International Society for Neuroethology

Newsletter

January 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

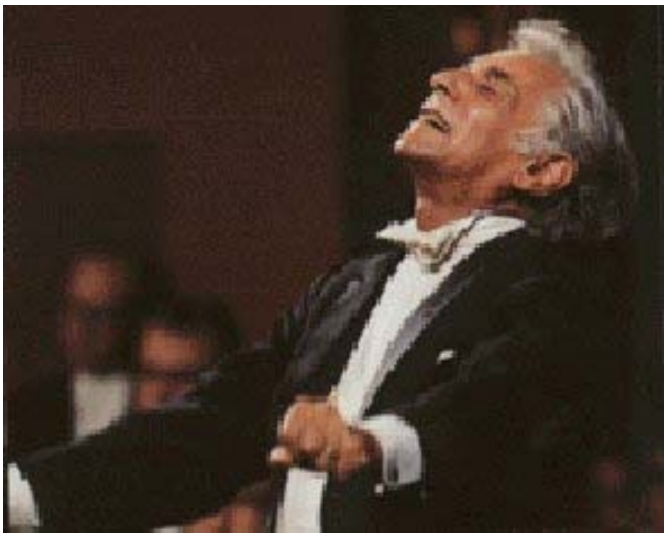
Happy New Year ISN!

Katalin Gothard (kmgothard@email.arizona.edu)
The University of Arizona, College of Medicine, Department of Physiology and Arizona Research Laboratories Division of Neurobiology

When the hangover is gone from the parties that ushered in the New Year, the question arises: why do we feel compelled to celebrate the New Year? Compared to other celebrations, the New Year it less meaningful because no myth or historic event is attached to it. It is an arbitrary change of numbers in the calendar. Nevertheless, at midnight we do not feel sorrow for the time that passed, but joy for what is coming – we get excited about beginning of a fresh new chapter of time, united by hope and by the promises of good times to come.

On January 1, 2009 the public TV station in Tucson broadcast the historic concert of December 25, 1989 from Berlin. Leonard Bernstein, although severely ill, returned to Berlin to direct Beethoven's Ninth Symphony, as one of his last great performances. Under his baton, an international orchestra was assembled to mark with this monumental piece of music the

fall of the Berlin Wall, the reunification of Germany, and the end of the Cold War. There was unparalleled joy in Berlin, but also throughout Eastern Europe because the totalitarian regimes were crumbling one by one. Joy is the theme of the Beethoven's Ninth but the musicians agreed to change the word Freude (joy) to Freiheit (freedom). In a tacit agreement between Schiller, Beethoven, and Bernstein (and, as I know him, I bet John Hildebrand was in on this too), the first word sang by the baritone was Freiheit! This newly gained message of Beethoven's Ninth hit home for me; I lived in Romania at the time and we had been free for only three days, and could not yet grasp the idea that the regime in Romania had also fallen like the wall in Berlin. Crouching on a chair with my ears held to the loudspeaker of the old radio, my throat and fists were clenched, I felt a mixture of pain and happiness listening to this once-in-our-history concert.



Leonard Bernstein conducting

The word "freedom" never felt more powerful for Europeans than it did then, and for me it also meant freedom to become a scientist. In the past 19 years this word gained many new meanings; instead of thoughts of freedom from totalitarian tyranny, I contemplate dopamine-mediated freedom from GABA-ergic inhibition in the amygdala during emotional learning. I look for mechanisms of freedom from relatively rigid control of behaviors – for the role of modulation (at least) or control (at best) of emotional behavior from higher cognitive centers. I often contemplate decision-making in primates – we have some freedom from making decisions based on fear and hunger alone, from being dominated by the selfish gene, the selfish limbic system, which transforms blindly our basic drives into actions. There is hope that we can learn how these systems work and gain freedom from tyranny inside to become clever, generous, and compassionate beings. Every beginning holds this promise, and this is how we close the circle back to Beethoven – "Alle Menchen werden Brüder" (all men are brothers) – and to what neuroethologists share, the love for "Freude trinken alle Wesen/An den Brüsten der Natur" (all creatures, drunk on joy from Nature's breast).

Happy 2009 to all neuroethologists, to all the wonderful creatures you study; here is to the Beethoven, to joy and freedom of science, and the brotherhood that unites all who love Nature.

A Visit to Salamanca is like walking through poetry

By Dean Alger (a special to the Pioneer Press)

Salamanca, about 120 miles west and a little north of Madrid, is not well known in America, but to Spaniards and many other Europeans, it is a very special place. Spaniards even say the name "Salamanca" with a special feel. The four syllables are pronounced rapidly but lyrically, with a Spanish soulfulness, rhythm and flair — sounding sort of like a linguistic Flamenco expression. We were visiting this town as part of an international conference examining democracy in the 21st century. It was an appropriate place for contemplating the future of how we govern ourselves.

Fig 1. An ancient tower juts out from a street in Salamanca.

