



California Institute of Technology

Division of Biology

Division of Engineering & Applied Science

Dr. Christof Koch

Lois & Victor Troendle Professor of Cognitive & Behavioral Biology

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re.: Letter for Alireza Soltani, PhD

Dear colleagues,

I would like to warmly and unconditionally recommend Alireza Soltani, PhD, to you as a wonderful faculty member in your department.

In the summer of 2007, Alireza joined my laboratory to carry out detailed computational modeling of electrophysiological data pertaining to selective, visual attention in the behaving monkey, within the 'saliency map' framework my laboratory has advocated over the past two decades.

Alireza built a network of spiking cortical neurons that mimic cells recorded from the lateral intraparietal sulcus (LIP). Starting with a series of visual maps that receive converging synaptic input - corresponding to regions V1, V2 and V4 - he transformed these into a representation of visual saliency. There are an astounding 90,000 papers under scholar.google.com containing the words "visual" and "saliency" or "salience", with the vast majority of these focusing on saliency as defined within a psychophysical, computational or computer vision frame of mind. Little is known about the neuronal representation of saliency except for a handful of electrophysiological studies arguing that such a map is contained within LIP, the FEF or in the pulvinar. Alireza's study adds the certainty that such a map can be instantiated in these regions on the basis of all available evidence. It was a hard project as modeling spiking neurons depends sensitively on assumptions and parameters (due to the time-localized and very non-linear nature of spiking). Although he worked day-and-night on this project, harder than I have seen anybody else work in my 26 years of supervising post-doctoral fellows, it was only toward the end of his stay in my lab - which was limited

to two years - that he finally succeeded with his project. The resulting work, which has appeared in *Journal of Neuroscience*, showed how saliency signals can emerge in successive layers of neural population and pointed to biological limits of these computations imposed by the spiking nature of signaling in the brain.

During his stay at Caltech, Alireza also initiated some fruitful collaboration with experimentalists at Caltech and Stanford University. In a collaboration with Antonio Rangel and Colin Camerer at Caltech he investigated how neuro-economic decisions are shaped by the set of available options - phenomenon known as the context effect - and constructed a model to relate this phenomenon to known limits of neural representation. In another collaboration with Tirin Moore at Stanford, he explored the influence of reward value on attentional processes and the interactions between the influence of microstimulation and reward on target selection.

Recently, Alireza joined Moore's laboratory to utilize his modeling expertise to address important questions regarding the dissociation of reward and attentional processes and how neuromodulators such as dopamine affect these processes. His close collaborative work with experimentalists holds a great deal of promise, not only to find plausible mechanisms underlying experimental observations, but also to design experiments focused on revealing such mechanisms.

Finally, Alireza has a strong grasp on the literature with a very pleasant and easy-going character that fitted in well with my large group. I enjoyed working with him and I strongly recommend him to you as an assistant professor.

I remain with collegiate greetings,

[A signed letter can be sent upon request]

Dr. Christof Koch

Lois and Victor Troendle Professor of Cognitive & Behavioral Biology

and

Chief Scientific Officer, Allen Institute for Brain Science, Seattle

