Public release date: 16-Jul-2012
[Print | E-mail | Share] [Close Window]

Back To EurekAlert!

Contact: Sonia Fernandez
sonia.fernandez@ia.ucsb.edu
805-893-4765
University of California - Santa Barbara

1

UCSB study reveals brain functions during visual searches

(Santa Barbara, Calif.) -- You're headed out the door and you realize you don't have your car keys. After a few minutes of rifling through pockets, checking the seat cushions and scanning the coffee table, you find the familiar key ring and off you go. Easy enough, right? What you might not know is that the task that took you a couple seconds to complete is a task that computers -- despite decades of advancement and intricate calculations -- still can't perform as efficiently as humans: the visual search.

IMAGE: Pictured is part of the research team in front of the magnetic resonance imaging device at the UCSB Brain Imaging Center. From left to right: researcher Tim Preston; associate professor of...

Click here for more information.

"Our daily lives are comprised of little searches that are constantly changing, depending on what we need to do," said Miguel Eckstein, UC Santa Barbara professor of psychological and brain sciences and co-author of the recently released paper "Feature-Independent Neural Coding of Target Detection during Search of Natural Scenes," published in the *Journal of Neuroscience*. "So the idea is, where does that take place in the brain?"

A large part of the human brain is dedicated to vision, with different parts involved in processing the many visual properties of the world. Some parts are stimulated by color, others by motion, yet others by shape.

However, those parts of the brain tell only a part of the story. What Eckstein and co-authors wanted to determine was how we decide whether the target object we are looking for is actually in the scene, how difficult the search is, and how we know we've found what we wanted.

They found their answers in the dorsal frontoparietal network, a region of the brain that roughly corresponds to the top of one's head, and is also associated with properties such as attention and eye movements. In the parts of the human brain used earlier in the processing stream, regions stimulated by specific features like color, motion, and direction are a major part of the search. However, in the dorsal frontoparietal network, activity is not confined to any specific features of the object.

"It's flexible," said Eckstein. Using 18 observers, an MRI machine, and hundreds of photos of scenes flashed before the observers with instructions to look for certain items, the scientists monitored their subjects' brain activity. By watching the intraparietal sulcus (IPS), located within the dorsal frontoparietal network, the researchers were able to note not only whether their subjects found the objects, but also how confident they were in their finds.

The IPS region would be stimulated even if the object was not there, said Eckstein, but the pattern of activity would not be the same as it would had the object actually existed in the

1a

scene. The pattern of activity was consistent, even though the 368 different objects the subjects searched for were defined by very different visual features. This, Eckstein said, indicates that IPS did not rely on the presence of any fixed feature to determine the presence or absence of various objects. Other visual regions did not show this consistent pattern of activity across objects.

"As you go further up in processing, the neurons are less interested in a specific feature, but they're more interested in whatever is behaviorally relevant to you at the moment," said Eckstein. Thus, a search for an apple, for instance, would make red, green, and rounded shapes relevant. If the search was for your car keys, the interparietal sulcus would now be interested in gold, silver, and key-type shapes and not interested in green, red, and rounded shapes.

"For visual search to be efficient, we want those visual features related to what we are looking for to elicit strong responses in our brain and not others that are not related to our search, and are distracting," Eckstein added. "Our results suggest that this is what is achieved in the intraparietal sulcus, and allows for efficient visual search."

For Eckstein and colleagues, these findings are just the tip of the iceberg. Future research will dig more deeply into the seemingly simple yet essential ability of humans to do a visual search and how they can use the layout of a scene to guide their search.

"What we're trying to really understand is what other mechanisms or strategies the brain has to make searches efficient and easy," said Eckstein. "What part of the brain is doing that?"

Research on this study was also conducted by Tim Preston, Koel Das, Barry Giesbrecht, and first author Fei Guo, all from UC Santa Barbara.

