



BERLIN
SCHOOL OF
MIND AND
BRAIN

An Issue on
DECISION-
MAKING

Newsletter
Nº III
JANUARY 2011

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Decision-making

There is a long history of decision-making research in philosophy, economics, and psychology and only recently cognitive neuroscience has joined these disciplines in the quest to better understand how we make decisions.

Decision-making research in Berlin covers a broad range of different aspects: from mechanisms of perceptual, value-based, and economic decision-making to social, legal, and moral decision-making.

Decision-making is not only a fascinating topic for basic research but may have important practical implications, for example, in designing better decision architectures to enable people to make better decisions.

What is more, alterations in decision-making are a central feature of neuropsychiatric disorders. A more comprehensive understanding of how we make decisions will also contribute to a better understanding of disorders of this kind in clinical populations such as patients with brain lesions, drug and alcohol addiction, depression, and impulsive aggressive behavior.

The interdisciplinary environment at the Berlin School of Mind and Brain provides a unique opportunity to tackle problems related to decision-making by taking into account knowledge from philosophy, economics, psychology, and cognitive and affective neuroscience. ●

Editorial
by HAUKE
HEEKEREN,
faculty member
of the Berlin
School of Mind
and Brain

Einstein Visiting Fellow: Raymond J Dolan (London)



The Berlin School of Mind and Brain is happy to announce that Professor Raymond J Dolan (Wellcome Trust Centre for Neuroimaging, University College London) will be the School's "Einstein Visiting Fellow" beginning in 2011. The Fellow will receive funding from the Einstein Stiftung (www.einsteinfoundation.de) to set up a research group in Berlin and collaborate with the Berlin School of Mind and Brain, its faculty and doctoral students over the coming years.

Professor Dolan's research focuses on the neurobiological characterization of human emotion and its interaction with other components of cognition, such as attention, memory, and decision-making. Ray Dolan has received numerous prestigious awards, including the Humboldt Research Award for Outstanding Scholars, the Minerva Foundation Golden Brain Award, and the International Max Planck Research Award. In the field of Neuroscience and Behaviour, he is one of the most cited scientists in the world.

Professor Dolan is a member of the Berlin School of Mind and Brain's International Advisory Board. He has kindly agreed to participate in this edition's "Questions and Answers" to introduce his studies and aims for his project in Berlin. ●

Q *What motivated you to take up the Einstein Visiting Fellowship and set up a research group at the Berlin School of Mind and Brain?*

A I have longstanding collaborations with colleagues in Germany, and especially in Berlin. Many of these have in fact led to scientific publications. So, it seemed logical to put things on a more formal basis.

Q *What is your research topic?*

A I work on emotion and decision-making, in health and disease. This is a wide brief but is one that is intellectually rich. Arguably, many of the mental pathologies that afflict humans are directly related to this topic and this is of interest to me as a practising psychiatrist.

Q *Which do you see as the challenges of an interdisciplinary study of the mind and brain?*

A It is one of translation. How do you map one level of description on to that of another.

Q *What classes from undergraduate study do you wish you could still remember or wish you had taken?*

A Mathematics to a high level, and physics too.

Q *What do your parents think you are doing?*

A I am not sure as they are both dead – but I don't for a moment imagine they would have envisioned me working either in neuroscience or indeed having a base in Berlin!

Q *What do you like best about living in Berlin?*

A I think the city is fascinating, with an extraordinary history. I am deeply impressed with a commitment to deal with this history, rather than bury it. The commitment to the architectural and cultural life of the city especially through visible investment is also impressive. The city also feels very open in all senses of the word, and that includes the most important element – the people.

Q *What do you find most interesting about your research?*

A The fact one is continuously confronted by new problems and challenges that are never boring.

Q *How would you explain what you do to a non-expert?*

A I say that I am trying to understand how one bit of the mind works. ●

Q What motivated you to apply for the program at the Berlin School of Mind and Brain?