As the site of one of Europe's oldest universities, Salamanca offers a rich historical background. The University of Salamanca was founded in the 1200s. In the 1500s and 1600s, it

was one of the great centers of learning in Europe and remains an active university. Visitors can tour the original classrooms and the impressive formal ceremonies room, still used for special events. The extraordinarily ornate carved stone façade all around the main entrance is a must-see that also makes for a unique visual game: Among the hundreds of carved figures of all sorts, there is a small frog. For generations, it has been said if you can find the frog, you will have good luck.

On a warm, summer evening, with the sun pouring over the riot of carved figures throughout the façade, there were dozens of people, necks craning upward, searching for that little frog — and a little luck. Unlike that frog, storks — a protected species — were in abundant sight, making their huge nests on the tops of several church bell towers.

Fig. 2 The lights go on at dusk each night in the central plaza in Salamanca, Spain. (Photos by Dean Alger)

The sun plays a special role in the impressions and heritage of the city. Because of the sort of sandstone used in most of the older buildings, a rich golden glow floats through the city as the last hours of sunlight shine on the walls. The place especially favored by that golden glow is the Plaza Mayor.

The Plaza Mayor — meaning the main or central plaza — is the official center and the heart and soul of Salamanca. It is delineated by the Baroque-style building from the 1700s that fully surrounds the square (punctuated by archways to allow entrance).

One Spanish map with notes on city attractions says the Plaza Mayor, "is like a big living room" for Salamanca, and that it "is the monument which the people who live in Salamanca most love and enjoy." That big living room becomes a gathering place for Spaniards starting about 8 each night. Restaurants, ice cream shops and other storefronts start filling up. Citizens gather at tables for a drink and then dinner, while teens gather more toward the center of the Plaza, simply sitting on the stone "floor." Some nights, there are public events, including speeches. Other nights, roaming musicians entertain the crowds. And in the summer as the sun goes down, with that golden glow just fading from the top of the east side of the Plaza building, they turn on lights around the building. Plaza Mayor then becomes a place of magic.

Earlier in our trip, arriving from Madrid, we drove up a little rise, the road turned right, then we were on a bridge over the River Tormes, where two towers topped with domes dazzled against the brilliant blue sky. The medieval flying buttresses and other characteristics of the great gothic cathedrals highlighted the Cathedral of Salamanca. The building is actually two conjoined cathedrals: the "Old Cathedral" and the "New Cathedral." Not exactly new by American standards — the building was begun in 1513, and various segments were finished in the 1600s and 1700s, it's significantly younger than the old portion, which was begun in 1152.

The greatest cathedrals in Europe are surely among the most magnificent of all human artistic creations. Along with being extraordinary expressions of religious inspiration, these buildings are used as communal gathering places in daily life.
The nave, transepts and other main parts of the New Cathedral are simply breathtaking, with the soaring fluted columns rising to ribbed, vaulted ceilings. In the center is the nearly 200-foot dome, with scenes of the Virgin Mary painted around its base and exquisitely detailed carvings decorating the fluted columns. Sightseers can get a striking look at the dome with the large mirror on a little platform the church supplies.

We also were treated to a concert on the New Cathedral's organ. As the sound reverberated through the great, soaring spaces of the church, we marveled at the beauty of the music and sites, including the sumptuously ornate framework of the organ itself. Finally, at the closing session of the conference, Spanish executive and politician Alfonso Guerra said, "I know the real reason you came to this forum is because it is being held in Salamanca!" There were acknowledging smiles and chuckles throughout the auditorium. Salamanca is indeed a special place.

Dean Alger is a writer and Media and Public Affairs Consultant who lives in St. Paul.

The Future of Neuroethology

Seth Ament
Gradudate Program in Neuroscience at the University of Illinois)

It is difficult to predict the future directions within a scientific field that are 5 or 10 years away, let alone 50. However, the scientific careers of today's graduate students are likely to span this entire period. For a recent conference, I was asked to present my thoughts on the future of Neuroethology, the scientific study of the neural basis for behavior.

It is probably a given that scientists within a field are bullish on their own field's scientific prospects. For neuroethologists, who have long relied on specialized "behavioral" model systems rather than catch-all "genetic" models, cheap genomics and broadly applicable neural imaging techniques (among other innovations) are likely to level the technological playing field between traditional and emerging models. Furthermore, the success of the field of the evolution of development ("evo-devo") and a new genome-inspired appreciation for similarities between taxa appear to increase the demand for comparative studies across biology. Meanwhile, informatics specialists are assembling the databasing tools that are necessary to make sense of all these data. Therefore, at least from an insider's perspective, the near-term future looks to be a bonanza for the synthetic, comparative, and non-reductionist approach long championed by neuroethologists.

If this is such a good time for neuroethological approaches, why do self-identified neuroethologists remain a small part of the Society for Neuroscience and other mainstream neuroscience venues? And why do many neuroethologists struggle to secure funding for their research? To some extent there seems to be an image problem for the field. Upon describing my own interests to one respected scientist, he raised an eyebrow and mused that it was unusual to encounter someone "who is still so interested in neuroethology". Faced with this sort of skepticism, it may be difficult to convince the best students to stay in the field. An informal poll of graduate students I have encountered at neuroethology meetings suggests that few would describe themselves primarily as neuroethologists, preferring to self-identify with other sub-disciplines such as behavioral neuroscience (which despite the similar name seems to be a distinct field).

