International Society for Neuroethology

Newsletter
April 2009

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Next ISN Congress: Salamanca, Spain, 4-7 August 2010. Local organizer: Alberto Ferrús, Instituto Cajal, C.S.I.C., Avenida Dr. Arce 37, E-28002 Madrid, Spain. Tel: +34-1-585-4739; Fax: +34-1-585-4754; aferrus@cajal.csic.es

This Issue Includes

Note from the President

Dear Members:

On May 23 the Executive Committee (EC) meeting is coming up. It is a 'first' in that it will be held as a video conference at two locations, Würzburg and Boston, to diminish travel cost. The main topic on the agenda will be the ICN in Salamanca. Together with the chairs of the Program Committee (Ansgar Bueschges, Harold Zakon) and Local Organizing Committee (Alberto Ferrús) we will review the state of preparations and make final decisions. If you have not done so already, please firmly mark the dates, August 4-7, 2010 on your calendar.

Aside from the congress preparations the society has made two major decisions since the last EC meeting: The conference cycle of the ICN will be shortened from three to two years.

Considering the exciting times for Neuroethology, i.e., the accelerating rate of discoveries and innovations as well as the growing public interest in the behavioural brain sciences, we need to meet more often than every three years.

Secondly, the society has allocated a large sum of money for the 'Developing Neuroethology Fund' (DNF; see the announcement of Willi Honegger below). It shall support colleagues from emerging countries to participate in the ICN. We see this as a means to foster Neuroethology research and teaching in these countries. After all, some of the most rewarding systems to be explored in Neuroethology are found there.

If you have any issue you would like discussed at the EC meeting, just let me know (Heisenberg@biozentrum.uni-wuerzburg.de). In case you wonder how you could further support Neuroethology, please try to acquire new members among your friends, students and colleagues.

Martin Heisenberg

Minding Gorilla and the Gorilla's Mind

H. Dieter Steklis and Netzin G. Steklis
The University of Arizona

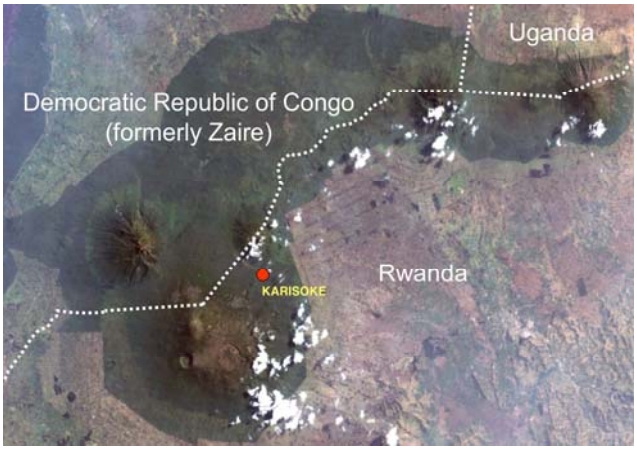
With the world's attention focused on the potential dire consequences of global climate change and failing financial markets, why should anyone think about the fate of gorillas deep in the heart of Africa? Indeed, the plight of polar bears clinging to melting chunks of arctic ice perhaps more deservedly and urgently captures our attention. Since 1991, when we started working with mountain gorillas (*Gorilla gorilla beringei*) in Rwanda, this small, endangered population of gorillas has been center stage in world news on several occasions, as Rwanda and neighboring countries have succumbed to and recovered from civil strife and genocide. Today, as we try to imagine a near-future world with ever greater demand for limited energy resources, of yet unknown adaptive responses to climate change, and of mounting species extinction rates, one thing seems certain: We will need to make tough decisions about what we value most and what we are willing to do without.

It is equally certain that we cannot save the world or biosphere from itself. Had we begun to manage carbon emissions and industrial pollution a 150 years ago, climate change and species extinction would still dog us, albeit at different rates or perhaps intensity. And so, if we admit that it is hubris to think that we can save every species from extinction or *stop* climate change, then our real choice for action will ultimately boil down to managing those ecological resources that we want and need. Both polar bears and mountain gorillas are charismatic mega-vertebrates, which means, like pandas and other large, wide-eyed, cuddly mammals, they readily evoke in us strong, positive emotions of a kind not induced by their scaly or furless brethren. (As a quick aside, we plead guilty that on many occasions when in the company of our musky, gentle, giant friends, we—like Dian Fossey before us--were overcome with an inexplicable desire to hug, play or groom, checked only by our awareness of transmitting infectious diseases to them, not to mention the disapproving eye of a nearby dominant silverback male. We also note that this common affective response to large, furry creatures seems surprisingly little studied by scientists!) But the sad truth is that, when push comes to shove in our near-future world, we may need to choose between polar bears and mountain gorillas.

Silverback Titus and his group

How do we decide? The question is most often put into stark relief when human needs come into conflict with those of wildlife, as happened often during our years with the gorillas. Seeing us drive up in Land Rovers and smartly outfitted in field gear and equipped with the latest research technology, local people (and government officials alike) would ask us, "why do you care more about the gorillas than us?" A legitimate and potentially embarrassing question, given that the average annual income in Rwanda amounts to less than $300 and the average life expectancy is 45 years!

One kind of answer is that both gorillas and humans have a right to exist, that both species therefore should be able to coexist, and that gorilla research helps us to understand how this coexistence can best be achieved. A second answer is that the mountain gorilla is of high economic value because of the ecotourism dollars flowing into the country, and so it should be preserved. In the past, we've given both answers with genuine conviction, but on examination neither has proved fully satisfying either to us or our local audience. And, indeed, there may be no single satisfactory answer to this complex question of a species' value or rights to exist.



