

David Sheinberg, PhD
Search Committee Chair
Department of Neuroscience
Brown University, Providence

Dear Search Committee,

I would like to express my strong support for George Dragoi's application for an assistant professorship at Brown University. I have followed Dr. Dragoi's work since he began working in the Buzsaki lab more than 10 years ago. I found his work in the Buzsaki and Tonegawa labs interesting and have always visited his posters at meetings and conferences.

Dr. Dragoi's research work focuses on the neural basis of learning and memory. By combining advanced multi-channel neuronal recording with advanced analysis tools, many developed by himself, he has made several important contributions. With Gyuri Buzsaki at the Center of Molecular and Behavioral Neurosciences at Rutgers University, Dr. Dragoi discovered that during slow-wave sleep the hippocampus inhibits the activity of medial septum neurons mostly during periods of maximal communication between the hippocampus and the neocortex (Dragoi et al, 1999). This result demonstrated the capacity of the hippocampal system to shift from a predominantly new memory encoding mode characterized by a medial septum imposed theta oscillation into a memory consolidation mode that allows for the previously stored information to be transferred to the neocortex. The study played a key role in the understanding of the interaction between the hippocampus and the medial septum and its consequences on memory consolidation. In 2003, Dr. Dragoi found that experimental increase of synaptic strength results in new representations of the unchanged external world (Dragoi et al, 2003, Neuron). This result was followed by a series of cleverly designed and interpreted experiments which allowed him to demonstrate that the information is organized in cellular assemblies of the hippocampus in a way that enables fast compression of spatial sequences, a possible element in hippocampal episodic memory (Dragoi et al, 2006, Neuron). The most important study, however, was published after Dr. Dragoi moved to the Tonegawa lab at MIT (Dragoi and Tonegawa, Nature 2011). Before he started on this study, it was known that cell assemblies in the hippocampus recapitulate activity patterns that just occurred during experience. Such reactivation is thought to facilitate the formation of long-term memory. Dragoi and Tonegawa found that experience is associated also with the resting patterns that precede the event, suggesting that some of the underlying temporal structure might be hardwired. The study changes radically the view we have of how information is coded in the hippocampus. Until the Nature paper, it was thought that experience is encoded on a relatively blank background. The new data suggested, instead, that the structure of activity in hippocampal ensembles is prewired, perhaps as a result of genetic or early maturational factors. These prewired patterns are reflected in the ensemble activity, with experience-related changes encoded on top of the pre-existing patterns. The paper received much attention and I wrote a News and Views article on it for Nature. I am convinced that this study will trigger much new research on the precise hardwired structural basis for population activity.

Having followed Dr. Dragoi for about a decade, it is easy to see some patterns. First, he is an independent scientist who is able to go his own ways. Many of his results have come unexpectedly as the result of careful observation in experiments with very different aims (e.g.

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the Nature study was originally designed to determine the molecular basis of memory). The effects could easily have been missed by a less knowledgeable and thoughtful postdoc. Second, he consistently takes the time needed to complete a study, regardless of its complexity, and he is willing to do the extra experiments required to support his claims. The publication frequency reflects this careful and independent attitude. He is a creative scientist with his own views and I very much enjoy discussing with him. Dr. Dragoi is clearly ready for setting up his own lab now and I am convinced that he has the qualities needed to become one of the field's leading scientist within a few years.

Yours sincerely,

A handwritten signature in black ink, appearing to read 'Edvard Moser', with a long, sweeping horizontal stroke extending to the right.

Prof. Edvard Moser
Norwegian University of Science and Technology
Director, Kavli Institute for Systems Neuroscience
Director, Centre for the Biology of Memory