A The title of my Master's degree was "Brain and Mind Sciences." When I started my Master's course, I was mainly interested in the brain on a cellular level. However, gradually my interests shifted to topics related to human behavior. I was really glad that the interdisciplinary structure of my Master's course aroused my fascination for both brain and mind sciences. Therefore, I wanted to pursue my PhD thesis in a similar, interdisciplinary environment. Furthermore, I was looking for the possibility to do my PhD in a framework that offers a lot of face-to-face interaction with other students and researchers. In addition to doing research, I also wanted to get additional teaching during my PhD. The Berlin School of Mind and Brain offered precisely what I was looking for.

Q What is your research topic?

A In our everyday lives we make many decisions in a social context. I am interested in how this social context influences and shapes our behavior. Specifically, my current research focuses on how we process self-related social feedback. This social feedback can be positive, such as somebody telling us that we are nice and friendly, or it can be negative, such as somebody telling us that we are arrogant and hypocritical. From our own experience, we know that our reactions to positive and negative feedback differ substantially.



CHRISTOPH KORN

By using functional magnetic resonance imaging I want to investigate the brain mechanisms involved in differentiating positive and negative social feedback. Importantly, in order to get a more mechanistic understanding of the computations performed by certain brain regions during social feedback processing, I am applying insights and theories from recent studies on non-social decision-making.

Q *Which do you see as the challenges of an interdisciplinary study of the mind and brain?*

A In my opinion, the challenge is not so much about explaining what you are investigating, but about conveying why you are interested in answering a certain research question. In interdisciplinary debates, scientists often have difficulties communicating the motivation for their specific research questions. Furthermore, scientists trained in different fields sometimes have a hard time understanding each other due to the use of different research methodologies. I think that we should be aware of the shortcomings of our respective approaches and acknowledge that scientists trained in

another discipline often use a different methodology precisely because they are asking a different question.

Q *What do you find most interesting about your research?*

A What I like about my research topic is that a lot of people can immediately understand and relate to what I am interested in from their everyday experiences. Furthermore, I like the fact that I am working on an interdisciplinary topic, which is influenced by studies in neuroeconomics, cognitive neuroscience, and social psychology. I also like the fact that my research topic may be relevant for clinical research and practice. Patients suffering from psychiatric disorders such as major depression show altered social feedback processing. Therefore, I hope that in the future, my studies can contribute to better understanding the deficits of these patients. ●

Q *What motivated you to apply for the program at the Berlin School of Mind and Brain?*

A How can the brain give rise to subjective experience? Why do I experience myself as a person in space and time? Such questions have fascinated me since early adolescence. I applied to the Berlin School of Mind and Brain because I am convinced that interdisciplinary discussion is crucial if we want to have even the slightest chance of understanding these topics better. At the School of Mind and Brain you can interact with and learn from students and researchers from diverse backgrounds who share the same passion for mind and brain topics. You are constantly exposed to new ideas, perspectives, and methodological approaches. This helps one to avoid getting caught up in rigid ways of thinking. I am very grateful to be part of this stimulating environment.

Q *What is your research topic?*

A When we decide between several options, we have to assign values to each of them in order to choose the option with the highest value. I study the neural mechanisms underlying this assignment process by functional magnetic resonance imaging (fMRI). In my experiment, participants decide how much money they are willing to pay for different food items (e.g., chocolate, potato crisps). This is one measure for the value participants place on items. To study how value signals are computed or retrieved in the brain, we use hypnosis to systematically influence factors relevant for the assignment of values and observe how this changes brain activation during decisions about food.

Q *What do your parents think you are doing?*

A Something crazy. My family knows I am investigating something about the brain, that we will hypnotise people, and that I go to the supermarket to buy incredible amounts of sweets. Who could possibly make sense of this?