Satellite image of the mountain gorilla habitat in the Virunga Volcanoes region

Nevertheless, in the remainder of this essay, we suggest another approach to answering the question, one that draws on our knowledge of both wild and captive gorillas, and in particular on our reflections on gorilla cognitive capacities or, what we have here loosely called the gorilla's mind. Our claim—which itself is hardly novel—is that a species' value or rights should at least partly be determined from our knowledge of the workings of its mind. In approaching the question from this angle, we avoid a problem inherent in the first answer above: the unexamined premise that gorillas, like humans, have a right to exist.

Dieter and Netzin observing wild mountain gorillas

We'll proceed by providing a little more background about the mountain gorilla, including its endangered status, and finish with a discussion of what we know about the gorilla mind, drawing on our field research on wild mountain gorillas in Rwanda and interactions with captive language-trained apes.

Of all the apes, the mountain gorilla was the last to be discovered by science. In 1902, a German army officer, Capt. Robert von Beringe, patrolling the border of German East Africa, first spotted and promptly collected (read "shot") their large black hulks on the slopes of Mt. Sabinyo in the Virunga Volcanoes region of Rwanda. Mountain gorillas are one of three subspecies of Eastern African gorillas, all geographically isolated from each other, largely because of human clearance of lands surrounding the gorilla habitats for agricultural use. The mountain gorillas confined to the Virungas are the smallest isolated population—about 380 individuals—of which a bit more than half are habituated for either tourist visits or research. Their isolated status and small population size (i.e., effective breeding population—or number of adult females—is closer to 150!), in addition to continuing threat from poaching and human habitat degradation keeps them on the IUCN Red List of Threatened Species.

Most of what we know about the ecology and social life of mountain gorillas we owe to the work of Dian Fossey who, in 1967, established the Karisoke Research Center high up in the Virungas that made possible in the ensuing decades a steady flow of university students and researchers from around the world. Fossey's story and particularly her sometimes unorthodox efforts to halt the poaching of gorillas is well known through the pages of National Geographic and the popular Hollywood production "Gorillas in the Mist". Fossey was murdered in her cabin at Karisoke in 1985, and six years later we stepped into her cabin that had been sealed since her death. Her blood stained mattress still sat untouched next to the large hole that had been cut into the sheet metal skin of the cabin, through which the killer had allegedly made his entry on that fateful night. We had come to this eerie, cold, misty mountainous place to set up home for two years, for one of us (Dieter) to direct the research center (now operated by the Dian Fossey Gorilla Fund International), and, most of all, for both of us to study the mountain gorillas.

Dian Fossey

After months of chasing chimpanzees through a snake-infested, tree-climbing lion populated riverine forest near the fabled mountains of the moon in (then) eastern Zaire, the relatively sedate demeanor of the gorillas and quiet mountain retreat seemed a pleasant change. (Little did we know that a civil war was brewing!) The 19th C German zoologist Brehm had well characterized gorillas as "born with a patent of nobility among apes…in comparison to a chimpanzee, he holds his head higher, producing the impression that he belongs to a better class of society." Both of us wished to learn what lurked in the mind of this noble primate. Following in the tradition of the husband-wife primatologists Robert Seyfarth and Dorothy Cheney, we hoped to understand how gorillas "see the world", to infer mental content from the study of their vocalizations and facial expressions. Surprisingly, at the time virtually nothing (save one paper by Fossey) had been published on wild gorilla vocalizations, despite the fact that gorillas seem to be

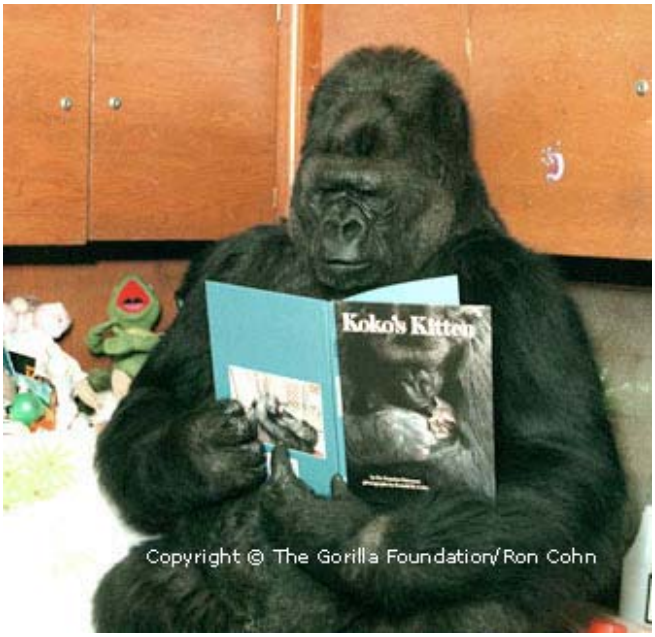
the most vocal among apes. Reminiscent of human chatter, we soon learned that gorilla calls indeed are the most frequent behavior—well, with the exception perhaps of "passing wind" brought on by their heavy herbivorous diet. Interestingly, compared to chimpanzees, gorillas are "poker faced"—they make fewer and less frequent facial expressions. We might say that they live primarily in a "vocal world" that is richly varied and contextually nuanced.

What's on Pablo's mind?

But what are they "talking" *about*? Not too long ago, primatologists believed that despite their obvious intelligence, nonhuman primates communicated only about simple emotional/motivational states. This view was in line with neurological findings of the time indicating that calls were controlled by limbic brain structures and, unlike human speech, were not under volitional, neocortical control. Further corroboration seemed to come from language-trained chimpanzees who could not be trained to speak but could use their hands and limbs to acquire American Sign Language (ASL) of the deaf. But this emotion vs. semantic dichotomous view of ape and human communicative capacity is today of little more than historical interest in light of abundant data on representational vocal signaling in monkeys, the rich representational capacities of apes and many non-primate species (e.g., crows, parrots), a point we will return to a little later.

