

CONTENTS

Affiliate Lab Interview
Amir Raz
McGill University

Research Initiative Update
Neuroeconomics

Upcoming Events
2011 Spring Speaker Series

Collaborative Research
**National Academy of Sciences Visits
CCSN**
with Linda Waite

CONNECTIONS

The Quarterly Newsletter for the Center for Cognitive and Social Neuroscience | Winter 2011

The University of Chicago

Collaborative Research

National Academy of Sciences Visits the CCSN

On January 27, 2011, the Center for Cognitive and Social Neuroscience (CCSN) held a site visit for representatives from the National Academy of Science's National Research Council's (NRC) Committee on Population. The CCSN was selected for this visit as the setting of exemplary, cutting-edge interdisciplinary research. This visit was part of the Committee on Population's ongoing, international exploration of research on aging. Linda Waite, a member of the Committee on Population and of the CCSN, and a leading researcher in the field of aging, helped to facilitate the site visit.



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LINDA WAITE

ABOVE: The National Academy of Sciences Committee on Population visits the Center for Cognitive and Social Neuroscience



On January 27, 2011, the Center for Cognitive and Social Neuroscience (CCSN) held a site visit for representatives from the National Academy of Science's National Research Council's (NRC) Committee on Population. The Committee was represented by Michael Shanahan, professor of sociology at the University of North Carolina, Keiko Ono, senior program associate of the National Research Council, and Linda Waite, professor of sociology at the University of Chicago. The representatives met with the leaders of many scientific teams to learn more about the Center's ongoing interdisciplinary, multi-institution, research projects. The visit highlighted the work of the Chicago Health, Aging, and Social Relations Study (CHASRS), an ongoing longitudinal research program that brings together sociological, psychological,

and biological levels of analyses to understand the relationships among, and mechanisms underlying, social isolation, feelings of loneliness, health, and the aging process.

The Committee was also briefed on the work of the Chicago Endothelial Function Study (CHEFS), the Chicago Social Brain Network, the Social Resilience Training program, the Arete Initiative, and the Social Regulation of Gene Transcription, a multi-institution research project currently underway in collaboration with John Capitanio at University of California—Davis, and Steven Cole of the University of California—Los Angeles, under the direction of principal investigator John Cacioppo. Representing the CCSN at the meeting were: John Cacioppo, Director of the Center for Cognitive and Social Neuroscience, Jianqiao Ge, postdoctoral scholar in psychology, Louise Hawkey, Associate Director of the Social Neuroscience

Lab, Lianne Kurina, assistant professor of epidemiology, Maïke Luhmann, research associate, Christopher Masi, assistant professor of medicine, and Ronald Thisted, professor and chairman of biostatistics, and Linda Waite, professor of sociology.

The site visit committee commented on the impressive research teams, the remarkable variety of topics being studied, and the state-of-the-art laboratory for collecting biological, physiological and psychological measures at the Social Neuroscience Laboratory in the Biopsychological Sciences Building.

The National Research Council Committee on Population

"The purpose of convening the committee was to bring a group of people from many different disciplines to determine the most promising research opportunities in the field of

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Collaborative Research *Continued*



ABOVE: Linda Waite, Professor of Sociology at the University of Chicago

aging,” explains Waite. “The Committee is composed of experts in sociology and related fields, and we hope this interaction will allow experts in related disciplines to better share knowledge and practices. There are areas that sociology measures and conceptualizes well that would benefit social psychology, and vice versa. Sharing these concepts will help all these allied researchers to think about problems better. Assembling a group of thoughtful people on the cutting edge of the field was a good first step.”

The Committee began this process by surveying numerous experts on aging to determine important topics in the field, the most influential recent research publications, and the areas where new interdisciplinary research may have the greatest impact. Based on their received responses, the Committee organized site visits, including this visit to the CCSN. Following the site visits, the Committee plans to commission papers and hold a workshop in June 2011, producing an edited volume in the following year.