###

Public release date: 16-Sep-2012
[Print | E-mail | Share] [Close Window]

Contact: Cathy Kolf
ckolf@jhmi.edu
443-287-2251
Johns Hopkins Medicine

How bees decide what to be

Johns Hopkins researchers link reversible 'epigenetic' marks to behavior patterns

Johns Hopkins scientists report what is believed to be the first evidence that complex, reversible behavioral patterns in bees – and presumably other animals – are linked to reversible chemical tags on genes.

The scientists say what is most significant about the new study, described online September 16 in *Nature Neuroscience*, is that for the first time DNA methylation "tagging" has been linked to something at the behavioral level of a whole organism. On top of that, they say, the behavior in question, and its corresponding molecular changes, are reversible, which has important implications for human health.

According to Andy Feinberg, M.D., M.P.H., Gilman scholar, professor of molecular medicine and director of the Center for Epigenetics at Hopkins' Institute for Basic Biomedical Sciences, the addition of DNA methylation to genes has long been shown to play an important role in regulating gene activity in changing biological systems, like fate determination in stem cells or the creation of cancer cells. Curious about how epigenetics might contribute to behavior, he and his team studied a tried-and-true model of animal behavior: bees.

IMAGE: Nurse bees generally remain in the hive to feed and take care of the queen and her larvae.

Click here for more information.

Working with bee expert Gro Amdam, Ph.D., associate professor of life sciences at Arizona State University and the Norwegian University of Life Sciences, Feinberg's epigenetics team found significant differences in DNA methylation patterns in bees that have identical genetic sequences but vastly different behavioral patterns.

IMAGE: Forager bees are responsible for gathering pollen and nectar.

Click here for more information.

Employing a method that allows the researchers to analyze the whole genome at once, dubbed CHARM (comprehensive high-throughput arrays for relative methylation), the team analyzed the location of DNA methylations in the brains of worker bees of two different "professions." All worker bees are female and, within a given hive, are all genetically identical sisters. However, they don't all do the same thing; some nurse and some forage.

Nurses are generally younger and remain in the hive to take care of the queen and her larvae. When nurses mature, they become foragers that leave the hive to gather pollen and other supplies for the hive. "Genes themselves weren't going to tell us what is responsible for the two types of behavior," Feinberg says. "But epigenetics – and how it controls genes – could."

Feinberg and Amdam started their experiment with new hives populated by bees of the same age. That removed the possibility that any differences they might find could be attributed to differences of age. "When young, age-matched bees enter a new hive, they divvy up their tasks so that the right proportion becomes nurses and foragers," explains Amdam. It is these two populations that were tested after painstakingly characterizing and marking each bee with its "professional," or behavioral, category.

Analyzing the patterns of DNA methylation in the brains of 21 nurses and 21 foragers, the team found 155 regions of DNA that had different tag patterns in the two types of bees. The genes associated with the methylation differences were mostly regulatory genes known to affect the status of other genes. "Gene sequences without these tags are like roads without stop lights – gridlock," says Feinberg.

Once they knew differences existed, they could take the next step to determine if they were permanent. "When there are too few nurses, the foragers can step in and take their places, reverting to their former practices," says Amdam. The researchers used this strategy to see whether foraging bees would maintain their foraging genetic tags when forced to start acting like nurses again. So they removed all of the nurses from their hives and waited several weeks for the hive to restore balance.

That done, the team again looked for differences in DNA methylation patterns, this time between foragers that remained foragers and those that became nurses. One hundred and seven DNA regions showed different tags between the foragers and the reverted nurses, suggesting that the epigenetic marks were not permanent but reversible and connected to the bees' behavior and the facts of life in the hive.

Dramatically, Feinberg noted, more than half of those regions had already been identified among the 155 regions that change when nurses mature into foragers. These 57 regions are likely at the heart of the different behaviors exhibited by nurses and foragers, says Amdam. "It's like one of those pictures that portray two different images depending on your angle of view," she says. "The bee genome contains images of both nurses and foragers. The tags on the DNA give the brain its coordinates so that it knows what kind of behavior to project."

