



DUKE UNIVERSITY MEDICAL CENTER

Department of Neurobiology

December 3, 2003

Biocomplexity Faculty Search Committee
c/o Professor Rob de Ruyter van Steveninck
Biocomplexity Institute
Indiana University
Swain Hall West 117
Bloomington, IN 47405-7105

Dear Professor de Ruyter van Steveninck:

Zhiyong Yang has asked that I write a letter of recommendation for his application for a position in your department and I am happy to do so. I have known Zhiyong for the past several years as a result of our common interest in mechanisms of visual perception. Actually, my knowledge of Zhiyong preceeded my interactions with him as I heard about this gifted theoretician from Dale Purves and from other members of Dale's lab. As the comments below indicate, I have been extremely impressed with Zhiyong's abilities and believe that he has demonstrated an approach to studying visual system function that has tremendous explanatory power and provides a refreshing new way of thinking about the relation between neuronal response properties and perception.

Zhiyong believes that the problem of understanding brain function is in a state that is not different from that of physics before the existence of quantum mechanics. We are swamped with data about the responses of individual neurons, but lack a clear theoretical framework in which to place these observations. His solution is to challenge the conventional view that neural circuits extract and analyze features of the visual scene. Rather Zhiyong argues that both perception and its neural substrate can only be understood in terms of the statistics of natural scenes. In his conception, vision is an associative process that takes advantage of the statistical properties of the visual scene to draw reflexive inferences about the most likely source of an inherently ambiguous retinal image. In three recent papers, Zhiyong shows how the probability distributions of stimuli in natural scenes can account for many puzzling aspects of motion perception. In the past, these effects (for example the well known effect of apertures on the perceived direction of line motion) were explained in terms of applying different weights to components of the stimulus (direction of terminator motion vs contour motion etc.) under different conditions. While these explanations can often provide an adequate description of some


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perceptual phenomena, they generally fail to explain the full breadth of the phenomena that have been associated with apertures. Zhiyong shows how taking into account the statistical relation of all of the possible correspondences and differences in a given movement sequence to physical object movements can explain the full spectrum of perceptual effects that are found with aperture motion. Furthermore, this approach provides a biologically plausible explanation for these perceptual phenomena that can be generalized to other sensory modalities. While there is much to be done to understand how this associative process is instantiated in neural circuits, this is Zhiyong's goal and he has interesting ideas about how to approach this problem.

Clearly, Zhiyong has an extremely creative mind which, when coupled with his strong background in mathematics and physics, is capable of exploring well outside the box of conventionality. Moreover, as evidenced by his CV, Zhiyong has been quite productive; in addition to what is listed there, there are several other manuscripts in preparation. Beyond his research achievements, Zhiyong is an excellent colleague. At first meeting, his quiet demeanor can be somewhat misleading; have no doubt, when challenged, Zhiyong presents his ideas with conviction, and defends them with authority. He is a nice guy, but he is not easily intimidated. I suspect these behavioral traits will serve him well as he continues to confront established ways of thinking about brain function.

In short, I have a very high regard for Zhiyong's accomplishments and I believe that he has the potential to make significant novel contributions to our understanding of visual system function. If you would like any other information about Zhiyong, please feel free to contact me.

Sincerely,



David Fitzpatrick, Ph.D.
Professor of Neurobiology