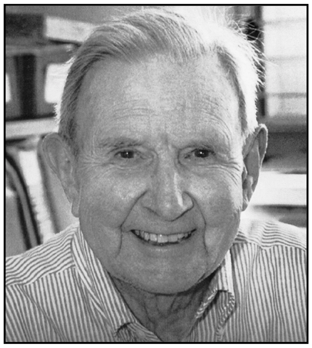

C. Ladd Prosser, Professor Emeritus of Physiology and Neuroscience at the University of Illinois at Urbana–Champaign passed away on Sunday, February 3, 2002. Known always to his friends and colleagues by his second name, “Ladd” devoted all of his adult professional life, from the early 1930s to the very end, to the pursuit of his great love – comparative physiology and neurobiology; he was a giant in both fields.

Ladd was born in Avon, New York. He received his B.S. degree in Zoology in 1929 from the University of Rochester. His love of Nature spilled over into an enthusiasm for experimental studies in biology, so much so that he applied and was admitted to the graduate program at Johns Hopkins University, where he subsequently received a Ph.D. in Biology in 1932. Working under S.O. Mast, his graduate research comprised a study of the development of the nervous system and behavior in the earthworm. These early studies laid the foundation for his lifetime work in comparative physiology and neurobiology. He then went on to receive postdoctoral training at Harvard (1932-33) followed by a year spent in Cambridge (1933-34), working with two renowned scientists, Hallowel Davis at Harvard and Edgar, later Lord, Adrian at Cambridge, as well as with John Eccles during a brief visit to Oxford.

Ladd’s first research and teaching position was at Clark University in Worcester (MA) in 1934. While at Clark and throughout his active academic life, he also spent the summers conducting research at the Marine Biological Laboratory (MBL) in Woods Hole. At the MBL he developed a lifelong friendship with numerous famous physiologists and neuroscientists including Kenneth “Kacy” Cole, Howard “Bim” Curtis, Alan Hodgkin, Albert Szent-Gyorgi and Steve Kuffler. He remained a faithful visitor to the MBL for many summers to come and subsequently became a Trustee (1950). Ladd loved the community of the MBL and he gave it many years of service. The scientific connections forged at the MBL were also to open doors for him. A contact with George Parker lead, in 1939, to his receiving the offer of a job at the University of Illinois, which he joined at the outbreak of hostilities in Europe.

During the Second World War, Ladd participated in the Manhattan Project. The work he undertook there as part of a team studying the effects of high-level radiation later became the basis for post-war radiation safety standards. Afterwards he returned to the University. In 1949, he helped form the Physiology Department where he launched a career of research that lasted for more than 50 years and during which he trained 45 doctoral students and numerous postdoctoral fellows from around the world. Many of his trainees and associates went on in turn to become chairs or directors of physiology, biochemistry, biophysics or neuroscience departments in various countries. From 1960 to 1969, he served as Head of the Department of Physiology and Biophysics. In the mid 1970s Ladd helped establish the Neural and Behavioral Biology Graduate Program, later renamed the Neuroscience Program, now an active program consisting of more than 60 faculty and 50 graduate students.

Ladd was a friend to so many people in physiology and neuroscience.

Ladd was, in the words of an eminent colleague, “A Statesman of Science”, ever ready to serve and represent the needs of science and scientists. He served as the President of the Society of General Physiologists (1958), the American Society of Zoologists (1961), and the American Physiological Society (1969). He also served on the editorial boards of many journals, including *Comparative Physiology and Biochemistry*, *American Journal of Physiology*, *Journal of Comparative Physiology*, and *Physiological Zoology*, as well as numerous governmental and national committees, including those of NASA, the National Academy committee on the Panama Canal, Bikini Island, and various study sections of the NSF and NIH.

During a long and productive career, Ladd produced a total of 7 books, more than 50 reviews and monographs, and nearly 150 research papers. The *magnum opus* with which his name is invariably linked was his textbook “*Comparative Animal Physiology*”. Remarkable for the breadth and comprehensiveness of its treatment, this book went through four editions and was translated into three languages. Through its pages, generations of students around the world were introduced to studies of comparative physiology. For his lifetime of research, he received numerous local, national and international awards and honors, including election to the American Academy of Arts and Sciences in 1957 and the National Academy of Science in 1974. Ladd was a friend to so many people in physiology and neuroscience. He will be dearly missed. ◆

How come neuroscientists working with vertebrates know nothing about invertebrates, while those working with invertebrates know an awful lot about vertebrates? (or, here's a little history of GABA as a neurotransmitter).