If mammalian neocortical expansion was driven by the cognitive demands of social life—as many have proposed—then we might expect that much of the gorilla's relatively large neocortical machinery serves the daily calculus of managing social relationships and that this, in turn, is accomplished by their frequent, varied calls. The gorilla's social life does indeed seem to pose far more cognitive challenges than it's "ecological" life. Because they are the largest of the primates, they face little predation threat (other than from armed humans), and can forage in large groups on abundant and evenly dispersed herbaceous vegetation. In the Virungas, gorillas live in cohesive family-type groups of varying sizes (i.e., from fewer than 10 to over 50 individuals) containing one or more breeding silverback males, several adult females and young. While there are occasional squabbles over the juiciest wild celery stalk or largest nettle, daily life is far more of an ongoing soap opera of struggles over—yes you guessed it—sex and power, sometimes far removed from what we might expect of Brehm's noble ape. For example, though DNA paternity studies of the several groups followed by Karisoke researchers since the time of Fossey have shown that in multi-male groups dominant silverbacks father the vast majority of offspring, non-dominant males do copulate, albeit usually well out of sight of the alpha male. Moreover, while doing so, they may suppress the usual copulation call. In simultaneously following and recording calls from two group members, we found that gorillas have "conversations", apparently addressing and responding to each other in an orderly fashion. At this point, we can only speculate that these conversations provide information about who's doing what to whom and where, an idea that will need to be tested using vocal playback methods.

A complementary approach to finding out what's on a gorilla's mind is to have a conversation with a language-trained one. Of course, the ideal approach—as illustrated by Dr. Doolittle--would be for us to learn their natural language, to learn "gorillaese". It would mean turning the customary language training paradigm around, with gorillas first learning human language and then using it to teach us gorillaese. It's an interesting question by itself as to whether any ape would be cognitively capable of this kind of teaching. In any event, it is true—and not meant as a criticism—that the different ape language training efforts, or more appropriately 'enculturation' efforts, while having forced us to question anew any hard divide between ape and human cognitive-behavioral capacities, have provided no significant insight into "what it's like to be an ape".



Does Koko imagine a life for herself?

Nevertheless, a conversation with an ape can reveal what's on its mind and, incidentally, soften the most hardened skeptic. And so it went for one of us (Netzin) when some years ago we first met the ASL proficient female gorilla "Koko". We had brought our two young sons and sat in front of Koko, separated by a glass wall. Koko scooted closer to the glass, sat and squarely faced Netzin and the two boys next to her, altogether ignoring Dieter. Looking at Netzin, Koko asked (in ASL), "are these your babies, and tell them to take off their hats". Koko

was clearly a 'wanna-be' gorilla mom, interested in human motherhood.

What do we make of this close encounter with the gorilla mind? First, it seems strikingly richer in thought than can be gleaned from the lean functions inferred from their calls, facial expressions, or any other behavior in the wild. As any researcher well knows (but rarely admits in print), there is much more going on inside than can be captured by our behavioral tools. Koko and the renowned pygmy chimpanzee Kanzi understand hundreds of spoken words and simple sentences, yet we don't understand a single one of theirs! In reflecting further on these astonishing capacities of language-trained apes, however, a caveat is in order. We must consider the possibility that language acquisition—entering the realm of symbolic thought—enhances ape cognition in a domain-general way, much as it does in young children. The arduous training required to get an ape to understand a symbol may in fact rewire its brain so as to facilitate altogether new feats of cognition. Does self-awareness, for example, depend on language-facilitated symbolic or representational thought? Koko readily "passes" the self-recognition mirror test, previously failed by other gorillas. In thinking about motherhood, does Koko reflect on the meaning or value of her own life? Does language jack up her frontal lobe capacity to "prospect" (after Daniel Gilbert)—to imagine a future life she wishes for herself? Do the wild mountain gorillas introspect and prospect, are they conscious of their existence in the way we are?

Our answers to these questions, informed by our best scientific knowledge, we suggest, should guide our judgments about the value or rights of other species. For example, we value human life because it is consciously experienced or has the potential to develop into self-aware existence. We don't consider human life without consciousness worth living, not even the virtual consciousness explored in "The Matrix". We can argue that as a society, we recognize our individual desire to lead fulfilled lives and thus grant and respect others rights to pursue such subjectively rich lives. Further, our capacity to suffer is markedly enhanced by conscious awareness, such as the loss of freedom to pursue a life we have imagined for ourselves. If either gorillas or polar bears have the capacity to reflect on their lives, to imagine scenarios of their future lives, then we may be morally obligated to grant them the right to freely pursue their lives. If, however, their conscious experience is largely confined to the present and the immediate future, a kind of consciousness Daniel Gilbert calls "nexting", then, for example, living a life in captivity (in the absence of pain or other possible suffering) does not seem morally wrong or an abnegation of rights. In some ways, it is no more morally wrong than disconnecting from life support a person who has no chance of regaining consciousness. And, conversely, granting rights to other species is justified in the same way that we grant such rights to persons who exhibit or have the potential to develop conscious awareness.

In our view, then, decisions about the value or rights of other species will have to be made on a case by case basis, weighing carefully all available evidence concerning their mental capacities, both actual and potential.

Does this infant mountain gorilla have the right to exist?