The researchers say they hope their results may begin to shed light on complex behavioral issues in humans, such as learning, memory, stress response and mood disorders, which all involve interactions between genetic and epigenetic components similar to those in the study. A person's underlying genetic sequence is acted upon by epigenetic tags, which may be affected by external cues to change in ways that create stable - but reversible – behavioral patterns.

Public release date: 23-Jun-2011

Contact: Elisabeth (Lisa) Lyons
elyons@cell.com
617-386-2121
Cell Press

Effects of stress can be inherited, and here's how

None of us are strangers to stress of various kinds. It turns out the effects of all those stresses can change the fate of future generation, influencing our very DNA without any change to the underlying sequence of As, Gs, Ts and Cs. Now, researchers reporting in the June 24th issue of *Cell*, a Cell Press publication, have new evidence that helps to explain just how these epigenetic changes really happen.

"There has been a big discussion about whether the stress effect can be transmitted to the next generation without DNA sequence change," said Shunsuke Ishii of RIKEN Tsukuba Institute. "Many people were doubtful about such phenomena because the mechanism was unknown. Our finding has now demonstrated that such phenomena really can occur."

Our genes encode proteins, but whether and how those genetic instructions are ultimately read and expressed depends on how those genes are chemically modified and "packaged" into a more complex structure known as chromatin. Some portions of the genome are more tightly wound into what's known as heterochromatin. Heterochromatin is maintained from one generation to the next and typically doesn't contain active genes, Ishii explains.

Over 20 years ago, Ishii and his colleagues discovered a gene in yeast (called activation transcription factor-2 or ATF-2 for short)that is required for those tightly packed, heterochromatin structures to form. ATF-2 is altered by stress-activated protein kinases in response to environmental stress, inflammatory cytokines, and reactive oxygen species (ROS). But it wasn't entirely clear what this might mean for other organisms.

Ishii and his colleagues now confirm that ATF-2 is required for heterochromatin assembly in multicellular organisms. When fruitflies are exposed to stressful conditions, the ATF-2 is modified and disrupts heterochromatin, releasing genes from their usual silenced state. Importantly, these changes in genomic structure are passed on from one generation to the next.

The researchers expect that this finding in flies has relevance for humans, noting that we also carry the ATF-2 gene. Those epigenetic changes may influence basic cellular functions as well as metabolism, behavior and disease. In particular, Ishii suggests that epigenetic causes may play a role in "lifestyle diseases," including heart disease and diabetes, and in psychological diseases, such as schizophrenia.

If that's true, there may be some hope. Drugs targeting the enzymes that modify ATF-2 in response to stress have already been developed.

According to Ishii, the take-home message is this: "I hope that people understand that various stresses can change gene expression without DNA sequence change." He says the youngest among us – developing embryos and infants -- may be especially sensitive to that kind of stress-induced epigenetic change and "we should be more careful about stresses on them."

###

HiPEAC has triggered fundamental changes in the computing systems landscape in Europe

Publication Date: 2012-08-28

Eduardo Martinez
HiPEAC
San Bernardo 120, 5º Izda. A
28015 Madrid
Spain
press@hipeac.net
Tel: +34 649 93 60 99
http://www.hipeac.net./

The second edition of HiPEAC successfully passed its final review. The HiPEAC network has fully achieved its objectives and it has even exceeded its expectations, says the EU project officer of the network, Dr. Panagiotis Tsarchopoulos. The next edition of the HiPEAC network will increasingly focus on technology transfer and on the impact of new technologies.

The HiPEAC network, since its creation in 2004, triggered fundamental changes in the European computing systems community, and it has created a long lasting impact in Europe, said the EU project officer of the network, Dr. Panagiotis Tsarchopoulos. The network has fully achieved its objectives and it has even exceeded its expectations, he added.