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Richard Scheller leaned over the back of his chair at the inaugural meeting of the Merck Sharpe and Dohme Neuroscience Research Center in England in May 1985, to ask whether he should continue working with invertebrate tissue preparations. He was worried about funding for studies with invertebrates, and of course, about his future academic career. During his postdoctoral studies with Richard Axel at Columbia University, Richard had begun using molecular approaches to identify and learn the functional roles of peptides of the bag cell cluster in *Aplysia californica*. At the time of the meeting, he was an independent investigator at Stanford who already had made outstanding contributions in this area of investigation. Since his laboratory was far and away the premier laboratory involved in such studies, I tried to reassure him. "By now", I said, "most scientists recognize that it's not the organism you work on that's important. Instead the quality of your science and the uniqueness and generality of your contribution are what people really pay attention to". I added, "Richard, with the exceptional quality of your studies, you really have nothing to worry about".

The next morning, the first presentation was by Kresimer Krnjevic on the history of GABA and glutamate as neurotransmitters viewed from the perspective of 30 years after the discovery of GABA in brain. Krnjevic divided his "history" into 5 decades: ***Pre-history*** (until 1950); ***Ancient History*** (1950s); ***Dark Ages*** (1960s); ***Renaissance*** (1970s); and ***Baroqu****e* (1980s). In the ***Pre-history*** period GABA had not yet been found in brain (true, although the existence of inhibition in crustacean tissue preparations was well documented), while in the ***Ancient History*** period GABA was found in brain, actually reported by 3 laboratories at about the same time (Roberts and Frankel, Awapara *et al*., and Udenfriend, who was collaborating with the Roberts group), although Krnjevic only referred to the Roberts group in his talk. He did rightly cite Bazemore, Elliot and Florey who showed that the active ingredient in "Factor I" (an extract from the vertebrate CNS that inhibited the firing of crayfish stretch receptors) was mainly GABA. He added that during this period GABA came to be considered as a possible inhibitory transmitter compound especially in Crustacea, citing Kuffler and Edwards in 1958 in which they said no such thing (see below for who said what when). The ***Dark Ages*** were dismissed by Krnjevic in his presentation as the period when nothing of interest happened relating to GABA or glutamate as transmitter compounds. Again the written document suggested a different story in the crustacean world where he noted that some people might be seriously considering these compounds as "putative transmitters". I suspect that the somewhat more balanced presentation that appeared in the published text resulted from slightly heated words exchanged between Krnjevic and myself following his talk. It was the ***Renaissance*** that Krnjevic liked best as evidenced by his statement "Inhibitory cells, pathways and synapses were gradually recognized as of the utmost importance in the functional organization of the brain, and GABA as the transmitter at the great majority of inhibitory synapses". In referencing this claim, the first citation was to Eccles, who actually vigorously defended the position that GABA was *not* a vertebrate CNS transmitter throughout the 1960s.

At the end of Krjnevic's talk, I turned to Richard and said, "forget everything I told you last night".

Too often one hears, "This is beautiful work. Too bad it’s not being done in an interesting organism".

I must admit, I was taken completely by surprise by the "history" I heard that not-so-long-ago morning. Now, however, I no longer am surprised by what I hear from an ever-growing-group of higher vertebrate chauvinists (HVCs) out there. With the sequencing of genomes, with the possibility of selectively removing or adding genes in vertebrate organisms and with the availability of elegant new imaging tools, new realms of possibility have opened up for understanding how the human nervous system functions and for unraveling the root causes of the diseases that plague mankind. These truly are issues of great importance well worthy of the great excitement that exists in the field. Somehow or other, however, that excitement has been perverted into the belief among HVCs that "we are the only people doing science that is worth doing". Moreover, that belief gets translated into who gets hired for key appointments at academic institutions, and possibly worse, for who gets funded for their research by federal granting agencies. The notion of the unity of Biology has been lost, at least among the HVCs, despite the fact that over and over again important discoveries begin with an investigator selecting the appropriate organism to study a question of great biological significance. Even worm and fly geneticists are not immune from attacks of the HVCs. Too often one hears, "This is beautiful work. Too bad it's not being done in an interesting organism".