“Our hope is that this approach will help researchers in different disciplines import new approaches and perspectives in order to apply them to solve their own problems. Bringing together thinkers who are willing to work across disciplines, for the benefit of social science at large, can only be good. We cannot make any guarantees, but I think this is a wonderful opportunity,” says Waite.

The Committee on Population is funded by the National Institute on Aging through the National Research Council of the National Academy of Sciences. The National Research Council facilitates the

integration of existing knowledge and makes this research accessible to a broader audience. The NRC has contributed to the development of scientific consensus on many topics including: seatbelt use, x-rays, best practices for collecting scientific data in developing countries, racial and ethnic disparities in health and access to health care, and the United States Department of Agriculture’s food pyramids.

“The purpose of the NRC is not to commission original research, it is to synthesize and integrate existing research. Often these efforts of the NRC are very high profile, helping to direct public attention to these critical issues,” explains Waite.

National Priorities: Research on Aging

This work on aging is coming at a critical time. An aging population presents many problems that may best be addressed by researchers working in different domains.

“There are so many questions to answer: What does it mean to have an aging population? What are the implications for couples, for families, for the workforce? How are we going to pay to solve these problems? We have an increase in life expectancy, which is good. However, we have a host of costs associated with that increase in life expectancy, from direct medical costs to costs of care and support. This is all happening very quickly. We must be prepared to determine how we allocate our resources as a society—do we use them disproportionately for people at the end of their lives? If so, how do we educate the next

generation? How do we pay for childhood immunizations?” explains Waite.

One specific problem the Committee on Population is addressing is the slower rise in life expectancy in the United States as compared to other developed Western countries like Denmark, the United Kingdom, and France.

“The gap between these other countries and the United States is widening, and we do not know why. We think that some of the gap may be attributable to smoking, specifically women smokers. Men have always been heavier smokers, but then began to cut back. Women in the United States did not begin smoking in large numbers until the 1940s, during World War II. Now we have a cohort of aging women who are old enough to be dying from the effects of smoking,” explains Waite.

This is in stark contrast with Denmark, which has seen large increases in life expectancy in recent years.

“In Denmark, there has been a powerful public health campaign encouraging people to drink less, move more, stop smoking, and eat less—asking people to think of their health and put away the herring,” explains Waite. “And it is working. Denmark was on par with the United States, but they have now pulled ahead. There are fascinating mechanisms underway that we do not fully understand, and there will be a lot of challenges we need to address. This is why we need interdisciplinary, national and international action-- we must understand the social, economic, ecological, psychological, biological, physiological processes producing these patterns, so we are able to intervene with effective public health campaigns.”

National Social Health and Aging Project

Waite’s own research on aging through the National Social Health and Aging Project will contribute pertinent information to the Committee on Population’s inquiry. The project is currently in the field collecting a second wave of data on a group of three thousand participants. The project is re-interviewing participants who were last interviewed five years ago, and is now interviewing spouses and partners of those participants.

“For the first time, we will have data on aging couples, which is very exciting. Likewise, we spent a great deal of time considering how things were measured in the first round of data collection, and attempting to improve on our methods. We will be able to determine this group’s health,

relationship, and functioning trajectory for the last five years,” says Waite.

Because the recession occurred between two waves of data collection, the project will also look at the impact of the economic downturn on this group in areas such as job loss, early retirement, changes in living arrangements, and accompanying physical, psychological, and family consequences of these changes.

The data collection for this project involves survey measures, including a comprehensive mental status measure used by geriatricians with clinical samples, as well as physiological measures such as height, weight, waist circumference, hip circumference, salivary cortisol measurement, vaginal swabs, and finger-stick blood samples (CRP, Epstein-Barr, A1C).

Future Directions

Waite maintains that one of the most exciting areas in the future of aging research may be one of the most difficult to fully understand, namely gene expression and gene-environment interaction over the lifespan. The measurement and understanding of this interaction is poised to present a host of challenges to researchers in the field.