Second edition

The second edition of the HiPEAC network started in January 2008 and it ended in January 2012. It was run by a consortium of eight European universities and four companies and it was coordinated by Ghent University, Belgium. At the end of the final review in Göteborg, Sweden, the review panel congratulated the consortium for the impressive progress made over the last four years.

The review panel explicitly praised three accomplishments of the second edition of the network:

The bi-annual HiPEAC roadmap, which has created a solid vision for computing systems research in Europe, and has become one of the major inputs driving the EU investments in computing systems.

The HiPEAC conference which has tripled in attendance over the duration of the project, and is now the second biggest European computing systems conference. The reviews panel also had much appreciation for the efforts to change the publication culture to a journal-first publication model and encourages the network to continue working on this transition.

The ACACES summer school which remains a high-quality training event organized by the network, and the biggest event of its kind in Europe, yearly bringing together about 200 students and researchers from all over the world.

Third edition

Prof. Koen De Bosschere, coordinator of the network, thanked the European Commission for entrusting the consortium a third edition of the HiPEAC network, which will run until 2015.

"The focus of the third edition will be to continue the successes of the just finished network, and in addition seriously focus on promoting innovation and stimulating technology transfer, on attracting and training new talent, and on the exploitation of emerging new technologies in computing systems", he said.

De Bosschere explained that the technology transfer will be stimulated by organizing a series of technology transfer workshop, that talent will be attracted via a new job portal and that the emerging new technologies will be introduced through a series of workshops.

"These efforts, in combination with the increased funding for computing systems in the next framework program Horizon 2020 must accelerate European innovation in computing systems", he added.

Remarks :

About HiPEAC
The HiPEAC network is an FP7 project which gathers more than 1000 researchers in computing systems in Europe. It is the biggest such network in the world, offering training, mobility support, dissemination services, and abundant networking facilities to its members. The yearly budget of the network is about 1 Mio Euro. The third edition of HiPEAC started on January 2012, and will run until December 2015. It is run by a consortium of six universities, one research institute and five companies. It is coordinated by Ghent University. See also http://www.hipeac.net./

About Horizon 2020
Horizon 2020 is the financial instrument implementing the Innovation Union, a Europe 2020 flagship initiative aimed at securing Europe's global competitiveness. Running from 2014 to 2020 with an €80 billion budget, the EU's new program for research and innovation is part of the drive to create new growth and jobs in Europe. Horizon 2020 will be complemented by further measures to complete and further develop the European Research Area by 2014. These measures will aim at breaking down barriers to create a genuine single market for knowledge, research and innovation. See also