A short history of GABA as a transmitter compound focusing on crustacean studies

"*Pre-history*": Crustaceans really were the right organisms to use to ask: (i) how did inhibition work; and (ii) what chemical transmitter compound was involved. Inhibition as an important physiological mechanism was first demonstrated in crustaceans by Biedermann in 1887. Using a crayfish claw preparation, he showed that only two axons innervated this readily accessible peripheral tissue preparation. In addition, Biedermann's electrical stimulation experiments suggested that the axons might have opposing physiological effects, one excitatory and the other inhibitory. Over the next decades, a controversy arose around whether inhibition was due to electrical interactions between nearby fibers in these tissues or was actually due to the presence of special inhibitory nerves. This was put to rest in the 1930s by Van Harreveld and Wiersma, when they separately stimulated single axons to demonstrate the opposing actions. These authors and their colleagues showed further that: no electrical signal was recorded from the muscle surface in response to inhibitory nerve stimulation; the timing of stimulation of excitatory and inhibitory nerves influenced the effectiveness of the inhibition; and inhibition blocked neuromuscular transmission at two distinct sites. In the 1940s, Katz and Kuffler showed that localized end-plate-like regions existed along crustacean muscle fibers, demonstrated a facilitation of synaptic responses, and showed that graded local contractures and propagated contractions were seen in crustacean muscle fibers. They also refined the measurements of how far in advance inhibitory nerves had to be stimulated to reduce the magnitude of excitatory synaptic responses.

Ancient History: Reliable intracellular microelectrodes suitable for examining the electrical properties of cells were introduced by Graham and Gerard, Ling and Gerard, and Nastuk and Hodgkin in the period from 1946-1950. These powerful tools triggered a revolution in our understanding of the electrical properties of nerve and muscle tissues. They were used to study a wide variety of vertebrate and invertebrate tissue preparations, with crustacean preparations leading the way in the study of inhibition. The year 1950 also saw the first reports of the existence of an unusual amino acid, γ-aminobutyric acid (GABA) in brain. GABA was already known to exist in bacteria, yeast and plants, and the enzyme that synthesized it, glutamic decarboxylase, also was known from the same sources, but until 1950 it was not known to exist in animals (reports from the laboratories of Roberts, Awapara, and Udenfriend). A final important event of the early '50s was the finding by Alexandrowicz of isolated peripheral sensory elements resembling the muscle spindles of vertebrates in easily accessible sites in crustaceans. Furshpan and Wiersma were the first to use stretch receptor preparations for physiological and pharmacological studies. Ernst Florey, who was a visiting scientist at Caltech at the time, learned how to set up and use this preparation as a convenient bioassay. Originally interested in identifying transmitter candidates from the vertebrate CNS, Florey used changes in the firing rates of crayfish stretch receptors to screen extracts prepared from various regions of the CNS for excitatory or inhibitory substances. Using relatively crude purification methods, Florey found that his tissue extracts could be divided into fractions showing mainly excitatory or inhibitory activities. He called these crude fractions Factor E and Factor I. From the first, Florey suggested that Factor I was an inhibitory transmitter compound, not making clear whether he was talking about vertebrate or invertebrate inhibitory transmitters. In 1956 in a note to *Nature*, and one year later in a more complete article, Bazemore, Elliott and Florey demonstrated that GABA accounted for most of the activity of Factor I.

The 1960s began with two international congresses proclaiming that GABA was not a transmitter compound.