“As we learn more about development in context, gene-environment interactions, measured through gene expression, will be even more critical,” says Waite, “We only have glimmers of the underlying complexity, and we are learning it is harder to measure than we originally thought. The interaction of the environment with biology may affect many aspects of life—attention, cognitive function, impulse control, cancer, stress reactivity—and provides oceans of opportunity for discovery.”

Waite explains further that current gene-environment interaction research is focused on the individual, but the additional group processes at work, including religious participation, family membership, friendships, and social networks, must also be examined.

Says Waite, “This is enormously complex. Thinking carefully about that complexity, and not reducing the problem to our own areas of expertise, is unbelievably important. Nothing is all social, or all genetic, or all biological. This is why we require ‘Team Science.’ But we may need new kinds of teams.” ■

RECENT PUBLICATIONS BY LINDA WAITE

Cornwell, E. Y. & Waite, L. J. (2009). Measuring social isolation among older adults using multiple indicators from the NSHAP Study. *Journals of Gerontology: Social Sciences*, 64B(S1):i38-i46.

Lee, Y. S. & Waite, L. J. (2010). How appreciated do wives feel for the housework they do? *Social Science Quarterly* 91(2):476-492.

Hughes, M. E. & Waite, L. J. (2009). Marital biography and health at midlife. *Journal of Health and Social Behavior*, 50(3):344-358.

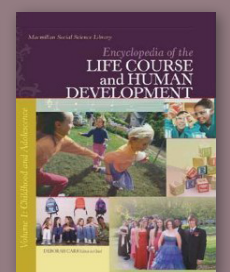
Waite, L. J., Laumann, E. O., Das, A., & Schumm, L.P. (in press). Sexuality: Measures of partnerships, practices, attitudes, and problems in the National Social Life, Health and Aging Study. *Journals of Gerontology: Social Science*, special issue.

Waite, L. J. (2009). The changing family and aging populations. *Population and Development Review* 35(2):341-346.

Cornwell, E. Y. & Waite, L. J. (2009). Social disconnectedness, perceived isolation, and health among older adults. *Journal of Health and Social Behavior*, 50:31-48.

Waite, L. J., Laumann, E. O. & Das, A. (2009). Sexual activity, later age. In D. Carr, R. Crosnoe, M.E. Hughes, and A. Pienta (Eds.), *Encyclopedia of the Life Course and Human Development* (pp. 362-366). Farmington Hills, MI: Gage.

Waite, L. J., Luo, Y., & Lewin, A. (2009). Marital happiness and marital stability: Consequences for psychological well-being. *Social Science Research*. 38:201-212.



Research Initiative Update

Neuroeconomics

CCSN Research Initiatives were created to organize Center members into interdisciplinary groups that address “big questions” in the areas of cognitive and social neuroscience. Members of each initiative strive to employ complementary methodologies and identify opportunities for new research programs. Luigi Zingales, Robert C. McCormack Professor of Entrepreneurship and Finance and David G. Booth Faculty Fellow, was interviewed about the Neuroeconomics research initiative.

What projects are you currently exploring as part of the Neuroeconomics Research Initiative?

With Paola Sapienza, a colleague at Northwestern University, I am working to identify which characteristics of MBA students at the University of Chicago and Northwestern University lead to their later success. We have collected a variety of experimental, biological, survey, and behavioral data. For example, we asked the MBA students to play a game to determine their risk aversion, and also measured their levels of testosterone and cortisol. As this is the class of 2008, we have data on their real world experience: the careers they pursued, the positions they took, and the salaries they earned. We plan to follow this class through their careers to track their outcomes. In one instance, we are examining the connection between their risk aversion and their life choices.