Phylogenetic proximity to humans will be no sure-fire guide in this, despite the fact that apes share more of our cognitive equipment based on recent shared ancestry alone. This is because ecological convergence can produce remarkable behavioral and mental convergence in species that are genetically distant and neuroanatomically dissimilar. Among birds, corvid species (e.g., crows, magpies) most vividly illustrate what can be achieved by brains without a cerebral cortex, including many insight-related cognitive capacities previously believed possible only among primates with a well-developed neocortex (i.e., episodic memory, theory of mind, causal reasoning). As we learn more about the minds of animals, and as we face more and more decisions about what species we chose to conserve, our conservationist arguments should include a neuroethologist's testimony on cognitive capacities. In other words, in our view, how we mind gorillas should in no small measure take into account the gorilla's mind.

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For more information about gorillas visit:
The Dian Fossey Gorilla Fund International
www.gorillafund.org
The Gorilla Foundation www.koko.org

Image of Koko provided courtesy of Dr. Ron Cohn and The Gorilla Foundation/Koko.org. All other images provided courtesy of the Dian Fossey Gorilla Fund Int.

Moths, flowers, and brains in the desert: Neuroethology in the Hildebrand lab

Josh Martin
The University of Arizona, Arizona Research Laboratories Division of Neurobiology.

At dusk, the desert around Tucson cools enough to allow fragile night-blooming flowers to open for business. Among the animals that visit these flowers is a fat, fuzzy moth called *Manduca sexta*. During a few short hours after dusk, *Manduca* performs all its business of eating, mating, and laying eggs. Also out in the summer night is another curious species: the neuroethologist, interested in the chemical senses that guide *Manduca* behavior. For nearly forty years, members of the Hildebrand lab and associated workers have been observing and experimenting on these animals that use their sense of smell in almost everything they do. A basic philosophy motivates our investigations: To know what to look for in brains, one must know what problems the brain solves. Equally important is its complement: when one knows more specifically how the brain operates, subtleties of the animal's behavior may become more clear. Work in our lab thus proceeds in two complementary directions. We observe Manduca's behavior both in the field and in a controlled laboratory environment, sample the smells it is interested in to understand the patterns its brain must attend to, then seek out the codes and processes in the brain that underlie behavior. We also begin in the brain, identifying mechanisms involved in processing information about odors, and then attempt to link those mechanisms to the performance of natural behaviors. Here, I highlight a few examples of work recently published or underway that exemplify this approach.

Wind carries odors from their source in plumes that twist and curl in long, thin eddies. As a moth flies through a plume of an interesting odor such as a pheromone, it alternately encounters brief pulses of odor interspersed with clean air. Clever experimentalists in other labs have manipulated the odor plume into a continuous, diffuse cloud, and found that moths could not locate the odor source. The discontinuity of the plume is necessary for that. Work in our lab established that the output neurons of the moth's primary olfactory center respond to brief odor pulses with correspondingly brief bursts of spikes, with silent periods in between. Behavior and neural observations therefore correlated well. But correlation not equaling causation, members of our lab set out to connect the two. They discovered that when the brain was bathed in an antagonist of an inhibitory transmitter, the silent spaces between odor pulses filled with spikes. The drug didn't change other features of the response, providing a reasonably clean pharmacological tool to disrupt an odor-sensitive neuron's ability to follow pulses of odor. A technique developed in our lab allowed injection of the drug into the primary olfactory center of intact moths, which could then be induced to follow pheromone plumes to their source in a wind tunnel. The

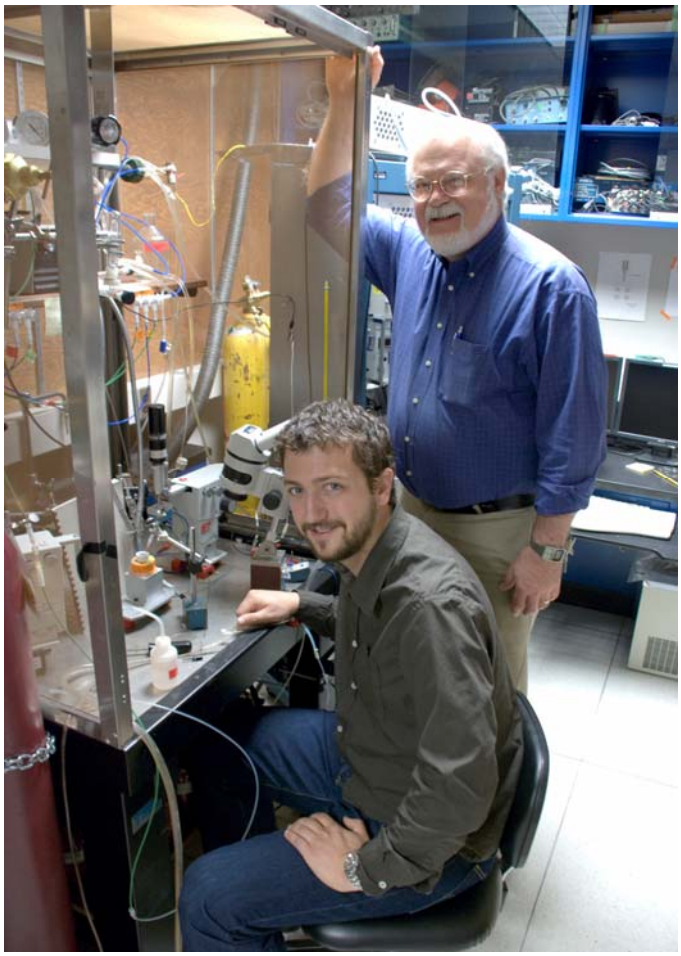
Manduca sexta relies heavily on smell for survival and reproduction. Clockwise from top left: A male moth feeds from a Datura flower; A male approaches a female for mating; A female lays eggs on Datura leaves (Photo Credit: C. Hedgcock)

winding, meandering paths of injected moths compared to the sure, straight paths of their unmanipulated cousins provide evidence that the contrast between odor and clean air, spikes and silence in the brain, allows these animals to find the sources of odors, mates as well as food for themselves and their offspring (Lei et al., 2009).