Meanwhile, how inhibition worked was being explored in great detail using intracellular recording techniques. In the early 1950s, Fatt and Katz defined the electrical properties of crustacean muscle fibers and demonstrated that stimulating inhibitory nerves to these preparations triggered a conductance increase in muscle fibers (thus accounting for one of the two actions of inhibitory nerve stimulation). The conductance increase usually was not accompanied by a change in membrane potential unless the potential was displaced from its resting value. Moreover, whether the membrane potential was displaced above or below the resting level, the direction of the potential change triggered by inhibitory nerve stimulation always was towards the resting level. Boistel and Fatt in 1958 showed that the conductance increase caused by inhibitory nerve stimulation resulted from an increased permeability towards chloride ion, and that in all respects externally applied GABA exactly duplicated the actions of inhibitory nerve stimulation. Furshpan and Potter showed a similar effect of GABA on a crayfish central synapse and Kuffler and Edwards did the same for the crustacean stretch receptor preparation. In numerous publications, however, Kuffler cautioned that there was no compelling evidence supporting the suggestion that GABA was an inhibitory transmitter compound in crustacean tissues. While there was excellent pharmacological and physiological evidence demonstrating that GABA acted like the inhibitory transmitter compound, Kuffler felt there were too many missing pieces to call it a transmitter.

The Dark Ages: The 1960s began with two international congresses proclaiming that GABA was not a transmitter compound. Leading the retreats were Ernst Florey, now claiming that there was no GABA in crustacean tissues, hence it couldn't be a transmitter there, and Jack Eccles and David Curtis pushing their evidence that GABA and the real transmitter compound had different physiological and pharmacological actions in the vertebrate CNS, hence it couldn't be a transmitter there either. With titles like "The non-identity of the transmitter substance of crustacean inhibitory neurons and gamma-aminobutyric acid" (Florey and Chapman, *Comp Biochem Physiol*, 3:92-98, 1961) appearing in journals, interest in GABA as a transmitter compound plummeted. All the while the electrophysiologists, including Fatt, Katz and Kuffler and their colleagues, still suspected that GABA might be the crustacean inhibitory transmitter compound, despite these negative reports. Caution, however, kept these speculations out of their published articles. Also ushering in the 1960s was the demonstration by Dudel and Kuffler that the second action resulting from the stimulation of inhibitory nerves to crustacean neuromuscular tissues was a presynaptic inhibition of excitatory transmitter release. This effect too was duplicated by GABA. When I arrived at Harvard Medical School in 1960, Steve Kuffler, Dave Potter and their colleagues already had shown convincingly that GABA was indeed found in crustacean tissues. Moreover they had already identified at least 10 compounds showing inhibitory activity on crustacean neuromuscular preparations, with GABA as the most active, but not contributing the bulk of the activity. I arrived at Harvard Medical School with a test tube in my pocket containing a strain of the bacterium, *Pseudomonas fluorescens* that had been grown on GABA as a sole carbon source. Extracts prepared from this organism (originally isolated by Jakoby and Scott at NIH) contained enzymes that metabolized GABA yielding reduced pyridine nucleotides in the process. Partial purification of these enzymes yielded a highly sensitive, specific enzyme assay for GABA, which proved to be a key tool for us over the rest of the decade.

Our first studies using the enzyme assay, published in 1962, showed that GABA was highly concentrated in inhibitory axons dissected from crustacean nerve bundles. Next we showed that the enzyme forming GABA, glutamic decarboxylase, also was present in crustacean nervous tissues. In a series of papers in 1963 we showed that GABA alone of the ten inhibitory compounds extracted from lobster nervous tissues was exclusively localized in inhibitory axons. We dissected meter lengths of single inhibitory and excitatory axons in demonstrating that result. Within the next few years we showed the following: a calcium-dependent release of GABA was seen following inhibitory but not excitatory axon stimulation; GABA was found in inhibitory axons in at least 100-fold higher concentration than in other axons; the selective accumulation of GABA resulted from the selective localization of glutamic decarboxylase in inhibitory axons, product inhibition of the enzyme, and a symmetrical distribution of the degradative enzymes for GABA between inhibitory and excitatory axons; lobster CNS neurons could be identified and mapped and the cell bodies of inhibitory neurons also contained high levels of GABA; and finally, a specific sodium-dependent GABA uptake mechanism existed in crustacean neuromuscular preparations that could serve to inactivate released GABA. The Takeuchis added the elegant demonstration that spots highly sensitive to GABA and glutamate could be detected on crustacean muscle fibers between regions showing little or no responsiveness to the amino acids.

> ***. . .outstanding contributions to the understanding of important scientific questions are being made by investigators using organisms other than primates and rodents. Nowhere is this more true than in the field of neuroethology.***

With the completion of the studies from our laboratory, and including the continuing beautiful physiological studies of other investigators, not only was there no doubt that GABA functioned as a transmitter compound, but this body of evidence provided the most complete and compelling demonstration of the identification of a transmitter compound that had ever been done.