These worrisome signs suggest that it would behoove neuroethologists to develop a strategy to combat their image problem in order to fulfill the field's evident scientific potential. This image campaign could be guided by assertive and effective advocacy from scientific societies at meetings and through perspectives and reviews in major journals. Although the future for the science seems bright and scientific study of behavior is likely to go on with or without a discipline called neuroethology, it would be a shame to lose the continuity and perspective that this community provides.

Seth Ament is a graduate student in Neuroscience at the University of Illinois. He studies the molecular basis for social behavior in honey bees.

The Winners of the 2007 Capranica Foundation Prize: Gary Marsat and Yun Zhang

The nominees for the Capranica Foundation's 2007 Award of $4000 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 papers published by young neuroethologists during 2005-2007. Following lengthy discussions and deliberation, the Committee reached unanimous agreement that the prize should be shared equally between Dr. Gary Marsat and Dr. Yun Zhang. The members of the Committee viewed their papers as exceptional contributions to the field of neuroethology and their papers received the following citations:

Gary Marsat and Gerald S. Pollack "A behavioral role for feature detection by sensory bursts," Journal of Neuroscience 26: 10542-10547 (2006). Episodes of brief bursts of high-frequency firings are common occurrences in the sensory nervous systems of many animals, both vertebrates and invertebrates. This has led to the assumption that bursting constitutes a specific universal neural code for signaling the occurrence of a behaviorally relevant stimulus, namely it reflects the underlying process of feature detection. However the behavioral relevance of such neural bursts has not been well established in the sensory system of any animal. Marsat and Pollack studied the functional significance of neuronal bursting in the auditory system of the cricket Teleogryllus oceanicus . They recorded the activity of interneuron AN2 in both the left and right cervical connectives. The responses of these neurons to ultrasonic frequencies (30kHz) are thought to alert the insect to hunting bats. These interneurons fire both isolated spikes and bursts of spikes. Marsat and Pollack used signal-detection measures to quantify the performance of bursts and isolated spikes as feature detectors. Comparisons of spike-triggered and burst-triggered averages to fluctuations in stimulus envelope show that bursting encodes stimulus amplitude changes and sound direction much better than isolated spikes. Furthermore they showed beautifully the significance of AN2 bursting in eliciting evasive behavioral steering movements of tethered crickets. This study is an excellent example of classical neuroethology

Yun Zhang, Hang Lu, and Cornelia I. Bargmann "Pathogenic bacteria induce aversive olfactory learning in Caenorhabditis elegans ," Nature 438: 179-184 (2005). The soil nematode Caenorhabditis elegans is an excellent model organism for

neurogenetic studies. Its nervous system consists of only 302 neurons whose complete wiring is known, thus facilitating the identification of molecules, neurons and circuits involved in behavior. One of its most robust and important behaviors is an innate olfactory chemotaxis toward food-associated odors. While these worms normally feed on benign bacteria, they are nevertheless susceptible to intestinal infection by pathogenic bacteria that may be present in the soil. Zhang, Hu and Bargmann used infection by pathogens to develop an ecologically relevant olfactory learning assay involving a clever multiple-choice paradigm. They discovered that C. elegans worms learn within just a few hours to selectively avoid the odors of pathogenic bacteria while continuing to show positive chemotaxis to familiar non-harmful bacterial strains. These changes in olfactory preferences are highly suggestive of associative learning. By use of immunoreactivity studies, Zhang et al. discovered that pathogens increase serotonin in ADF chemosensory neurons through both transcriptional and post-transcriptional mechanisms. These results imply that an increase in serotonin may directly promote olfactory learning in pathogen-exposed animals. The success of this study stemmed in large part from the innovative design of using complex odors of actual bacterial food, rather than the traditional use of simple pure odors. This paper therefore represents an innovative important neuroethological step forward for others to follow in future studies of olfactory learning in simple animals.

Wikis in Research and Teaching

Paul Katz (pkatz@gsu.edu)
Georgia State University

By now, most of you are familiar with Wikipedia (http://wikipedia.org/), the on line encyclopedia that anyone can edit. It's the first place that I turn for information about things that I know little or nothing about. Actually, the first place that I go is Google and Google usually directs me to Wikipedia. I have found Wikipedia to be generally accurate. A few years ago, Nature compared its accuracy favorably to that of the Encyclopedia Britannica (1). For obvious reasons, I would never rely on either Wikipedia or the Encyclopedia Britannica as a source of information in a scientific area. Nevertheless, the Wiki format can play an important function in science and can serve as a useful teaching tool.

What is a Wiki?

A Wiki is simply a webtool that allows multiple users to update the content. This can be implemented in a variety of ways. Wikipedia, for example, uses a open source package called MediaWiki (http://www.mediawiki.org). Wikis can differ in who they allow to edit the content. Wikipedia is one extreme in which anyone can change the content. This means that it must be constantly patrolled for inaccuracies and for vandalism. The other extreme is that only a select group of editors can make changes. For example, we have a lab Wiki (http://katzlab.org/) that can only be edited and viewed by members of my laboratory. We use this as a place to keep track of experiments and protocols. There are a number of Wikis that fall between these two extremes, which I would like to bring to your attention because they can be important resources for research and teaching.