This study of risk aversion is interesting because we find a correlation between the type of career a person chooses and his or her level of risk aversion. People who seem to be more risk averse are less likely to go into finance, a high payoff and high liability career. The financial crisis afforded us a special opportunity to examine this, as we were able to look at an individual's financial portfolio before and after the crisis. For the group of MBA students we studied, we saw no significant difference in risk aversion before and after the recent financial crisis.

However, in another study, we looked at similar data for a panel of clients at a large Italian bank. With the Italian subjects, we found a significant increase in risk aversion

following the financial crisis. This might be attributable to differences in financial education and sophistication between the samples. One explanation may be that if a person loses wealth or becomes poor, they become more risk averse. However, our data shows that a change in wealth does not seem to be driving this phenomenon. This spike in risk aversion with the Italian clients seems to be more emotional than mental, and may reflect changes in the study participants' trust in markets and larger financial systems. Determining where this response originates in the body and the brain could have significant implications for how people respond to risk, and consequently the financial markets.

How does biology influence risk aversion?

In the study with MBA graduates, we looked at the relationship between level of testosterone and risk aversion. To measure risk aversion in this study, we asked participants to play a specific game. For fifteen rounds, the participants were asked to choose between receiving a guaranteed dollar amount that slowly increased each round, and participating in a lottery where either zero or two hundred dollars was paid out each time. At the end of the experiment, they would receive a payment randomly selected from one of their fifteen choices. The very risk-averse would be more inclined to choose the guaranteed amount, and the risk-tolerant would choose the lottery. As a result, a person who was more comfortable with risk would decide to switch from choosing the lottery to the guaranteed dollar amount later (i.e., for a higher amount of the guaranteed amount). We looked to see if this measurement of risk aversion was related to salivary testosterone. Interestingly, we found that this measure was correlated for women (the higher the level of testosterone, the lower

the risk aversion) but not for men.

This difference could be due to the fact that men have a higher baseline level of testosterone, or to the fact that testosterone plays a different role in men and women. Men and women with similar levels of testosterone do not have different levels of risk aversion. Thus, the level of testosterone could explain the well-established finding that women, in this case, are less risk averse.

What questions would you like to answer with future research?

One potentially fascinating question is the extent to which different parts of the brain activate in making these decisions about risk and also trust. In a study conducted with John Cacioppo, Director of the Center for Cognitive and Social Neuroscience, we began the process of answering this question. First, we wanted to determine what factors influence a person's trust of other people. In our experiment, we asked subjects to play a traditional trust game. In this game, the first participant gives money to the second participant. If the first participant sends the second \$1, the second participant receives \$3. The second participant then can decide to send some money back to the first participant. Whatever they do not send back, they keep. Economists anticipate that since the second participant makes the last decision and the anonymous game is not repeated, the second participant should keep whatever money they receive. Surprisingly, among our MBAs, two-thirds of the participants send money back to the first participant. We believe this is driven by a feeling of reciprocity, but there is much debate over the cause of this pattern. By matching the behavior in this game and the actual donations made to the business school at the end of the program, we find that the pattern of reciprocity is correlated with the

amount donated.

We would like to look at these and other patterns using fMRI technology and continue to look at hormones and physiological changes. Traditional economists assume individuals behave rationally, or (in neurologic terms, they only use the rational part of the brain). As our knowledge of the brain advances, we discover that different parts of the brain are used for different functions and not all of them behave according to the principle of rationality assumed by economists. The exciting question is: how do these different biological, rational, emotional, and social components work together? What triggers these interactions? What takes precedent in decision-making? I think we are far away from having sort of a general theory, but greater understanding is an exciting goal. ■

BELOW: Professor Luigi Zingales



UPCOMING EVENTS

Upcoming Lectures

Donald W. Fiske Distinguished Lecture

10 March 2011
4:30-6:00PM

Social Sciences Research Building
Room 122

John A. Bargh
Yale University
Physical Priming of Psychological States

Research in Progress Seminars

The Center faculty also participate in workshops, brown bags, and research in progress seminars. To be added to the email list for announcements of talks and events, email Anna Gomberg, agomberg@uchicago.edu.