Other projects continue on either end of the brain-behavior spectrum. Collaborations with field biologists presented an interesting question. Naïve moths prefer to feed from the flowers of Sacred *Datura*. In the Sonoran Desert, these large, white, fragrant blossoms are abundant during only part of the summer. Moths caught when *Datura* is scarce have traces of pollen from *Agave* flowers on their proboscises. Given the choice, naïve moths prefer *Datura* over *Agave*, but moths that experience feeding from *Agave* lose this preference and readily feed from both. Learning in this natural context allows us to investigate how the brain encodes odors that are innately attractive, and those that are learned during the animal's life (Riffel et al. 2008).

The odors that attract *Manduca* to visit flowers, mates, or places to lay their eggs are complex mixtures of many volatile chemicals. We dissect these odors to catalogue their constituent parts, and reassemble them to understand their representation in the brain, and their effect on the moth's behavior. We have collected hundreds of *Datura* flowers from *Manduca*'s range around Tucson, and analyzed what exactly constitutes this signal that the moth must decode to find a reliable source of food. Work in our lab has shown that, as in previous work on the pheromones released by females, neurons in the antennal lobe respond strongly to a few of the dozens of chemicals

present in the odor, and the mixture of these odors alone are sufficient cues to drive behavior. In behavioral tests, moths can detect and locate the source of this mixture even at very low concentrations. The brain responds to this mixture with specific patterns of synchrony between neurons that are consistent across concentration, even as other features of the response are less reliable (Riffel et al. 2009). Both mates and flowers also release their odors in consistent proportions. Recent behavioral experiments have confirmed that moths are most attracted to these odors in their natural proportions, and we now turn again to the brain, to seek out how this additional dimension of the odor is encoded. Finally, we seek to reconcile unique observations in the brain with the roles they may play in the animal's life. Certain cells in the brain of the female moth respond to a specific enantiomer of a volatile chemical, and not the mirror-image version (Reisenman et al. 2004). We are investigating the role of the enantiomer in guiding female-specific behavior such as egg-laying, and the conditions under which discrimination between such extremely similar chemicals aids the survival of *Manduca*.



The author (foreground) and John Hildebrand in the lab (Photo Credit: C. Hedgcock)

Neuroethology in the Hildebrand lab has the goals common to all neuroethological research. We seek both to understand the mechanisms in the brain that control animal behavior, and to more firmly link mechanisms found in the brains of many species, such as synchrony, to specific behaviors in our model animal. I will take from my training in John Hildebrand's lab an ethos to guide my work in neuroethology: Behavior tells us what to look for in the brain, and the brain can also tell us what subtleties to look for in behavior. Only when an explanation satisfies in both directions can we call it complete.

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XIV Escuela Latinoamericana de Neurociencias

Montevideo, Uruguay 2009

Ana Silva & Jose Luis Peña

The *XIV Latin American Advanced School of Neuroscience* took place in Montevideo, Uruguay from March 16th to April 3rd 2009. The purpose of this IBRO School, a now well-established event, is to provide training to young Latin American neuroscientists and promote scientific and social interaction between international researchers and students from Latin American countries. This edition of the School was directed by Federico Dajas and Omar Macadar. The local Organizing Committee selected 28 graduate students from among more than 130 applicants. Excellent students from Argentina, Brazil, Chile, Colombia, Cuba, Peru, Venezuela, Spain, and Uruguay attended and more than 40 lecturers participated. Please check the website http://www.iibce.edu.uy/escuela for more details.

Group picture of students and lecturers at the charming patio of the Instituto de Investigaciones Biológicas "Clemente Estable", host institution of the XIV Escuela Latinoamericana de Neurociencias, Montevideo, Uruguay.

The first "Escuela Latinoamericana de Neurociencias" took place in Montevideo in 1996. It was created as a joint effort of the Instituto de Investigaciones Biológicas "Clemente Estable" (IIBCE), the School of Medicine, and the School of Science of the Uruguayan Universidad de la Republica. The course is now a crucial starting point in the training of young Uruguayan scientists interested in neuroscience, and the International Brain Organization (IBRO) has used it as a model for other schools of neuroscience. To date, more than 60 researchers from Uruguay, 120 researchers from other countries, and more than 300 students from Argentina, Brazil, Chile, Colombia, Cuba, Ecuador, France, Mexico, Peru, Spain, Uruguay, and Venezuela have participated in the School. The School covers the field of neuroscience from cellular and synaptic physiology to systems and behavior. Activities include morning lectures at the Instituto de Investigaciones Biológicas Clemente Estable (IIBCE) and afternoon experimental seminars in laboratories at IIBCE, the School of Science, and the School of Medicine. All activities are oriented to enhance critical and creative thinking and the discussion of scientific literature.

Traditionally the School's program has focused on basic neurophysiology, neural development, sensory physiology, and behavior. To our delight, this year the organizing committee decided to dedicate the third week to Neuroethology. We – Ana Silva (School of Science-IIBCE, Montevideo, Uruguay) and Jose Luis Peña (Albert Einstein College of Medicine, Bronx, New York) – co-organized this week. ISN generously contributed by covering the travel of six members of the Society – Catherine Carr (University of Maryland, USA), Martin Giurfa (CNRS, University Paul Sabatier-Toulouse, France) John Hildebrand (University of Arizona, USA), Peter Narins (University of California, USA), Philip Stoddard (Florida International University, USA), Lidia Szczupac (University of Buenos Aires, Argentina), and Daniel Tomsic (University of Buenos Aires, Argentina) – so they could attend and lecture during this week. This outstanding group of researchers, combined with the invaluable collaboration of the visiting professor Kent Dunlap (Trinity College, USA) and the Uruguayan scientists Angel Caputi, Marita Castelló, Annabel Ferreira, and Juan Valle Lisboa, contributed to make this week devoted to Neuroethology a great success.