Q *What do you like best about living in Berlin?*

A The atmosphere, the people, and the fact that there is so much to do: conferences, workshops, exhibitions, bars, sports – even beautiful lakes are close by. I enjoy that you hear many different languages in the streets, that you discover new things every day, and that living here is quite cheap. Even though Berlin is not perfect (we do have some ugly buildings, cold winters and rude people), somehow that just makes me love it more.



VERA LUDWIG

Q *What do you find most interesting about your research?*

A What I find most interesting about my research is that we use hypnosis in our experiments. It is a very promising tool for cognitive neuroscience, because you can induce states in healthy people that would be difficult to produce otherwise (e.g., amnesia, paralysis, hallucinations). Hypnosis has not yet been applied in studies of decision-making and reward-related processing. I am very excited to see how well it will work and what we will find. ●

Q *What motivated you to apply for the program at the Berlin School of Mind and Brain?*

A The Mind and Brain program offers the opportunity to meet students from completely different research backgrounds. After school, I was not sure whether biology, psychology, philosophy, or medicine would be a good choice for me. I decided to study psychology since topics like consciousness, pathological states of mind, thinking, and many more were covered by these studies. After finishing my studies, I decided to do a doctorate in biological psychology and discovered another chance for getting to know other disciplines better, this time at Mind and Brain. What I found most interesting was the opportunity to understand the research questions that each respective science branch asks. In the end, this methodological perspective taking allows one to come closer to the big picture of the mind and its relations to the brain. Connecting knowledge from modern state-of-the-art neuroscience data with theoretical concepts and its philosophical implications is probably fascinating for everyone who considers themselves to be a scientifically-minded person.

Q *What is your research topic?*

A I am interested in the brain's ability to deal with conflicting action tendencies during goal-directed behaviour. In specific, focus on how we can select relevant or ignore irrelevant elements during information processing. Imagine yourself as a German in London crossing the street: your first tendency might be to look to the left for approaching cars. However, several near accidents later you will have learned to ignore your tendency to look to the left and overcome this action tendency by looking to the right.



ROLAND NIGBUR

A proposed idea is that there is a single system in the brain which is capable of controlling information processing by selecting or ignoring such motor programs or learned reactions. However, quite early in my project it became clear that this system is more complex and consists of several building blocks instead of one central executive. Right now, I am investigating how different task-relevant parts of our brain can “communicate” and influence the information flow. I use electrical brain signatures (EEG) to study neuronal counterparts of cognitive processing during conflict resolution, but I am also interested in the general set-up of the brain and how long-range communication might be influenced by emotions.

Q Which do you see as the challenges of an interdisciplinary study of the mind and brain?

A From my perspective, the most important challenge of interdisciplinary research lies in developing a common vocabulary. It happens very often that people from different fields such as philosophy or psychology use exactly the same term in completely different ways. For example, take the

term “representation.” Especially neuroscientific research delivers counterintuitive results, which are sometimes incompatible with our everyday thinking about the mind and our psychological architecture. I think the most fruitful search lies in the gap between molecular level up to the cognitive operations that can be done and functions that we ascribe to our brains. In my view, sketching the basic properties of this incredibly complex system and relating it to concepts and questions from humanities is the biggest challenge.

Q What do you like best about living in Berlin?

A Berlin is cheap, dynamic, and overwhelming. I think everyone can find his, her or its niche and it doesn't matter if you prefer music, nightlife, arts, or people. Following my favourite Berlin slogan, “Jeder nach seiner Fassung”*, you can do what you want and become who you are without anyone disturbing you. ●

* Roland quotes King Frederick II of Prussia who, commenting on religious tolerance, said (roughly translated): “Whatever floats your boat!” (Ed.)

Q *What motivated you to apply for the program at the Berlin School of Mind and Brain?*

A The opportunity to meet and collaborate with members of the colourful Berlin neuroscience community. And money.

Q *What is your research topic?*

A Neuroeconomics – i.e., combining neuroscience and economics in order to understand better how people make economic decisions.