Scholarpedia

Scholarpedia (http://www.scholarpedia.org/) is an encyclopedia like Wikipedia, but unlike the anonymous entries in Wikipedia, all articles in Scholarpedia are authored, peer-reviewed, and citable. Scholarpedia was founded by Eugene M. Izhikevich at the Neurosciences Institute in San Diego, who serves as its editor in chief. He initially wanted it to be an encyclopedia for computational neuroscience. But it has rapidly expanded to include many other fields in neuroscience and even outside of neuroscience.

There are a number of factors that distinguish Scholarpedia from other on line encyclopedias. First it's free. So, it is immediately accessible on the web to students and researchers around the world. This makes the articles immediately searchable through Google. Enter "Tritonia" in Google and you will see my article on *Tritonia* in Scholarpedia. Enter "Tritonia" in Google and you will see my article on Tritonia in Scholarpedia (Fig. 1).

Scholarpedia also differs from other on line encyclopedias in that it is infinitely updateable and correctable. Not only can the author make changes, but registered users can edit the article as well. Now, you're probably thinking, why would anyone write an article that can be edited by a reader. Any changes to the article in Scholarpedia require the consent of the author, who becomes the curator of the information. This provides a stamp of authority on the information. All changes to the article are recorded in the "Revisions" tab, which can be clicked on at the top of the page. Discussion about the article can also be recorded on the "Reviews" tab. The advantage of allowing the community to comment on and help edit any article is that it ensures that the article represents the common understanding of the community. Unlike a book, if you find an omission or inaccuracy in a Scholarpedia article, you can correct it. However, unlike Wikipedia, the changes all must be approved by a known curator, thereby providing the reader with confidence in the accuracy of the information.

Unlike printed books, there are no page limitations on Scholarpedia. There are also no restrictions regarding the level of detail. For example, an article can provide a basic introduction to an experimental animal as the article on Tritonia does, or it can be a detailed article about a particular research area. See for example, the article by Hillel Chiel on *Aplysia* feeding biomechanics (http://www.scholarpedia.org/article/Aplysia_feeding_biomechanics).