We believe we have fulfilled the goal of connecting Latin American students with each other and with outstanding neuroethologists. In doing so, we have also fulfilled a mission very dear to our hearts, which is to promote Neuroethology in young Latin American scientists. The Neuroethology week was considered by the students, and, of course by us, a very exciting and thought-provoking section of the School. This success was greatly due to the outstanding set of lecturers who participated. Because of them, we could create a cohesive program showing students of most diverse backgrounds how Neuroethology helped make the knowledge of Neuroscience they had learned in the first two weeks fall into place.

Organizers at "El Terruño" restaurant, where students and lecturers gathered for dinner. From right to left. Ana Silva, Rossana Perrone, Jessika Urbanavizius, Florencia Arredondo, Jose Luis Pena

Establishment of the Developing Neuroethology Fund

Willi Honegger (h.willi.honegger@vanderbilt.edu), Al Feng, (afeng1@illinois.edu), Barb Beltz (bbeltz@wellesley.edu)

Dear friends,

We are pleased to announce the official establishment of the "Developing Neuroethology Fund (DNF)". The DNF shall support ISN members in emerging and developing countries to participate in ISN congresses.

The ISN has allocated $ 20,000 as seed money for this program. Of this, $8,000 will be used as travel support for the

Salamanca conference. The rest will be put into an endowment that will be built up further with part of the donations from ISN members. Your donation is crucial if the DNF is to have a long-lasting impact.

Some of you have pledged to contribute towards this fund. These initiatives have been instrumental in setting up the DNF. We thank you for your generosity, and ask that you please make the donations on-line now for the year 2009. Simply click on the link 'Donations' on top the ISN home page. This brings you to the voluntary contributions. The DNF is listed among them. We wish to ask other members to join in this worthy initiative that will allow our colleagues to participate in our congresses. We hope that you share our belief that this fund is needed to establish the internationality of the society and that it will strengthen Neuroethology. We envisage and welcome donations at any time in the future, but the current year is critical in building a financial base for the program.

We, the members of the committee, will also work on obtaining money for the DNF from governmental and private agencies. There will be an opportunity at the business meeting in Salamanca to discuss the future of this fund. Please email one of us if you have any questions.

Thank you for your attention.

Willi Honegger (h.willi.honegger@vanderbilt.edu)

Al Feng, (afeng1@illinois.edu)

Barb Beltz (bbeltz@wellesley.edu)

Supplemental information:
The award process and the governance of the DNF will be as follow:
The applicant must submit: (i) the abstract including the names of authors, (ii) the type of presentation (oral or poster), (iii) the amount of travel funds requested, (iv) a brief justification for the request of travel funds, (v) the amount of matching funds from the applicant's institution (if none, a letter from the PI or the applicant's Department Chair is required to certify the lack of travel funds). The call for applications will be published in the ISN newsletter at the start of 2010. (The award committee will consist of the DNF Committee, the President, the Treasurer, and the Chair of the Heiligenberg Award Committee). The DNF Committee will work closely with the Heiligenberg Award Committee so that all applications for travel support will be in the hands of one committee (and that there will be no double-dipping from the different support pools). A decision on which applications will be funded will be published in April 2010.

3rd Computational Neuroscience Summer School

Center for Neural Dynamics
University of Ottawa
JUNE 7-20, 2009

We are pleased to announce the 3rd summer School in Computational Neuroscience, which will be held from Sunday June 7, 2009 until Saturday June 20, 2009 inclusively. It is organized by the Center for Neural Dynamics at the University of Ottawa. The highly pedagogical course is directed at graduate students and postdoctoral fellows from the physical sciences (e.g. physics, applied mathematics, engineering, computer science) and the life sciences (e.g. neuroscience, biology, physiology, human kinetics) who wish to develop their skills in neural data analysis and in mathematical modeling of neural activity. The topics will range from cellular to systems neuroscience, with a focus on sensory and motor systems.

The course will consist of 3 hours of lectures in the mornings, followed by 3-hour MATLAB-based computer laboratories in the afternoons. Participants will pair up for these laboratories, and an effort will be made to pair someone from the life sciences with someone from the physical sciences. All classes and laboratories will be held on the main downtown campus of the University of Ottawa. The School will be held in English, although many of the lecturers also speak French. The course can be taken for credit, since it is a University of Ottawa three-credit graduate course (NSC8104). The mark will be based on work done in the computer laboratories and on the presentation of a research project by the end of the course, with write-up to follow within a week. The first day of the school (Sunday June 7th) will be a mathematics refresher open to all participants, which will include some introduction to differential equations.

Enrollment in the course will be limited to 40 participants.

MATH PRE-REQUISITES: Calculus I and II, first-year university level Linear Algebra and Probability and Statistics.

LIFE SCIENCES PRE-REQUISITES: first-year university level life science courses for students in the physical sciences.