2011 CCSN Speaker Series

The Center for Cognitive and Social Neuroscience, in collaboration with other departments, centers, institutes, and programs, sponsors presentations by visiting scholars. Upcoming speakers include:

7 April 2011
4:00- 5:30 PM
Harper Memorial Library
Room 140 (tent.)
Tomáš Paus, University of Toronto

21 April 2011
4:00- 5:30 PM
Harper Memorial Library
Room 140 (tent.)
Lisa Parr, Emory University

28 April 2011
4:00- 5:30 PM
Harper Memorial Library
Room 140 (tent.)
Emily Falk, University of Michigan

5 May 2011
4:00- 5:30 PM
Harper Memorial Library
Room 140 (tent.)
Stephanie Ortigue, Syracuse University

26 May 2011
4:00- 5:30 PM
Harper Memorial Library
Room 140 (tent.)
Morten Christiansen, Cornell University

Affiliate Lab Interview

Amir Raz

Amir Raz, an affiliate of the CCSN, investigates attention, placebos, and altered states of consciousness such as hypnosis. He is Director of the Cognitive Neuroscience Laboratory and Professor of Psychiatry at McGill University in Montreal, Canada.

What research projects are you currently exploring?

By training, I am a cognitive neuroscientist,

but I am very interested in many social psychological questions. My research tends to marry these two approaches. One study I recently conducted looked at how people might be influenced by technology. At the beginning of a semester, I asked an advanced class of 160 students studying neuroimaging techniques to participate in a study of new technology for extra credit. The participants walked into a room and were asked to sit in a chair attached to a coiled device that resembled a salon hairdryer. They were told this was a new type of brain scanner. A screen nearby displayed rotating, three-dimensional brain renderings. This whole set up was simply for show. In order to maintain the illusion in the age of Google, we told the participants this technology was based on spintronics, a real system used by physicists-- if they investigated, it may have seemed legitimate.

During the experimental task, we asked the participants to think of a two-digit number and keep it secret, just as audience members might do in a magic show. They were then asked to think of their number while our machine completed their brain "scan." Following the procedure, a computer screen displayed the number they were thinking of during the scan, allegedly based on their neural activations. This is patently impossible today. However, there are many standard magicians' tricks employed for this kind of guessing.

Because I employed these sorts of tricks in guessing their numbers, I was almost always able to guess the participant's number correctly. A majority of the participants believed that the brain scanner was reading their thoughts simply because I got the number right.

Two months later, I invited the same participants back for another task, this time in my office. I asked them to think of a two-digit number, and I wrote down a two-digit number on a piece of paper. Because I used the same magician's tricks in guessing their number, invariably, they were

the same. Once again, they were surprised. I then asked them how they thought I was able to do this, and they offered many different explanations, ranging in credulity. At the end, I offered an explanation of the trick, using familiar psychological terms like priming, subliminal activation, and contamination. This explanation was inaccurate, but familiar to students of neuroscience and psychology. Just as with the technical devices, the students believed the scientific explanations delivered by an expert, without skepticism. I found similar results when performing similar experiments with my colleagues and graduate students.

People really believe in technology, particularly when it comes to neuroimaging techniques like fMRI (functional magnetic resonance imaging) or TMS (transcranial magnetic stimulation). We may not always have good reasons to do so, and we must be aware of this bias. The results of these studies

were disturbing. Expert knowledge does not seem to limit our capacity to believe what technology tells us.

How does this relate to your research employing hypnosis?