Thus ended the ***Dark Ages***.

I have no answers for how to break down the HVC mentality that overwhelms the opinions of too many of our colleagues. I can only say that, then (with the GABA story and many others) and now, outstanding contributions to the understanding of important scientific questions are being made by investigators using organisms other than primates and rodents. Nowhere is this more true than in the field of neuroethology. The wealth and diversity of organisms described at the last ISN Meeting in Bonn and the breadth of fascinating problems being addressed more than attests to this fact. Moths and olfaction, birds and communication, bats and prey-finding, thumping frogs and mate-finding, bees and learning, and yes, even those lowly crustaceans and aggression, all and more are opening doors towards our understanding of how animals function in the complex world that surrounds them. Such knowledge eventually must impact on the understanding of how we too, as human beings, function in the same world. It's essential to our field and important to all of science that we get that message out there! ◆

2001 ISN Annual Financial Report

Prepared by Sheryl Coombs, Teasurer

As of 12/31/01

Balance as of 12/31/00	**$250,859.57**
Revenues in 2001:	**$136,864.85**
Investment Portfolio*	($10,916.56)
Bank Interest:	$71.08
Membership Dues:	$29,094.25
Donations:	$0.00
Conference	$118,616.08
Other	$0.00
Debits in 2001:	**($125,374.32)**
Operating Expenses	($20,547.96)
Conference Expenses	($104,826.36)
Current Balance	**$262,350.10**
Total Assets - Liabilities	**$262,350.09**

* Growth (loss) in market value since 12/31/00

Meetings and Courses

The Second Gordon Research Conference on Neuroethology, August 2002

Harold H. Zakon (h.zakon@mail.utexas.edu)
University of Texas, Austin, USA

The second Gordon Research Conference (GRC) on "*Neuroethology: Behavior, Evolution and Neurobiology*" will be held on August 18-23, 2002 at Queen's College, Oxford University, Oxford, UK. The organizers are Harold Zakon (Chair), Nick Strausfeld (Co-Vice Chair), and Ron Hoy (Co-Vice Chair). This year the conference is organized around issues of plasticity in brain and behavior within a neuroethological perspective. A secondary goal of this meeting is to examine how molecular biological approaches can be applied to neuroethology and, conversely, how a neuroethological perspective can enrich studies of "genetic" organisms such as nematodes, fruitflies, and mice. Full details on the program and a list of invited speakers can be found at http://www.grc.uri.edu/programs/2002/neuroeth.htm. Symposium topics include *Behavioral Plasticity*; *Synaptic Mechanisms of Plasticity: are they universal?; Molecular/Genetic Approaches*; *Plasticity in the Auditory System*; *Aggressive/Affiliative Behaviors*; *Morphological Plasticity*; and *Computational Neuroethology*.

The GRCs are wonderful and stimulating; they are organized to be free-wheeling and spirited events with built-in time for audience participation and discussion. All participants are encouraged to speak with abandon about their wildest ideas. The meetings are structured with sessions in the morning and evenings; afternoons are left open so people can chat, relax, or see the sights. We can assure you, the sights in and around Oxford are plentiful and interesting.

The registration fee for the meeting at the Oxford site is $790. This covers all expenses including room and meals. Airfare is, of course, additional. We will try to make funding available to graduate students and post-docs to help defray some expenses.

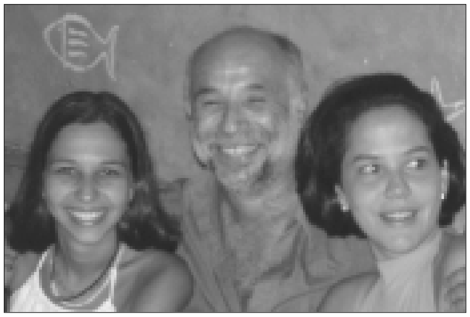
If you are interested in attending, you MUST apply at the GRC website (http://www.grc.uri.edu/grc_home.htm). Applicants will be chosen to maximize diversity of interests, levels of education, ethnicity, gender, geography, etc. Beyond this goal, applicants will be chosen on a first-come first-serve basis. The final selection of participants will be made by the organizing committee in May. We encourage you to apply as soon as possible since capacity is limited.

