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Re. Letter of recommendation for Sungho Hong

Dr. Sheinberg and members of the Search Committee:

I am writing to enthusiastically support the application of Sungho Hong for a tenure-track faculty position in computational neuroscience at Brown University. I first met Sungho at a convention in 2006. We have communicated extensively ever since then based on our mutual interests in how neurons and neural circuits process information. This ongoing communication led to an active collaboration starting in 2009 and its first publication in 2012 (Hong et al., Single neuron firing properties impact correlation-based population coding. *J Neurosci* 32: 1413-28). I must point out that the concepts at the core of that study were entirely Sungho's, and that he undertook a large majority of the work. Furthermore, his distinct perspective on the topic and his mathematical analysis of the data were crucial for the project's success.

In brief, that study demonstrates that intrinsic cellular properties are fundamentally important for how neurons respond to synaptic input. At the multi-cell level, differences in cellular responsiveness translate into whether sets of neurons receiving shared input respond with correlated spiking; specifically, neurons that operate as coincidence detectors will tend to respond with precisely synchronized spiking, whereas neurons that operate as integrators will tend to respond only with coarse rate co-modulation. These two forms of correlated spiking (i.e. spike-time synchronization and rate co-modulation) are differentially sensitive to variations in firing rate. These findings refute erroneous claims arising from simpler neuron models that correlated spiking is inextricably linked with firing rate (de la Rocha et al., *Nature* 2007). One important implication is that correlation-based coding can operate independently of rate-based coding depending on intrinsic cellular properties. More generally, our results highlight the crucial importance of cellular properties for network-level processing, which is something that many network modelers have neglected.

Sungho's approach was a very rigorous one stemming from his expertise in information theory. I must admit that many of the finer mathematical details escape me, but time and again, Sungho has exhibited the utmost patience in explaining concepts from information theory to me. Likewise, he has been very generous in helping my post-doc who recently began using spike-triggered co-variance for the analysis of a separate data


set. Similarly, the post-doc in my lab who conducted the experiments included in the Journal of Neuroscience paper has had only positive experiences in her exchanges with him. Personally, I have found Sungho to be a pleasure to work with and I hope very sincerely that this is just the start of a very long collaboration.

Sungho is, without any doubt, very intelligent and hard working. He is a quiet individual but, at the same time, is fun to be around in a social setting. As I have already mentioned, he has been extremely patient and generous with his time when it comes to helping others. As a theoretician, I found him keen to learn and adaptable when it came to dealing with the limitations of experimental data; indeed, I think his ability to effectively interact with experimentalists is one of his major strengths. From what I see of his research plans, it seems as though he plans to capitalize on that ability. Furthermore, with regard to independence, Sungho is able to conceive of good research questions and to pursue those questions to the point of publication. I would add that he is applying his expertise in information theory to questions that seem not to have attracted other investigators with similar expertise, specifically questions about the biophysical basis for different neural coding properties. I think this bodes well for Sungho's career insofar as he can become a leading expert in a unique and important niche.

In closing, it is a pleasure to write a reference letter for such a fine person. I envy anyone who has Sungho as a colleague within walking distance (as I will most likely be stuck using e-mail and skype to communicate with him...but it is well worth it). I expect he will have an outstanding career.

Please feel free to contact me if you wish to have any additional information.

Sincerely,

A handwritten signature in black ink, appearing to be 'SP', with a long horizontal flourish extending to the right.

Steven Prescott, MD, PhD