Q *Which do you see as the challenges of an interdisciplinary study of the mind and brain?*

A Finding a good way of relating David Marr’s three levels to another: Traditional economics is, I would claim, almost exclusively about Level 1, the “Computational Theory.” The reason is that on this level, it is easiest to model both individual agents with their individual motives and their interactions, which jointly shape aggregate outcomes. Cognitive psychology, in my eyes, deals with both the “computational” Level 1 and with Level 2, “Algorithms and Representations.”

Neuroscience, in turn, is concerned with the “algorithmic” Level 2 and Level 3, the “Physical Implementation.” In the end, neuroeconomics attempts to provide a description of (economic) decision-making that is satisfactory on all three levels. However, it is very difficult to develop models that fulfil this criterion while maintaining a healthy level of abstraction and simplicity. It is easy for such models to become overly complex so that one cannot analyse the interaction between agents anymore.

Q *What classes from undergraduate study do you wish you could still remember or wish you had taken?*

A There was no freedom of choice. We had to ingest what was being served.

Q *What do your parents think you are doing?*

A That I am a neoliberal who helps companies find new ways to empty people’s pockets.

Q *What do you like best about living in Berlin?*

A The company of people who are even greater geeks than yourself ... see my answer below.

Q *What do you find most interesting about your research?*

A The opportunity to combine all my favourite geekeries: a geeky academic topic, endless discussions about tiny details, big issues and right and left and wrong, computer geekery (especially Mac), typographic geekery/graphic design, and meeting people who are even greater geeks than yourself.

Q *How would you explain what you do to a non-expert?*

A No, neuroeconomics is not about manipulating people so that you can empty their pockets even faster (you're confusing neuroeconomics with neuromarketing ...)! Rather, neuroeconomics is about finding out how people make economic decisions – which might even come in handy when advising people how to make better decisions.

Q *What do your kids bring to “Show and Tell – what do your parents do”?*

A A laptop. ●

HOLGER GERHARDT



Q What motivated you to apply for the program at the Berlin School of Mind and Brain?

A Before I started the PhD program, I worked in various neuroscience labs that applied different methods in order to study animals and humans. It was very important for me to have the possibility to learn new methods and to have the access to new inputs. The Berlin School of Mind and Brain is a big collection of researchers working in diverse fields varying from humanities to medicine. I was attracted to the amazing possibility of all these topics.



SOYOUNG PARK

Q What is your research topic?

A I am interested in value-based decision-making and reinforcement learning. Everyday we decide among many options and most of them are driven by the value that an option has. An option, let's say a pair of shoes, has both positive value, the comfort of the shoes, and negative value, the monetary cost. We are very good at computing the overall value of the shoes by integrating the different values to make a successful choice. My current project aims to investigate how our brain performs such a computation. Here, I apply computational models to the brain data, assessed by functional magnetic resonance imaging (fMRI). Although the behavioural data cannot provide decisive information about which mechanisms are used, brain data is beneficial because it unveils the fact that values impact each other when being integrated.

Q Which do you see as the challenges of an interdisciplinary study of the mind and brain?

A Openness, breaking down the barriers between languages. Researchers tend to talk in the language of their respective discipline and it is only natural that they differ across disciplines. I think that the ability to listen to researchers from other disciplines, to ask what they mean when they say certain things, and to try to understand their concepts is very important.

Q What classes from undergraduate study do you wish you could still remember or wish you had taken?

A Actually, psychology as an undergraduate study seems to prepare one very well for neuroscientific research. Additionally, I could have done more mathematics and computer science. This might make it easier to create new models.

Q What do your parents think you are doing?

A Investigating brains. My parents are very curious about what I am doing and I sometimes have to spend a whole day on the phone with them explaining computational models.

When I have publications or submit a thesis, they always ask for a copy and read it. After that, we have to talk for a long time on the phone.

Q What do you like best about living in Berlin?