There will be poster sessions, and attendees are encouraged to bring posters. The deadline for posters and the details of poster sizes etc., will be announced in the future and this information will be made available to all those who have applied. ◆

Report on "Experimental Approaches in Neuroethology" in Chile, January 2002

Mario Penna (mpenna@machi.med.uchile.cl)
University of Chile. Santiago, Chile

The international course *Experimental Approaches in Neuroethology* was given in Santiago and Valparaíso, Chile, from January 7-18, 2002. The course was intended to inspire Latin American students to engage in behavioral and neural studies of native species, a rich source for the development of original scientific work on the continent. The course offered an overview of current explorations of the neural basis of animal behavior, encompassing diverse vertebrate and invertebrate models, presented from physiological and evolutionary viewpoints. Case studies of chemical, visual, electric, auditory and vibratory sensory modalities were treated in conferences, seminars and field and laboratory practical activities. The significance of specializations and general organizational patterns of nervous systems for the extant behavioral diversity of organisms was appraised. The teaching staff included participants from Chile (Juan Bacigalupo, Antonieta Labra, Jorge Mpodozis, Hermann Niemeyer, Adrián Palacios and Mario Penna), Cuba



Course participants (L to R): Fabiana Caitano (Brazil), Mario Penna (Chile) and Marilia Barros (Brazil)

(Frank Coro), Slovenia (Tine Valentincic), Spain (Ester Desfilis), Uruguay (Omar Macadar) and the USA (John Caprio, John Hildebrand and Peter Narins). The students were from Argentina (6), Brasil (2), Chile (6), Cuba (1), Perú (1) and Uruguay (2).

Two round table discussions entitled “Vertebrate and invertebrate neuroethology: incongruous sciences?” (chaired by John Hildebrand) and “Neuroethology: what is behind, ahead and beyond?” (chaired by Peter Narins) addressed the scope, motivations and identity of neuroethological research, and envisioned avenues for the development of this discipline in the Latin American scene.

The course schedule was tight, but time was saved for short presentations by the students of their work at home, and for social activities, in which excursions, dining, and musical events made significant contributions to the group’s cohesion.

The students’ background made a good and sustained level of discussion possible during the entire period of the course. In their final evaluation of the course, the students expressed their feeling that the course level had been mostly above their expectations, and considered it as an experience that will influence their academic careers. Main suggestions for improving future versions of the course were: increasing the course duration to three weeks, and to allow more hands-on practical activities. In addition, they requested that the articles assigned for seminars be distributed weeks before the initiation of the course, in order to have the necessary time for reading. Also a proposal was put forward to open applications for students of regions other than Latin America. On the other hand, some students suggested that the use of English as the official language should not be so strictly enforced.

The organizing committee and teaching staff are satisfied with what turned out to be a rewarding and enjoyable experience, and feel encouraged to plan for future Neuroethological graduate ventures in southernmost South America.

The course was funded by the Millennium Science Initiative (MSI), the International Brain Research Organization (IBRO), and the Latin American Network for Research in Bioactive Natural Compounds (LANBIO). ◆

New Books by ISN Members

Genetics and Auditory Disorders, edited by Bronya J. B. Keats, Arthur N. Popper and Richard R. Fay. Springer-Verlag 2002 (see www.springer-ny.com/SHAR). In this volume, the authors present the fundamental principles and methodology of genetics, the application of these research methods to hereditary hearing impairment, and the identify and function of genes associated with auditory disorders. ◆

Integrative Functions in the Mammalian Auditory Pathway, edited by Donata Oertel, Richard R. Fay and Arthur N. Popper. Springer-Verlag 2002 (see www.springer-ny.com/SHAR). This volume summarizes how the electrical signals used to represent sounds are encoded and interpreted through the integrated roles of various nuclei in the mammalian auditory pathway. Chapters discuss how the pathways lead to an animal's ability to localize and interpret sounds. The authors discuss how a variety of species recognize the location of sources and complex features of sound, thus contributing to ongoing research toward an understanding of the general functional strategies of the auditory system. ◆