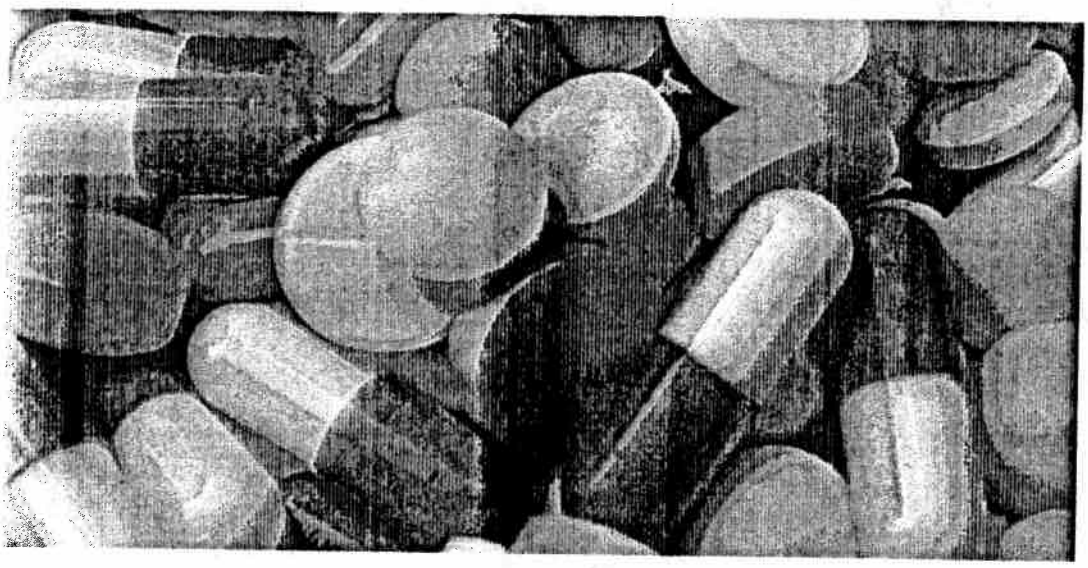
6

Drug discovery

Sifting through chemical kaleidoscopes

Munich, 09/03/2012

LMU researchers have developed a new and highly efficient drug screening method. The technique can identify drug candidates in so-called dynamic compound libraries even when the target molecule itself is present only in extremely low concentrations.



Effective drugs act by binding tightly and specifically to particular biomolecular targets. That is why binding studies, which measure the affinities of potential drug candidates for a specific target molecule, are one of the mainstays of drug screening. Several different approaches can be used to determine binding affinities, and LMU pharmacist Professor Klaus Wanner previously developed MS binding assays, a strategy based on the use of mass spectroscopy, which avoids the need to label test substances with radioactive isotopes.

In its original form, the method had only been applied to one test compound at a time. Wanner and his team have now adapted the technique for use on whole sets of substances simultaneously. The strategy utilizes "dynamic combinatorial libraries" of test substances - collections of compounds formed by linking diverse molecular modules of two different types together by means of a single, reversible reaction. This allows the bipartite compounds to be readily broken up and the fragments rejoined in different combinations, generating a kaleidoscope of agents for screening.

Aiming at low concentrated targets

The normal way to screen such a library is to monitor how its composition is altered when the synthetic reaction is performed in the presence of the target. "This kind of analysis can be quite complicated, especially if the target can only be introduced in low concentrations, as is usually the case with membrane-bound targets," says Wanner. To obtain reliable binding data, the LMU team applied reaction conditions which ensured that the libraries were "pseudostatic" and all test compounds were present in comparable amounts.

Wanner and his colleagues were able to detect binding reactions even when the target was present in very low concentrations. The new method therefore permits faster and more efficient identification of model structures for drug development. Furthermore, the technique can, in principle, be applied to any type of target. In the new study, the approach led to the identification of two new lead compounds for the development of pharmacologically useful drugs. (ChemMedChem, 3. September 2012) *göd*

Responsible for content: Communications and Media Relations

The new television must listen to its audience

Publication Date: 2012-08-27

Amaia Portugal
Elhuyar Foundation
Zelai Haundi 3, Osinalde Industrialdea
20170 Usurbil
Spain
a.portugal@elhuyar.com
Tel: +34 943 363040
Fax: +34 943 363144
http://www.basqueresearch.com/berria_irakurri.asp?Berri_Kod=4095&hizk=I#.UCD71aAg7Aw

The sociologist Lázaro Echegaray maintains there is a need to interpret the share beyond the figure, which TDT is able to provide

"A new television broadcasting system requires a fresh formula to research its audience," asserts Lázaro Echegaray, who has produced his thesis right in the midst of the analogue switch-off. This researcher understands that the introduction of TDT and the new ways of consuming audiovisual products (Internet, tablets, etc.) render the use of audience measuring devices —being the only research tool— meaningless. He is calling for a qualitative audience study that goes beyond the share; to interpret what viewers want instead of quantifying them. However, he points out that this is something that goes against the grain of the Spanish media industry, which is keen to "perpetuate the system". His thesis, defended at the University of the Basque Country (UPV/EHU), is entitled: *Análisis de la influencia de la implantación del modelo digital audiovisual en el estudio comercial de las audiencias: tendencias metodológicas y opiniones del sector empresarial audiovisual* (Analysis of the influence of the introduction of the digital audiovisual model in the marketing study of audiences: methodological trends and views of the audiovisual business sector).

