



ANIMAL BEHAVIOR BULLETIN

Center for the Integrative Study of Animal Behavior

FALL 2006

VOL 9 ISSUE 4

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Putting *Speed Dating* to the Test

“Love is complicated, match is simple,” touts one on-line dating company that claims to take the trial and error out of finding the right mate.

Have they found the secret to a successful match? A quick search of the web for “dating services” retrieves almost five million sites, so it is obvious that finding a mate is of concern to millions of people. Services promise to provide “the best relationship you’ve ever

had,” to find your “soul mate,” and to put you “face to face with more of the right people faster.” Are all their claims just advertising gimmicks, or is there some underlying formula for success?

Although mate search by animals, including humans, is a complex process, it is not unlike searching for food, information or even parking spaces, **Dr. Peter Todd** suggests. A faculty member in the Department of Psychology and Brain Sciences, Cognitive Science Program and the School of Informatics, Dr. Todd studied computer speech and language processing at Cambridge, developed neural network models at Stanford, and founded the Center for Adaptive Behavior and Cognition at the Max Planck Institute where he modeled inter-



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actions between decision making and environments. His present research at Indiana University focuses on modeling human mate selection, and one of the tools he uses is a popular trend found around the world, Speed Dating.



“There is no perfect model,” Todd says. But comparing various models to demographic data and experimental results can lead to a better understanding of the mechanisms that underlie mate choice. Multiple empirical methods can be used to establish mate choice rules that people are not able to articulate or may not be able to explain accurately.

Todd’s research began with a simple model to convey the basic problem with mate search: how does one know when they have found the best mate? The Dowry Search model examines a one-sided mate choice search where a man must select one woman out of a hundred to become his wife. Prevented from going back or looking forward, how does he optimize the chances of selecting the best woman? Todd explains that this can be achieved by setting an aspiration level or *satisfice*. The man uses a certain number of the woman to conduct an initial *satisficing* search where he gathers information about the women available and sets an aspiration level. Once that level has been set, he searches through the remaining women until he meets someone who exceeds his aspiration level. By looking at various outcomes of the model, Todd has found that limiting the initial *satisficing* search to 9% of the women is the most efficient way to find the best mate in this instance.

Unfortunately, the one-sided search model does not reflect what is going on in the real world. Even in cultures with arranged marriages, mate choice is occurring in both directions simultaneously. In this mutual arena, participants not only have to set aspiration levels, they have to determine their own value in the mating scene. Like with the Dowry Model, one can use an initial *satisficing* search to set an aspiration as well as discover one’s own value to others, but many external factors on the social as well as the individual level can affect outcomes.

Looking at broad influences on mating behavior, Todd developed mutual search and learning models to predict age of first marriage. These models were compared to demographic data to determine what variables were important in determining marrying age: economic based rational expectations, *satisficing* and aspiration learning, states of marriageability and/or catching the “marriage bug.” He found that mutual search with learning models did not account for the demographics, but if individual variation in learning within the population was taken into account, the model looked more like the actual distribution.



These findings suggested the importance of decision making at the individual level and led to Todd’s present research. Using a speed-dating approach, he examined changes in aspiration levels over time to determine if they changed with learning experience. He found that there were no changes in aspiration, sug-

gesting that the “milling” phase of the dating process, when people were exposed to the entire group of participants before the dating period, may have been used as *satisficing* search time. By eliminating milling time and using enclosed dating booths, he will continue to test questions of changing aspiration levels. In the future he will also examine: how perceived feedback influence one's value of self-esteem, how people judge each other's attractiveness, and how third-party judgments can influence mate choice.

For those interested in learning more about animal search strategies, Dr. Todd offers an upper level/graduate course, Informatics I400/I590 (cross-listed in Cognitive Science) Seek and Find: Search Strategies in Space and Time. The course discusses papers on search behavior and explores the processes that animals use when foraging in the wild as well as what humans use when foraging for information on the web or looking for bargains at the store.

Further reading:

Todd, P.M., Billari, F.C., and Simão, J. 2005. Aggregate age-at-marriage patterns from individual mate-search heuristics. *Demography*, 42(3):559-574.

Simão, J. and Todd, P.M. 2003. Emergent patterns of mate choice in human populations. *Artificial Life*, 9:403-417.

Todd, P.M. 2000. The ecological rationality of mechanisms evolved to make up minds. *American Behavioral Scientist*, 43(6):940-956.

Gigerenzer, G. Todd, P.M., and the ABC Research Group. 1999. *Simple Heuristics that Make Us Smart*. New York: Oxford University Press.