A Berlin is one of the most amazing cities I have ever been to. It has everything one can imagine and more. It has history, it has class, and it is incredibly young and dynamic. Everyone can find his or her own niche here and feel comfortable, no matter how weird he/she is. Berlin is unbelievably open and would accept anyone!

Q What do you find most interesting about your research?

A Value is one of the central motivations that drive us. We work because our career has great value for us. We go all the way to a Japanese noodle soup restaurant three times a week because Japanese noodle soup is valuable for us. However, as you can see, the values are very subjective and shaped by learning and experiencing. It seems to be rigid, but is also very fragile and can be reshaped. Still, it determines so much of our life and behaviour. That is pretty fascinating! ●

Q *What motivated you to apply for the program at the Berlin School of Mind and Brain?*

A In the beginning of 2007, I started a PhD program at the Max Planck Institute for Human Development in the research group Neurocognition of Decision Making. My supervisor, Hauke Heekeren, suggested the newly founded Mind & Brain as a complementary program to my PhD because he knew that I think very broadly about how we make decisions, how we learn, how we think, and so on. I read about the school's concept and liked the idea and thus I applied.

Q *What is your research topic?*

A My current research is in the field of cognitive neuroscience. In particular, I am doing research on perceptual and reward based decision-making. For instance, I am using brain-imaging methods like fMRI in combination with mathematical models to understand the basic mechanisms of decision-making in the human brain.

Q *Which do you see as the challenges of an interdisciplinary study of the mind and brain?*

A How to put it all together! There are several scientific fields, such as cognitive science, neuroscience, cognitive psychology, philosophy, engineering, computer science, linguistics, and artificial intelligence, involved in studying the brain and the mind. Often, we have very similar views on a lot of the questions we are interested in. However, we tend to also have lot of different presumptions about the right level of detail or the right method to answer a question.

Q *What classes from undergraduate study do you wish you could still remember or wish you had taken?*

A Most of them. Like many others, I vaguely remember the details of complex knowledge if I do not use it regularly, be it pharmacokinetics, the symbol grounding problem, semantics, or differential calculus.

Q *What do your parents think you are doing?*

A Enjoying life with my family in Berlin! Seriously, most of the time we talk about the technical aspects

of my research, as they understand most if not more than me because of their profession.

Q *What do you like best about living in Berlin?*

A 1. The long, cold, dark grey winter! And definitely the summer in between! 2. High quality of living. 3. The experience of different ideas and expressions and interacting with the people behind them.

Q *What do you find most interesting about your research?*

A The questions: What kinds of things are involved when making decisions? What affects one's choice? What components are involved and how do they interact? Discussing possible ways of answering those questions. Taking apart our research findings and discussing their relevance.

Q *How would you explain what you do to a non-expert?*

A What is a decision? Whenever you choose between alternatives – whether it's selecting different vegetables offered on a farmers market, deciding if the person on the other side of the street in the distance is



NIKOS GREEN

a friend, or deciding to read this text rather than doing other things. I would start off by using these sorts of questions and examples of decision-making or a simile on the methods of cognitive neuroscience. Depending on the context, we would proceed from there.

Q *What do your kids bring to “Show and Tell – what do your parents do”?*

A In my son's case probably some music like the song Axons and Dendrites from Shipping News or Stream of Consciousness from Dream Theater and a sack full of walnuts. ●



CONTACT

If you would like to talk to us about research at the Berlin School of Mind and Brain and our doctoral program, please get in touch!

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Alexander von Humboldt (1769–1859), natural scientist and explorer, co-founder of Berlin University. Younger brother of Wilhelm (1767–1835), scholar of comparative linguistics and Prussian statesman, whose portrait was on the cover of Newsletter 11.

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BERLIN
SCHOOL OF
MIND AND
BRAIN

THREE-YEAR DOCTORAL PROGRAM
IN TRANSDISCIPLINARY
MIND AND BRAIN RESEARCH

Applications invited for

Conscious and unconscious perception

Decision-making

Language

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