Vision: the Approach of Biophysics and Neurosciences, edited by C. Musio, 2001, World Scientific (ISBN 981-02-4647-1, Hardcover US$86) This book provides an outline of most recent and updated findings in visual sciences. Visual mechanisms and processes are analysed at several levels (molecular, cellular, integrative, behavioral, and computational-cognitive) by different methodologies (from molecular biology to computation) applied to various living models (from invertebrates to vertebrates and humans). ◆

Positions available

Graduate Student Position available immediately to study the **Neural Basis of Odor-guided Navigation in Flying Insects**. Ongoing studies include: studies of olfactory navigation in freely flying moths; motor control of wing movements and maneuvering in freely flying moths; multi-unit neural recording of the activity of descending interneurons during tethered flight. Collaborate with engineers to model odor-guided orientation using robots moving in 2 and 3 dimensions. This opening includes a full tuition waver and stipend from the Department of Biology. In addition to joining the Biology Department, you may become a member of an NSF-funded Integrated Graduate Education and Research Training Program spanning Biology, Engineering and Biomedical Engineering which offers exciting opportunities for collaboration and additional opportunities for support. For further information and to apply for this position please contact: Dr. Mark Willis, Department of Biology, Case Western Reserve University, 10900 Euclid Ave., Cleveland, OH 44106-7080, maw27@po.cwru.edu. In education as in employment, CWRU is committed to affirmative action and equal opportunity. ◆

Graduate Position in Auditory Perception in Owls. A position for a graduate student (BAT IIa/2) to study neural correlates of auditory perception is immediately available at the Lehrstuhl fuer Zoologie/Tierphysiologie of the RWTH Aachen. The project is supported by the German-Israeli-foundation, and is a continuation of our work on precognitive and cognitive components in barn owl audition (Poganiatz et al., JARO

2001, 2:1), Poganiatz and Wagner, *J. Comp. Physiol*. 2001, 187:225). Specifically, we plan to examine neuronal mechanisms of sound localization in awake, behaving owls by using the virtual space technique to study the cocktail-party effect and binaural masking. For further information contact Prof. Dr. Hermann Wagner, Lehrstuhl fuer Zoologie/Tierphysiologie, RWTH Aachen, D-52074 Aachen, Kopernikusstrasse 16, e-mail: wagner@bio2.rwth-aachen.de. ◆

Postdoctoral Investigator to Study Ultrasound Detection in Fishes in the laboratory of Arthur Popper at the University of Maryland. Applicants should have a strong background in neurophysiology. Investigations will involve determination of responses of the auditory CNS of herring-like fishes to ultrasonic sounds and determination of the mechanisms of ultrasonic detection in these fishes. Additional opportunities are available to participate in a wide range of studies on fish hearing, and to interact with our very large auditory neuroscience group (www.life.umd.edu/cebh). Contact Dr. Arthur N. Popper, Dept. of Biology, Univ. of Maryland, College Park, MD 20742 USA or APOPPER@umd.edu. (www.life.umd.edu/biology/popperlab). The University of Maryland is an equal opportunity/affirmative opportunity employer. ◆

Postdoctoral Research in Auditory Neuroscience at the University of Maryland, College Park, are available starting July 1, 2002 in our training program within our Center for Comparative and Evolutionary Biology of Hearing (C-CEBH). C-CEBH has 23 investigators located at College Park and at NIH. Research opportunities are at all levels of analysis from molecular genetics through imaging of human speech processing. We employ a wide range of animal models from insects through humans. C-CEBH provides unique opportunities for research training and learning, and there is a strong emphasis on collaborative research across laboratories in our program. See www.life.umd.edu/cebh for details of the program. Contact any of our investigators directly or the program co-directors Arthur Popper (apopper@umd.edu) or Robert Dooling (Dooling@psyc.umd.edu). The University of Maryland is an equal opportunity/affirmative opportunity employer. ◆