Other experiments look at the neural correlates of agency using hypnosis. Hypnosis is an unusual plane of attention that allows us to create situations where people are unsure whether they are taking actions or things are happening to them. Around 15% of adults are very susceptible to hypnosis. With hypnosis, you can tell a person there is a helium balloon attached to their wrist, and their arm will slowly rise in the air. Of course, there is no balloon, but the atypical attention pattern makes the person raise his or her arm. This effortless effort is very compelling. If you ask someone to raise his or her arm deliberately in the same fashion, and look at brain imaging for

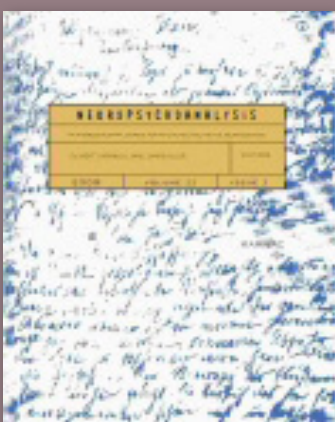


ABOVE: The Montreal Neurological Institute at McGill University in Montreal

EXPERT KNOWLEDGE DOES NOT SEEM TO LIMIT OUR CAPACITY TO BELIEVE WHAT TECHNOLOGY TELLS US.

AMIR RAZ

AMIR RAZ: FEATURED PUBLICATION



Raz, A. & Wolfson, J. B. (2010). From dynamic lesions to brain imaging of behavioral lesions: Alloying the gold of psychoanalysis with the copper of suggestion. *Neuropsychiatry*, Vol 12(1): 5-18.

Contemporary studies in the cognitive neuroscience of attention and suggestion shed new light on psychoanalytic concepts of yore. Findings from neuroimaging studies, for example, seem to revive the notion of dynamic lesions—focal brain changes undetectable by anatomical scrutiny. With technologies such as brain imaging and reversible brain lesion, some findings from modern biological psychiatry seem to converge with nineteenth-century psychiatry, reminiscent of the old masters. In particular, suggestion has been shown to modulate specific neural activity in the human brain. Here we show that "behavioral lesions"—the influence that words exert on focal brain activity—may constitute the twenty-first-century appellation of "dynamic lesions." While recent research results involving suggestion seem to partially support Freudian notions, correlating psychoanalysis with its brain substrates remains difficult. We elucidate the incipient role of cognitive neuroscience, including the relative merits and inherent limitations of imaging the living human brain, in explaining psychoanalytic concepts.

WE ARE JUST BEGINNING TO UNDERSTAND THE POWER OF THESE EFFECTS, BUT THE PROMISE THEY HOLD COULD BE EXTRAORDINARY.

AMIR RAZ

each situation, the activation is completely different. You can generate different neural patterns and neural correlates of the same movement, even with very simple paradigms.

With hypnosis, the experimenter manipulates the subject, as opposed to manipulating the experiment. In experimental cognitive neuroscience or cognitive psychology, most researchers do experiment A and then do experiment B “with a twist” and call it experiment B. They then look at the differences between the results. With hypnosis, people can do the same thing twice, but the context changes via the power of suggestion. In these cases, I am relying on changing the person, not changing the experiment. This social manipulation has produced results different from other psychological experimental methods.

BELOW: The “brain scanner” used in Raz’s experiments



How might these studies be applied?

Harnessing some of this work in attention therapeutically would be very rewarding. One area where the power of suggestion can be applied is with Tourette’s syndrome patients. Individuals with Tourette’s syndrome suffer from vocal ticks and motor ticks-- sometimes very simple, sometimes fairly complex. These can be very difficult to control and disruptive to everyday life. However, many individuals with Tourette’s can control their ticks for a short period of time, usually a matter of minutes, if given a significant incentive. After this short time, the ticks come back, often as a rebound effect, with many ticks occurring at once.

Some years ago, I noticed that when Tourette’s patients engage in tasks they particularly enjoy, like playing a game, reading, or watching a movie, they tick

less. It appeared there was an interesting correlation between attentional investment and ticks. I wanted to see if attentional training might help these patients.