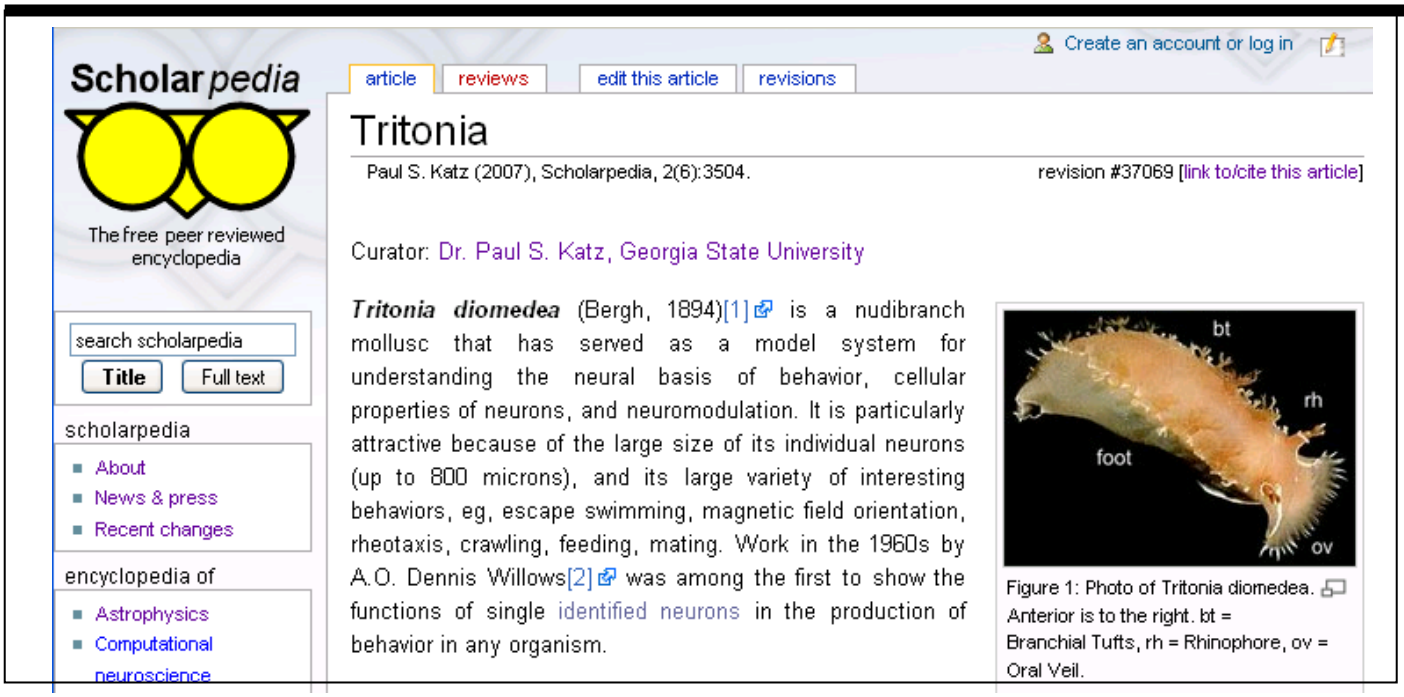


Fig. 1

There are two ways to become an author in Scholarpedia. You can be invited by an editor or a curator or you can be elected by the users of Scholarpedia as the best person to write an article. I am the editor of Invertebrate Neuroscience on Scholarpedia (http://www.scholarpedia.org/article/Category:Invertebrate_Neuroscience). If you are interested in writing an article on any aspect related to the use of invertebrate preparations in neuroscience, please contact me. Currently, we are looking for someone to serve as editor for Neuroethology on Scholarpedia. This person would then be able to invite others to write articles on the topic of neuroethology. .

I see Scholarpedia as an important, underutilized resource for Neuroethology. If members of the International Society for Neuroethology contributed papers to Scholarpedia, we would have a comprehensive up-to-date encyclopedia of Neuroethology that could be used for teaching in place of a text book. I have been using Scholarpedia articles as readings for my undergraduate and graduate classes.

NeuronBank Wiki

A second use of the Wiki format that I would like to draw your attention to is one that we have been developing in conjunction with our NeuronBank database. It is NeuronBank Wiki (http://neuronbank.org/wiki). The NeuronBank Wiki is a place for any scientist to post encyclopedic descriptions of neurons, neural structures, or neural circuits. The rationale for having such a Wiki is that our knowledge about neurons is becoming increasingly fragmented in the literature. The Wiki is our attempt to provide a place to unite our understanding of the features of the nervous system. Anyone who registers on NeuronBank can begin creating pages and editing existing pages.

It has been estimated that there are about 5000 different types of neurons in the mammalian brain, but their descriptions are spread out over tens of thousands of publications. Only one animal has all of its neurons cataloged, the nematode worm, *C. elegans* (http://www.wormatlas.org/). This task is easier in *C. elegans* because there are exactly 302 neurons in the adult hermaphrodite. It would be nice to have a similar catalog for any other species and to be able to compare the properties of neurons across species.

We have begun the process of databasing neurons in our primary experimental species, *Tritonia diomedea*. But we found that the database format (http://neuronbank.org/branch/Tritonia) is not yet conducive to people contributing information or reading about the neurons. So, we created a companion Wiki. Similar companion Wikis are now being developed for annotating Genes and Proteins (2-9). Now, if you would like to learn about the Tritonia DSI neuron, you can simply Google "DSI NeuronBank" and it will take you to either the Wiki page (Fig. 2) or the database page. As we learn more about this neuron, we can add information to the page.

I have found the NeuronBank Wiki to be useful for both teaching and research. I have used it for teaching in two ways: classroom assignments and laboratory orientation. In my undergraduate/MS level neurobiology course, I gave the students an assignment of researching any neuron in any animal and writing a NeuronBank Wiki entry on it. You can see what they wrote at http://neuronbank.org/wiki/index.php/Biol6102_student_pages. This format provided incentive to the students to do a good job because their work would be viewed by the general public. I was then able to e-mail researchers who work on those neurons to ask them to provide corrections or additions. Some of

the pages are still rather undeveloped, but it has served to seed the project.

I have also used the NeuronBank Wiki in my lab as a way to introduce Ph.D. students to particular neurons in the sea slugs *Tritonia* or *Aplysia*. They research the neuron, write or edit an entry on the neuron and then try to record from that neuron. They can then add their electrophysiology or neuroanatomical images to the Wiki. I invite you and your students to contribute to the NeuronBank Wiki. As more members of the community contribute, it will become a more and more reliable source of information.

In summary, I think that sharing scientific knowledge is undergoing a revolution. The web enables communities of researchers to share their current knowledge. This does not replace the need for books and research papers. Rather this is a way to consolidate the knowledge found in those sources. It places the knowledge in the public forum and creates the possibility for knowledge to grow in ways that were not possible previously.