FACULTY

Prof. Ramesh Balasubramaniam, School of Human Kinetics, McMaster University
Prof. Maurice Chacron, Center for Nonlinear Dynamics, Dept. Physiology, McGill
Prof. Victor LeBlanc, Mathematics and Statistics, University of Ottawa
Prof. John Lewis, Biology, University of Ottawa
Prof. Tim Lewis, Mathematics, University of California at Davis
Prof. André Longtin, Physics, Cellular and Molecular Medicine, University of Ottawa

Prof. Len Maler, Cellular and Molecular Medicine, University of Ottawa

TUITION
see the application form at:
http://www.neurodynamic.uottawa.ca/summer.html

ACCOMMODATION
Accommodation will be available at the Stanton Residence of the University of Ottawa, a few minutes walk away from the Biosciences Complex, cafeterias and downtown Ottawa with its restaurants, museums etc... Accommodation consists of a single or double room (with respectively one or two single beds, desks and internet access), with communal kitchen and living area and shared bathroom. The cost is approximately $40 CAN per night per person, taxes included.

FINANCIAL SUPPORT
Partial financial support is available for those demonstrating the need.

IMPORTANT DATES
February 1st , 2009: Application, including a letter of recommendation sent to compneuro09@uottawa.ca
February 15, 2009: Notification of acceptance and level of financial support.
March 1st, 2009: Notification of acceptance by the participant.
Accommodation: as soon as possible after notification of acceptance, participants can reserve their accommodation online at reserve@uottawa.ca or by phoning 1-888-564-4545.

REGISTER AT:
www.neurodynamic.uottawa.ca/summer.html

CONTACT US: compneuro09@uottawa.ca

SYLLABUS

1) Introduction to Linear and Nonlinear Dynamical Systems
-solutions of linear differential equations
-qualitative analysis of nonlinear differential equations

2) Single Neuron Models
-ionic models
-simplified deterministic models
-stochastic models

3) Neural Spike Train Analysis and Modeling
-basic statistics
-autocorrelation, spectrum
-information theory toolbox

4) Sensory Coding
-artificial and naturalistic stimuli
-modeling activity along the afferent pathways
-modeling feedback
-population coding and information theory

5) Computational and Dynamical Approaches to Motor Control
-posture control and equilibrium point approaches
-movement adaptation to force fields
-timing and rhythmic movements
-computational approaches to movement pathologies

6) Synaptic Plasticity
-short term depression and facilitation
-long term plasticity
-implications for information processing

7) Coupled Neurons
-gap junction
-excitatory and inhibitory synaptic coupling
-effect of coupling on neural population behavior

8) Waves of Activity in Neural Networks
-neural field models
-traveling waves
-spiral waves

The Winners of the 2008 Capranica Foundation Prize:

Marcos Gridi-Papp and Stanley Heinze

The nominees for the Capranica Foundation's 2008 Award of $5000 were evaluated by a Selection Committee of Drs. John G. Hildebrand (University of Arizona), William B. Kristan (University of California at San Diego), and Masakazu Konishi (California Institute of Technology). Competition was based on selection of the most outstanding paper published by a young neuroethologist during 2006-2008. A total of 18 candidates applied and the scope of their research was incredibly broad-ranging in animals studied, techniques used, and behaviors characterized. The quality of their work overall was uniformly high: the science was creative, clever, and beautifully described. It is clear that experimental research and interest in neuroethology around the world today has reached a remarkable level, so that this award is indeed an international competition open equally to applicants of all nationalities. Given the overall excellence of the papers that were submitted, selection of the most outstanding was not an easy task. Following lengthy discussions and thoughtful deliberation, the members of the Committee finally reached agreement that the prize should be shared equally between **Dr. Marcos Gridi-Papp** and **Dr. Stanley Heinze**. Their research was based on discoveries that each of them made, and they either solved long-standing questions (Heinze: how are e-vectors calculated?) or overturned previous generalizations (Gridi-Papp: frogs cannot control the sensitivity of auditory input). They both worked on questions that derived from natural behaviors and used several different techniques in pursuing the answers. They both conducted an immense amount of systematic work and were ranked as the best ever in each of their labs. The Committee

viewed these two candidates as having made exceptional contributions to the field of neuroethology and recommended that they share the Prize equally:

M. Gridi-Papp, A.S. Feng, J.-X. Shen, Z.L. Yu, J.J. Rosowski, and P,M, Narins "Active control of ultrasonic hearing in frogs, "*Proceedings National Academy Sciences*," 105 (31): 11013-11018 (2008). It is well known that the middle ears of more advanced vertebrates possess a set of middle ear muscles and bones that, in the presence of loud sounds, can modulate the transmission of sound to the inner ear, thus serving as a protective mechanism. In frogs the middle ear cavity contains just a simple rod-like columella and a normally open Eustachian tube that communicates with the mouth. Yet many anurans produce very intense vocal signals and they live in very noisy sound congregations. So how can they protect their inner ears from acoustic damage? Gridi-Papp and his coworkers discovered that the frog closes its Eustachian tubes during vocalization and also during swallowing. This closure results from contraction of the submaxillary and petrohyoid muscles, which drastically reduces the air volume behind the eardrums. The reduction in air volume increases the middle ear impedance, which results in 26 dB attenuation of low frequencies that dominate the noisy acoustic environment. This is a remarkable discovery in anuran sound communication.

S. Heinze and U. Homberg "Maplike representation of celestial *E*-vector orientations in the brain of an insect" *Science* **315**(5814): 995-997 (2007). Many animals, including both vertebrates and invertebrates, can detect linearly polarized light. The plane of polarization (*E*-vector) varies systematically across the blue sky and depends on the sun's position. For many insects this polarization pattern serves as a spatial map for navigation. In the locust *E*-vector orientations are detected in a specialized part (dorsal rim area) of the compound eye. The polarized-light signals from both eyes are integrated in the central complex, a group of neuropils spanning the midline of the insect brain, which consists of two substructures: the protocerebral bridge and the central body. Through a large number of intracellular recordings with systematic anatomical analyses, Heinze and Homberg discovered that a topographic *E*-vector map underlies the columnar organization of the protocerebral bridge in the locust. This map is highly suited to signal head orientation under the open sky. This finding is the first to demonstrate a systematic compass-like representation of azimuthal space in any animal.