**14TH
ANNUAL IU
ANIMAL BEHAVIOR
CONFERENCE
APRIL 23, 2007**

Mark your calendars. The next AB conference is quickly approaching. Last year we had over 110 register for the conference and attracted scientists from eight other universities, including the Keck Center at North Carolina State and Georgia State Universities. Twenty presentations and 21 posters covered a wide range of topics from ecology to neurobiology.

This year's plenary speaker will be Michael J. Ryan from the University of Texas at Austin. Ryan's research addresses questions on sexual selection and communication in frogs and fish. He is a 2001 Fellow of the American Academy of Arts and Sciences, a 1997 Guggenheim Fellow, and has published extensively on mate choice in mollies and tundra frogs, signal evolution and sensory exploitation.

Flies, Eyes and Neural Information Processing

How can a fly help us improve the way video cameras handle extremes of light and dark or enable a robot to respond to its visual environment more reliably? Rob de Ruyter and his colleagues have found that the biological components of the fly's visual system have evolved in such a way as to capture information from the fly's surroundings with optimal efficiency, but in order to duplicate such a system, one must understand it first. So don't be surprised if you see de Ruyter or one of his students "walking" one of their flies around campus in an effort to do so.



With an interest in both mathematical models and biological systems, de Ruyter is physicist whose goals are to use mathematical models to interpret behavior at its most basic levels. He is currently working with the blowfly, *Calliphora vicina*, to determine how the fly visual system inputs and processes light signals from a dynamic environment.

"Flies make excellent subjects," de Ruyter says. "Using them allows for long-term stable recordings that produce enough data to enable reliable statistical analysis and test theoretical predictions." There are plenty of flies in the local environment and he can use wild caught

individuals which are more robust than varieties bred for lab research. In the compound eye, photoreceptors are close to the surface, unlike in the vertebrate eye, and easy to monitor with a probe. The efficiency photon capture is about 50% in the fly, compared to about 10% in vertebrates. The photoreceptors are sensitive enough to detect a single photon of light, but they also encode signals efficiently up to rates as high as about 10^6 photons per second. The signals captured by these receptors are processed by several distinct areas in the fly's brain.

De Ruyter's initial research focused on the H1 cell, a wide field direction-selection neuron that responds to horizontal motion. Using lab experiments, he first presented the fly with bars on a video monitor, where he measured the cell's response as a series of identical action potentials or "spikes" produced by the neuron. He found that sensory neurons and chemical synapses were remarkably efficient in transferring information.



Rob de Ruyter and post-doc Shiva Sinha

This revealed information about the visual system, but did not take into account the varied

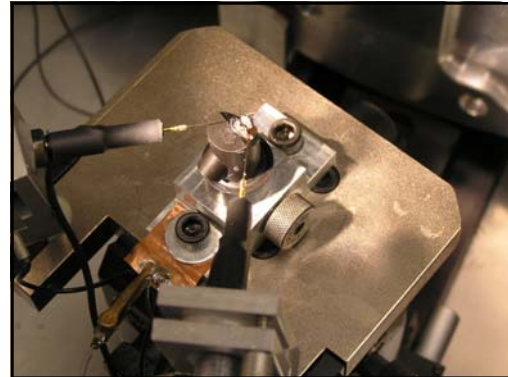
and dynamic environment that the organism must contend with everyday. De Ruyter's following experiments tested the visual system's ability to accurately respond to a pattern of random bars moving along a dynamic trajectory. He found that the fly's visual system responds to dynamic motion stimuli with a precision on the millisecond time scale and that the H1 neuron makes efficient use of its capacity to transmit information.



Rob de Ruyter in his lab

Since sense organs and brains are highly adaptive and animals have evolved to contend with noisy surroundings, to understand the true functioning of visual sensory system, de Ruyter and his students have recently been working in the natural environment. Light levels outdoors can be 100 times brighter than levels on the lab monitor and the stimuli are highly variable, extending across a large proportion of the fly's visual range and creating a greater signal to noise ratio. The natural setting also offers input from a three-dimensional space as opposed to the flat monitor, using more of the H1 neurons receptive capabilities. To test the system's true visual capabilities, flies were mounted on a stepper motor outside in a wooded area while a recording was made from the H1 neuron. In this way they were exposed to natural lighting conditions as well as an angular motion trajectory to simulate their

natural flight. De Ruyter found that reliability of the H1 neuron increased as light level rose and that to enhance information transmission, the H1 neuron increased the variety of messages, keeping the accuracy of each individual message the same, as opposed to encoding the same messages more accurately.



Experimental apparatus to mount the fly and record responses of the H1 neuron

In addition to his fly experiments, de Ruyter is sampling the joint statistics of camera inputs and camera motion in the natural environment. From these data, he will develop a statistical description of the relationship between visual input and motion to describe an optimal motion sensor. Surprisingly, this estimator shows specific biases in its estimations that are remarkably close to those measured in the fly sensory system. It seems biological organisms have a lot to teach us about developing new technologies, and de Ruyter is at the forefront of this new and exciting research.