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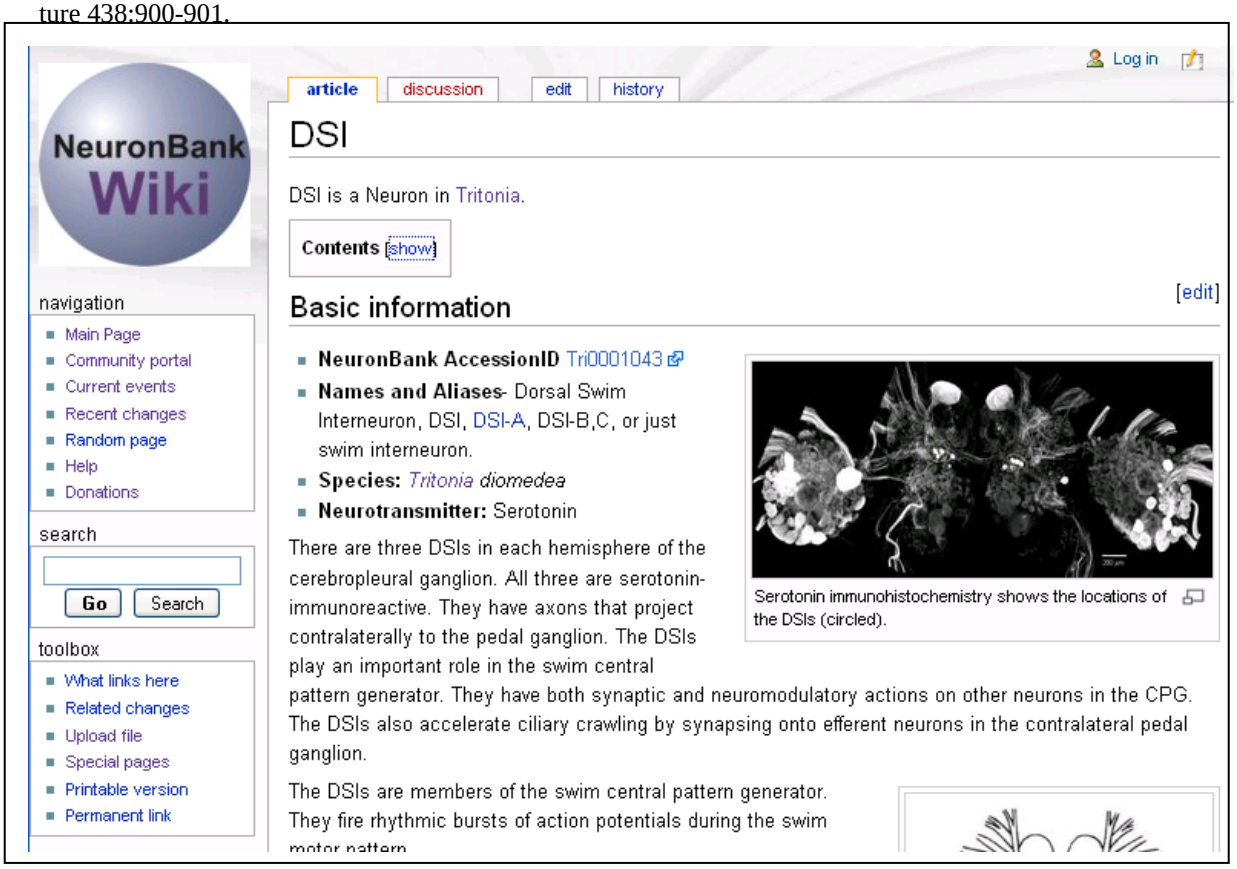

Fig. 2

Obituary

Martin Lindauer

On 13 November 2008, Martin Lindauer's long battle against Parkinson's Disease came to an end. He was nearing his 90th birthday, in late December. Like his mentor Karl von Frisch, Lindauer was a truly brilliant and passionate investigator of honey bees. A fitting tribute to his life and work was provided by Tom Seeley and published in *Nature* on December 11 (vol. 456, page 718).

Positions available

Development of simple neuronal networks

3 post-doctoral positions are available from March 2009 on a 3 year project based jointly in Bristol and Plymouth Universities and supported by the UK BBSRC

"A neuronal network generating flexible locomotor behaviour in a simple vertebrate: studies on function and embryonic self-assembly"

This study will investigate whether the ordered structure of the early vertebrate nervous system allows functional neuronal circuits to self-assemble using simple "rules" like the responses of growing nerve fibres to chemical gradients. We will use the young Xenopus tadpole as our model system. Here, our recent work has defined the features, connections and activity patterns of all the major neuron groups controlling both swimming and struggling locomotion. This knowledge offers a nearly unique opportunity in a vertebrate to investigate the anatomical and functional development of defined neuronal networks where the details of both input and output signals are known. The project has several parallel strands, each needing its own skills. It requires single neuron recordings to establish exactly how swimming and struggling are initiated by different skin stimuli. We also need more detailed information on the morphology of each neuron type and their spatial organisation within the CNS. Using the morphological information, we will build a mathematical model of neuron growth to generate the synaptic connections that different types of neuron make with each other in order to self-assemble neuronal circuits. Using the physiological information we will build models in which the different neurons are connected into functional circuits which we can stimulate to find how they generate the neuronal activity that produces swimming and struggling.

Our ultimate aim is to see how far simple growth rules can allow the self-assembly of neuronal networks which can "decide" when and how to respond to sensory stimuli and behave like a real animal. By making a "virtual tadpole" whose movements are controlled by our networks we can actually watch them producing behaviour, helping us evaluate the accuracy of our models. If successful, our study will lay a foundation for understanding the way more mature, complex nervous systems develop the ability to control different movements.

Post-doctoral Research Assistant (1 Bristol) with experience in neuroscience and training in single neuron recording, preferably using whole-cell patch techniques. The project requires technically demanding dissection followed by single and paired whole-cell recordings using both current and voltage-clamp. The recordings will be used to define the roles of anatomically identified neurons in the initiation of behaviour. In our laboratory these methods have taken new researchers as long as a year to perfect. We therefore need a skilled post-doctoral assistant trained in neuroscience and with whole-cell patch recording experience in investigating neuronal and synaptic mechanisms. We hope to appoint an experienced person in the salary range £29,704 pa to £32,458.