Positions available

Postdoctoral position in Neuronal Homeostasis, Whitney Lab / University of Florida

A postdoctoral position in neuroscience is available at the University of Florida Whitney Laboratory for Marine Bioscience and the College of Medicine Neuroscience Department, in the laboratory of Dirk Bucher.
The aim of the project is to study the homeostatic regulation of synaptic and intrinsic neuronal properties in the stomatogastric nervous system of crabs and lobsters. The position is NIH funded and can start immediately. Interest/training in electrophysiology is preferred, but applicants with a background in molecular neuroscience are welcome. In this project we use electrophysiological, molecular, and anatomical approaches to investigate the regulation of neuron and network properties that, in the face of plastic changes, keep physiological parameters in a functional range. Further information on the projects in the lab can be found on the lab website: http://www.whitney.ufl.edu/BucherLab/index.htm
Salary will be commensurate with level of experience. The Whitney lab is an off-campus institute in St. Augustine, Northeast Florida, in a spectacular beach location. For further information, go to http://www.whitney.ufl.edu. Please send curriculum vitae and contact information for references to bucher@whitney.ufl.edu

Postdoctoral position in auditory neuroethology, University of Minnesota

A postdoctoral position is available to study hearing and acoustic communication in treefrogs using behavioral and neurophysiological methods (http://umn.edu/home/mbee). The position involves the use of behavioral experiments to examine the mechanisms of hearing in noisy environments and it will provide excellent opportunities to develop and implement methods for investigating the neural mechanisms of hearing in these organisms. Applicants should have a PhD in animal behavior, psychology, neuroscience, or a related discipline. A background in animal acoustic communication, neuroethology, psychoacoustics, electrophysiology or auditory neurophysiology is preferred. Interested applicants must apply online at http://employment.umn.edu. Search for requisition number 160547. In addition to applying online, please have two letters of recommendation sent via email (preferable as PDF files) to Dr. Mark Bee at mbee@umn.edu. Review of applications will begin after June 1, 2009, with an anticipated start date of September 2009.

Postdoctoral and Research Scientist positions at Janelia Farm

Positions are available for both postdoctoral fellows and research scientists in the laboratory of Anthony Leonardo at the Janelia Farm Research Campus of the Howard Hughes Medical Institute (Ashburn, VA; http://www.hhmi.org/janelia/). We study how neural circuits work, what they do, and how they are linked together to produce computations and behaviors. Research in the laboratory is focused on the neural basis of prey capture, in both salamanders and dragonflies. Our work takes a systems level approach, combining quantitative behavioral measurements, neural recordings, and theory. We are looking for candidates with an outstanding track record in at least one or more of these areas. More information on research in the lab, and ongoing projects, may be found here: (http://www.hhmi.org/research/groupleaders/leonardo.html.

Janelia Farm offers an unparalleled environment for scientific research, with generous benefits and competitive salaries.

Postdoctoral position in auditory neuroethology, University of Minnesota - Twin Cities

A postdoctoral position in the Department of Ecology, Evolution, and Behavior is available to investigate acoustic communication in a lower vertebrate model. Our NIH-funded research uses behavioral and neurophysiological methods to study the auditory systems and communication systems of treefrogs (http://umn.edu/home/mbee). The position involves the use of behavioral experiments to examine the mechanisms of sound source segregation in noisy social environments and it will also provide excellent opportunities to develop and implement methods for further investigating the neural mechanisms of hearing in these organisms. The position also provides an opportunity to interact with a large community of behavioral biologists, ecologists, evolutionary biologists, auditory neurophysiologists, audiologists, and hearing psychologists.

The successful applicant will have a PhD in animal behavior, psychology, neuroscience, or a related discipline. A background in animal acoustic communication, neuroethology, psychoacoustics, electrophysiology or auditory neurophysiology is preferred, and the candidate should have demonstrated competence in conducting experiments in one or more of these disciplines. Desirable applicants will also have the ability to perform digital signal processing using Matlab and/or other programming languages. Salary will be commensurate with experience.

Interested applicants must apply online at http://employment.umn.edu. Search for requisition number 160547. Applications should include (1) a cover letter, (2) a curriculum vitae, and (3) a statement of research interests and experience (attach as Additional Document 1). PDF attachments of published or in press papers are encouraged but not required. In addition to applying online, please have two letters of recommendation sent via email (preferable as PDF files) to Dr. Mark Bee at mbee@umn.edu. Review of applications will begin after June 1, 2009, with an anticipated start date of September 2009.

Research Technician position at Janelia Farm/HHMI

A research technician position is available in the laboratory of Anthony Leonardo at the Janelia Farm Research Campus (JFRC) of the Howard Hughes Medical Institute (Ashburn, VA).

We are investigating the neural basis of prey capture in the salamander retina. The technician position involves using a multi-electrode array to record extracellularly from large numbers of retinal ganglion cells while simultaneously delivering patterned light stimulation to the photoreceptors. More information on our lab may be found here: http://www.hhmi.org/research/groupleaders/leonardo.html

An undergraduate degree, previous neurophysiology research experience, and proficiency with Matlab are required. This is an ideal position for a new college graduate who wishes to do a year or two of research before entering a PhD program (perhaps at JFRC). This is a full-time position with a minimum 1 year commitment. To apply, please send a cv, research statement, and contact info for 2-3 references to Anthony Leonardo (leonardoa@janelia.hhmi.org).

Add our Link to Your Website!

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