Further reading:

Lewen, G.D., Bialek, W., and de Ruyter van Steveninck, R. 2001. Neural coding of naturalistic motion stimuli. *Network: Computation in Neural Systems*, 12:317-329.

Bialek, W., Rieke, F., de Ruyter van Steveninck, R. and Warland, D. 1991. Reading the neural code. *Science*, 252:1757-1886.

Rieke, F., Warland, D., de Ruyter van Steveninck, R., and Bialek, W. 1997. *Spikes: Exploring the Neural Code*, Bradford Books-MIT Press, Cambridge, MA.

GRADUATE COURSE OFFERINGS SPRING 2007

ABEH-A501 Seminar in Animal Behavior:
Sensory Ecology: Laura Hurley

ANTH-B568 Evolution of Primate Social
Behavior: Kevin Hunt

HPSC-X755 Function & Mechanism in the
Life Sciences: Colin Allen

JOUR-J554 Science Writing: Holly Stock-
ing

BIO-L570 Seminar in Ecology and Envi-
ronmental Biology: Ellen Ketterson

BIO-Z620 Developmental Plasticity and
Evolution: Armin Moczek

NS-N501 Neural Science II: Cara Wellman

PSY-P717 Evolution and Learning: From
Molecules to Conscious Minds: Bill Tim-
berlake and Gary Lucas

TECHNIQUES IN REPRODUCTIVE DIVERSITY

Fall Semester, as part of the NIH training grant, "Common Themes in Reproductive Diversity," Ellen Ketterson offered a techniques class to PhD students working in fields related to reproduction. Emphasizing parallels found in humans, model organisms, and non-traditional organisms, the class was structured to provide students with opportunities to learn a variety of techniques, give them access to the

newest technologies, and encourage them to develop an integrative approach to research.

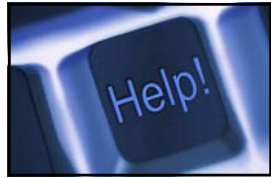
Faculty from the departments of Biology, Psychological and Brain Sciences, Chemistry, Medical Sciences and the Kinsey Institute participated in the course, teaching field collection and measurement techniques; DNA extraction, genotyping with microsatellites, immunostaining and in situ hybridization; recording electrical behavior, measuring hormone levels, fMRI brain imaging, and modeling using comparative methods.



Students felt the experience was beneficial and helpful. Dawn O'Neal who is studying the effects of winter climate and climate change on differential migration and immune function in the dark-eyed junco, said "I really liked the broad introduction to the facilities available and the chance to get hands on experience in the lab." Karen Acree was thrilled to handle birds for the first time. Jef Akst, whose research focuses on seahorse mating behavior was happy to learn about techniques she never fully understood, commenting "I learned techniques to quantify physical traits and assess genetic diversity that reduced the limitations I had once seen in my own research."

For those interested, Dr Ketterson will be offering this course every two years.

STATISTICAL CONSULTING CENTER



Michael Trosset, Director of the IU Statistical Consulting Center, welcomes faculty, post docs and graduate students to take advantage of their statistical expertise. There is often no “magic bullet” when it comes to analyzing data, Trosset says. Some research questions can take advantage of simple statistical tests, but more involved analyses take advanced computations. That is where the center can be of enormous help.

To avoid the disappointment of finding that one’s data does not answer the question one asked, he recommends speaking with a statistician as early as possible. “Everyone understands that it takes time to collect data,” Trosset says, “But they are often too optimistic about how long it takes to analyze data.” This is especially true with large datasets or when the researcher has not planned ahead.

“I see the statistician as a collaborator rather than as someone to hand the data off too,” Trosset says. The Consulting Center offers not only local expertise, it can be a source for finding and getting in touch with experts in the field. Statisticians are also available for developing new statistical techniques to analyze data.

The Statistics Department’s goal is make sure graduate and undergraduate students obtain the statistical education that they need. Trosset recommends that students looking for training also contact them with questions about which

courses would be beneficial for their particular research. “We keep track with what courses are being offered all over campus,” Trosset says.

For questions about data analysis or statistics courses contact:

Indiana Statistical Consulting Center
410 N. Park Ave

E-mail: iscc@indiana.edu

Phone: 855-8526

Director: Professor Michael Trosset
Consulting Associate: Adam Sheya

REU Program in Animal Behavior 2007

May 21– July 28

Application deadline
Feb 15, 2007

Information:
www.indiana.edu/~animal/REU



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