Post-doctoral Research Assistant (2 Bristol) with a broad background in neuroscience from cellular properties to the operation of whole networks and an interest in nervous system development. This Assistant is needed to carry out a wide range of work. One major role will be the anatomical analysis of neuron distributions and the 3D reconstruction of individual neurons dye filled during recording by Assistant 1. This will allow computer modelling of the anatomical development of neuronal networks. The second major role is linking between electrophysiology and network model development: contributing to analysis of recordings made by Assistant 1 and using these data to run simulations of functional networks controlling swimming and other behaviour in Xenopus tadpoles. These network simulations will use computer models built by Assistant 3 working in Plymouth. This post requires skills in immunocytochemistry, microscopy, imaging and use of neuron reconstruction software (eg Neuromantic) as well as a good grasp of CNS neuron physiology and the ability to run and analyse the results from simulations of neuronal networks. This post will have a starting salary of £29,704.

Post-doctoral Research Assistant (3 Plymouth) with education in computer science (or similar disciplines), a strong background in software engineering and excellent programming skills. Experience in software development and especially visualization techniques is essential. Knowledge of mathematics and computational neuroscience will be a great advantage. The assistant will be responsible for development of new biologically realistic models of both anatomy of neuronal circuitry and spike generation and synaptic processes relevant to tadpole behaviour. Model development will include mathematical formulation, design of numerical algorithms and software, model simulation, analysing and reporting simulation results, discussion of results with biological partners in Bristol, model adjustment etc. Visualization of the simulation results and programming a virtual tadpole will be a significant part of the workload. The assistant will also be involved in detailed physiological model simulation in Bristol. Taking into account a very high market demand of experts in computer

science, the salary will be in the range £29,704 pa to £32,458 to attract an appropriate specialist.

This project will be carried out in the laboratories of Prof Alan Roberts (a.roberts@bristol.ac.uk) and Dr Steve Soffe (S.R.Soffe@bristol.ac.uk), School of Biological Sciences, University of Bristol and Prof Roman Borisyuk (R.borisyuk@plymouth.ac.uk), Theoretical and Computational Neuroscience, University of Plymouth. Please contact us for more details.

For the Bristol posts applications should be made by completing an application form for the specific vacancy which can be found at: www.bristol.ac.uk/vacancies. The form should be submitted with a covering letter and CV on line before the closing date of 20th January 2009

The Canadian Centre for Behavioural Neuroscience
Department of Neuroscience

The Canadian Centre for Behavioural Neuroscience and the Department of Neuroscience at The University of Lethbridge, Alberta, Canada is seeking applicants for a tenure track assistant professor position at the rank of Assistant Professor to begin 1 July 2009, subject to budgetary approval.

The successful applicants will have an excellent record of research in any area of systems level neuroscience including cognition, plasticity, development, motivation, learning and memory, and neurological diseases. Candidates using techniques of molecular neuroscience, neurophysiology, and/or noninvasive imaging are especially encouraged to apply. Candidates will be expected to contribute to teaching at the undergraduate and graduate levels.

The Canadian Centre for Behavioural Neuroscience is a 60,000 ft2 facility devoted to behavioural neuroscience including a centre for functional neuroimaging in humans and rodents.

Located in southern Alberta, nestled by the Oldman River between the prairies and the foothills of the Rocky Mountains, Lethbridge offers a sunny, dry climate that is mild for the prairies, excellent cultural and recreational amenities, and attractive economic conditions. Founded in 1967, the University of Lethbridge has an enrolment of over 8,000 students.

Applications should include a curriculum vitae, research and teaching statements, and the names and contact information of at least three references who are scholars in the field. Send this information, and arrange to have the three letters of reference sent to: Deborah Saucier, Acting Chair, Department of Neuroscience, The University of Lethbridge, Lethbridge, AB Canada T1K 3M4. Phone: 403-394-3900; Fax: 403-329-2775;
E-mail: Deborah.Saucier@Uleth.ca.

Consideration of completed applications will begin by September 1, 2008 and continue until the position is filled.

Send the application information, and arrange to have the three letters of reference sent to:

Chair
Neuroscience Search Committee
Department of Neuroscience
Canadian Centre for Behavioural Neuroscience
The University of Lethbridge
Lethbridge, AB
CANADA T1K 3M4

The position is open to all qualified applicants, although preference will be given to Canadian citizens and permanent residents of Canada. The University is an inclusive and equitable campus encouraging applications from qualified women and men including persons with disabilities, members of visible minorities and Aboriginal persons.

University of Oklahoma Department of Zoology
Developmental Biologist

The Department of Zoology, University of Oklahoma, invites applications for a tenure-track position at the Assistant Professor level, beginning August 2009.