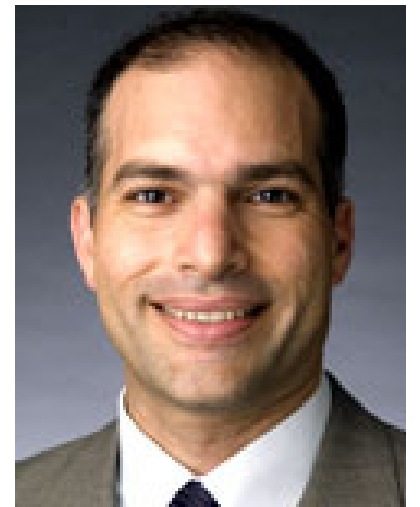
I decided to apply some of the work we had done with attention to Tourette’s patients in the lab. I would bring out an elaborate machine: an old video camera on a tripod complete with many complicated lights, meters, and knobs. I tell the subjects, both adults and children, that this is a tick detector. I tell them that it can tell me when you are about to experience a tick. This is a tautology, because they tick very frequently. I tell the participants that the machine says they are going to tick very soon, and they do, seconds or minutes later, reinforcing what I have told them. I then tell them I am going to turn on the tick-deflector function of the machine. I tell them the deflector will be able to sense the oncoming ticks and deflect them, and if the deflector is able to deflect a tick, they will hear a beep. The machine can be interpreted different ways-- either more sensitive than the participant, sensing and dismissing ticks that they do not feel, or predictive of the participant’s ticking behavior. Because they hear a tone, they learn to associate machine’s beeping with control of their ticks, and they tick less. This sense of control can be very helpful, as it allows them to control their ticks for an extended period of time with no rebound effect. The therapeutic role that such a device could have could be very powerful.

What future directions do you see for this research?

More and more often, we are finding that expectations and mental state can have substantial effects in shaping and forming a person’s physiology and creating certain measurable changes in neural circuitry. This is especially notable because this is a top-down effect. Traditionally, medicine and neuroscience have looked at bottom-up effects. Take, for example, the way our body responds to a mosquito bite. A mosquito bites us, and our body produces a histamine reaction, which communicates to peripheral nerves through our central nervous system

to our brain. The field has been oriented to understanding these processes. Neuroscience is just beginning to examine a system that begins in the brain, with signals traveling through the nervous system, those messages changing the way the system is performing. In this regard, the social sciences have a lot to offer neuroscience and may help to push the field beyond its reductionist beginnings. This is an important step for any paradigm. We are just beginning to understand the power of these effects, but the promise they hold could be extraordinary. ■

BELOW: Amir Raz, Professor of Psychiatry at McGill University



RECENT SELECT PUBLICATIONS FROM THE RAZ LAB

Raz, A., Schweizer, H. R., Zhu, H., & Bowles, E. N. (2010). Hypnotic dreams as a lens into hypnotic dynamics. *International Journal of Clinical and Experimental Hypnosis*, Vol 58(1): 69-81.

Raz, A., Packard, M. G., Alexander, G. M., Buhle, J. T., Zhu, H., Yu, S., & Peterson, B. S. (2009). A slice of π : An exploratory neuroimaging study of digit encoding and retrieval in a superior memorist. *Neurocase*, Vol 15(5): 361-372.

Raz, A. (2009). Varieties of attention. In Berntson, G.G. (Ed.) & Cacioppo, J. T. (Ed.), *Handbook of neuroscience for the behavioral sciences, Vol. 1* (pp. 361-369). Hoboken, NJ, US: John Wiley & Sons Inc., xvi, 613 pp.

Greene, D. J., Barnea, A., Herzberg, K., Rassis, A., Neta, M., Raz, A., & Zaidel, E. (2008). Measuring attention in the hemispheres: The lateralized attention network test (LANT). *Brain and Cognition*, Vol 66(1): 21-31.

Raz, A. (2008). Genetics and neuroimaging of attention and hypnotizability may elucidate placebo. *International Journal of Clinical and Experimental Hypnosis*, Vol 56(1): 99-116.