Postdoctoral Position in Vision Research, SUNY Upstate Medical University. Postdoctoral position is available in the Center for Vision Research, Department of Ophthalmology, SUNY Upstate Medical University. The individual will be trained in the areas of vision, neural coding and computational neuroscience. The Center for Vision Research brings together Vision Scientists from a variety of departments with common research interests. The Center has excellent laboratory space and facilities and is currently expanding its faculty. Applicants should send curriculum vitae, statement of career goals, and three reference letters to: Dr. Robert Barlow, Professor and Director, Center for Vision Research, c/o Edwina Clarlton, Department of Ophthalmology, SUNY Upstate Medical University, 550 Harrison Street, Syracuse, NY 13202. SUNY Upstate Medical University is committed to increasing representation of women and minority groups on its faculty and particularly encourages applications from such candidates. Upstate Medical University is an Equal Opportunity/affirmative Action Employer seeking excellence through diversity. ◆

Postdoctoral Position in Sensory Physiology. A postdoctoral position to study auditory processing and plasticity in barn owls is available in the laboratory of Prof. Eric Knudsen at Stanford University. We focus on neural mechanisms underlying sound localization and how they are shaped by auditory and visual experience. We use neurophysiological, anatomical, pharmacological and behavioral techniques. Experience with electrophysiology preferred. Please contact Dr. Eric Knudsen, Dept. of Neurobiology, Stanford University, Stanford, CA. 94305-5125. e-mail: eknudsen@stanford.edu. ◆

Postdoctoral position available immediately to study the **Neural and Behavioral Mechanisms Underlying Odor-guided Navigation in Flying Insects**. Potential projects include: free-flight olfactory navigation experiments; correlation between flight motor patterns and maneuvering in free-flight; multi-unit neural recording and analysis of spiking patterns in descending interneurons during tethered flight. Requirements: graduate or postdoctoral background related to the neural basis of behavior, including skill in electrophysiological recording and data analysis. Experience with intra- and extracellular recording methods in insects and data analysis is preferred. Experience in multi-unit neural recording and data processing methods is preferred, not required. Membership in the Willis laboratory includes joining a growing group of neuroethologists in the Biology Department with a long history of successful collaborations with the Departments of Computer Science and Mechanical and Aerospace Engineering. Send CV to: Dr. Mark Willis, Department of Biology, Case Western Reserve University, 10900 Euclid Ave., Cleveland, OH 44106-7080, maw27@po.cwru.edu. In employment as in education, CWRU is committed to affirmative action and equal opportunity. ◆

Postdoctoral Positions in Motor Control. Two positions are supported by an NSF Integrated Graduate Education and Research Training program at Arizona State University. See http://www.eas.asu.edu/~igert/ for details. An additional postdoc is available for work on the startle response of an invertebrate model. Queries for all three positions can be forwarded to Richard Satterlie at rsatterlie@asu.edu or by phone (480) 965-5518. Arizona State University is an Affirmative Action/Equal Opportunity Employer. ◆

Junior Professorship for Aquatic Bioacoustics at Institute of Biology, Humboldt-University Berlin. The focus is on electrophysiological and neuroanatomical investigation of processing of underwater sound in the completely aquatic frog, *Xenopus*. The studies will complement with the department's studies of processing of lateral-line stimuli in *Xenopus*. A pond of 9 x 6 m is available that has been specifically built for studies of underwater bioacoustics. Additional interest in comparative studies of hearing in fish is appreciated. Teaching is in the field of sensory biology. The original deadline for application has passed already, but the committee will also consider later applications. For details look at http://www.hu-berlin.de/juniorprofessuren/jp_aus_e.html or ask Prof. Elepfandt (+49/30/2093-8846, Andreas.Elepfandt@rz.HU-Berlin.de). ◆

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Material for Future ISN Newsletters

We welcome material for future newsletters in a number of categories. Advertisements for positions are limited to 150 words. Announcements of new books (copyright 2002) *written or edited by ISN members* should include the full citation information (including ISBN) plus a 40-50 word description of the book (note: if an ISN member contributes only a chapter to a book it is not appropriate for inclusion in the newsletter).

We also welcome discussions of research areas or topics of interest to neuroethologists, laboratory profiles, editorials, announcements of future meetings and courses, and reports on recent meetings or courses. Word limits depend on the type of article. Have an idea for an article that you or someone else could write? Contact the Secretary!

The deadline for the next issue is **June 1, 2002**. All material must be submitted electronically as a file attached to an e-mail message. Send queries or submissions to Janis Weeks (weeks@uoneuro.uoregon.edu). ◆

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