We seek an outstanding researcher and teacher with broad interests in developmental biology to join an integrative zoology department. Preference will be given to applicants whose research and teaching interests complement our existing strengths in development, neurobiology, cell signaling, behavior, ecology and evolutionary biology. We expect the applicant to establish an externally-funded research program and contribute to undergraduate and graduate teaching, including a core undergraduate course in developmental biology each year. In alternate semesters, the candidate will have the opportunity to develop a specialty course(s) in her/his area of interest. Our successful candidate will have a PhD and demonstrated ability to conduct significant independent research as judged by publications. Send curriculum vitae, reprints/preprints, and research and teaching statements, and arrange to have three letters of recommendation sent to

Chair,
Developmental Biology Search Committee,
Department of
Zoology,
The University of Oklahoma,
730 Van Vleet Oval, Norman, OK,
73019,

or as PDFs to zoology@ou.edu.

Further information about the Department of Zoology is available at zoology.ou.edu. Screening of candidates will be-

gin December 15, 2008 and will continue until the position is filled.

The University of Oklahoma is an Equal Opportunity/Affirmative Action Employer. Women and minority candidates are encouraged to apply.

A postdoctoral position in computational neuroscience/insect vision is available at Baylor College of Medicine, in the laboratory of Fabrizio Gabbiani.

Research in the laboratory focuses on the biophysical mechanisms underlying the implementation of non-linear operations by neurons and neuronal circuits using the visual system of the locust as a model system. The lab web site (glab.bcm.tmc.edu) contains a link to a list of recent publications.

The position is best suited for a candidate with a strong background in electrophysiology (intra- and extracellular recordings). Some experience in neuronal modeling and with Matlab is desirable. Salary will be commensurate with level of experience, based on an NIH scale.

For further inquiries and to apply, please send CV, the names and full contact information of two to three references, and one or two representative publications to gabbiani@bcm.edu.

Three Lectureship posts in Neurotechnology
Department of Bioengineering, Department of Computing and Department of Electrical and Electronic Engineering
Salary in the range £40,050 to £44,730 per annum

Imperial College is seeking to make three appointments at the interface between neuroscience and engineering. Two of these appointments will be joint lectureships between the Departments of Bioengineering and Electrical and Electronic Engineering (EEE). The third appointment will be a joint lectureship between the Departments of Bioengineering and Computing. Applicants should have a strong record of academic achievement and be able to direct an exciting and independent research programme in an area that synergises with our current activities.

For the Bioengineering/EEE appointments specific areas of interest include:

Position 1
Advanced optical and electrophysiological methods for reverse engineering of neural circuits, neuroimaging, brain machine interfaces, miniaturised sensors, sensory coding and sensorimotor control.

Position 2
Signal processing for advanced cellular neuroimaging or electrophysiological technologies, machine learning approaches to neuroscience, neural mechanisms of multisensory integration, reverse engineering of the visual system and cognitive brain processes and developing brain-inspired engineering solutions.
For the Bioengineering/Computing appointment, specific areas of interest include:

Position 3
Computational neural modeling; including large and multiscale brain models, sensory coding, multisensory integration, neural dynamics and neuroimaging for brain modeling.
Outstanding candidates working in other areas at the interface of Bioengineering and Electrical Engineering/Computing are also encouraged to apply. Senior appointments will be considered for exceptionally qualified individuals.
Applicants must have a PhD (or equivalent) and an outstanding research record as demonstrated by their publications. Teaching experience is also highly desirable.
An application form and further particulars of the posts can be downloaded from the following links:

- **Application Form**
- **Further Particulars - Joint Lectureship (Department of Bioengineering and Department of Computing)**
- **Further Particulars - Joint Lectureships (Department of Bioengineering and Department of Electrical and Electeronic Engineering)**
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Please contact Professor Ross Ethier, Head of the Department of Bioengineering, to discuss these positions informally at r.ethier@imperial.ac.uk.
Please return the application form electronically to margaret.hall@imperial.ac.uk, or you may post it to: Mrs Margaret Hall, Department of Bioengineering, Royal School of Mines Building, Imperial College London, Exhibition Road, London, SW7 2AZ.

In addition you should enclose a full CV (including list of publications), a research plan and a brief statement of teaching interests. Please indicate clearly which position you are applying for on your application form.

The closing date for this post is 9 January 2009
Valuing diversity and committed to equality of opportunity

The Department of Biological Sciences, University of Cincinnati, will fill two tenure-track Assistant Professor positions in Integrative Biology studying:

(1) ANIMAL DEVELOPMENT at genetic or cellular levels, and addressing questions of broad interest, e.g., evolution or gene-environment interactions, and

(2) effects of ENVIRONMENTAL STRESS from natural or human-induced causes on processes at cellular, population or community levels in plants, microbes, or animals. Applicants must hold a Ph.D. and have postdoctoral experience. Successful candidates will build an outstanding, externally-funded

research program, and contribute to undergraduate and graduate teaching. Individuals complementing existing strengths in behavior, neuroscience or evolutionary biology in the department (http://bioweb.ad.uc.edu) are encouraged to apply. Apply online at https://www.jobsatuc.com (Position Numbers 28UC2634, 28UC2635) by submitting cover letter, curriculum vita, and statements of research interests and teaching philosophy. Send three letters of recommendation and three representative reprints separately (PDF preferred) to: wischer@ucmail.uc.edu. Review of applications will begin November 15, 2008. The University of Cincinnati is an affirmative action/equal opportunity employer. Women, minorities, disabled persons, and Vietnam Era and disabled veterans are encouraged to apply.

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.