Digital television entails many changes when it comes to studying its audience. On a technical level, the audience measuring devices have had to be adapted, because the way of detecting channel changes on TDT is different from that of the analogue system. Socially, the fragmentation of the audience is clear; not only because of the increase in the offer of channels, but also in the availability of the mediums. "In the past, the programme total covered 100% of the audience, but all of a sudden there are spectators not accounted for, and there's no way of knowing where they are. One can assume they are on the Internet, but there's no way of knowing this," says Echegaray. So media people are demanding new ways of measuring audiences.

In any case, this research does not focus on changes of this type, which in the end are unavoidable. It maintains that it is necessary to take advantage of the situation to do things differently: "It not only seeks to analyse the problems that used to arise when measuring audiences and how they could be solved, but even to test other formulas that could have a place in the world of TDT in the future. Formulas that complement quantitative data with qualitative one.

Interactivity, an opportunity

"In qualitative research you can chat to people and see what they think, and interpret it. The results you get are not data but concepts." But, as Echegaray explains, quantitative research that governs today's TV leads us to a system of majorities, the so-called "audience dictatorship". For example, it does not clarify whether a gossip programme has an audience of 40% because people really like it or because there is nothing else available.

The characteristics of TDT could enable interactivity to take place. "The idea was that if interactivity existed, there was a medium so that there could be two-way information. And having a medium whereby that feedback existed, the study could be interpretative," says Echegaray. However, interactivity does not yet have a place in the new TV system, because other matters have been prioritised in the introduction of TDT, but it is something that is taking place already over the social networking sites, and which the Spanish audiovisual industry has yet to size up. As an example of this, the researcher mentions a controversy that spread over the Internet as a result of a Spanish programme showing an interview given by the mother of a boy who had been convicted of concealing a murder; and the mother had been paid for giving the interview: "Somebody started to say: 'But what are they up to showing this lady on TV and paying her money?' And all of a sudden the programme lost its advertising. If they had read the discourse on the social networking sites in advance, they would have found out that the audience does not agree with such things, and could have sorted out the problem earlier."

Its *modus vivendi*

Part of the research consisted of interviewing representatives of sectors and organisations related in one way or another to television. Most appear to concur with the view defended in the thesis, but contradictions emerge: "They all believe that qualitative research is very important and that it is necessary to structure two-way channels of information to produce qualitative discourses, but... they also believe that qualitative discourses need to be quantified. They don't want to end up with the idea, but with the number."

But the fact is, moreover, he perceives that it is the audiovisual industry itself that sets out to prevent there being changes in the way of watching television and measuring audiences. Among other things because it would also force it to change the way it makes money from advertising. "When you sit down in a sitting room, you start to zap. You are someone who is unconsciously *swallowing* all the publicity they are going to force down your throat. It's the seedbed for television, and the

industry wants to defend it tooth and nail, because it is its *modus vivendi*. They are out to perpetuate the system," he concludes.

About the author

Lázaro Echegaray-Eizaguirre (Madrid, 1971) received a degree in Political Sciences and Sociology from the University of Granada (Spain). He wrote up his thesis under the supervision of the PhD holders Carmen Peñafiel-Saiz and Amparo Huertas-Bailén; Peñafiel is a tenured lecturer in the Department of Journalism of the Faculty of Social Sciences and Communication of the UPV/EHU and a member of the governing board of the Spanish Association of Research into Communication, and Huertas is a tenured lecturer in the Department of Audiovisual Communication and Publicity of the Autonomous University of Barcelona. Today, Echegaray teaches Sociology and Market Research on the Management and Business Marketing Degree Course of the University School of the Chamber of Commerce in Bilbao (UPV/EHU).

Subject: Social Science; Social Aspects;
Country: Spain;
Institution: Private Research;
Category: Project;

RCN: 31533
Quality Validation Date: 2012-08-27

Top

CORDIS Services Help Desk