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BRAIN
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Rm. B243F LSRC Building
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Durham, NC 27710

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

Dear David,

I'm writing to recommend, in the strongest possible terms, Dr. John Pearson for a faculty position in Neuroscience at Brown University. I have known John for about five years now, three of which he has spent working in my lab as a post-doctoral fellow and then senior scientist. **John is quite simply one of the smartest people I have ever met and I count myself as uniquely fortunate to have had the pleasure of working with him. He is a fantastically-gifted thinker, scientist, and theorist. He makes everything he touches, and everyone around him, better.**

John's background in physics, in which he earned his PhD from Princeton, and computational modeling give him the tools to make really unique contributions to our understanding of the brain mechanisms underlying decision-making. Unlike many computational modelers, however, John has learned to go out and get the data he needs to test his models. At this point, John's neurophysiological and psychophysical skills are equal to those of any of my other postdocs. But he uniquely brings the rigor of computational modeling to the study of the neurophysiology of decision-making. John's models are not stale redescriptions of data or lifeless biologically implausible fluff, but rather make strong, novel predictions that motivate new science. This is precisely the promise of computational and theoretical neuroscience.

John has studied several difficult problems in my lab, including how the brain represents numerical information and how choosers allocate decisions amongst more than two dynamically changing alternatives. This latter problem is often referred to as an "explore/exploit" problem that pits the benefits of exploiting a known reward source against the potential of new opportunities that can only be discovered by seeking out new information. The mathematics of this problem is quite complex and John has leveraged his computational acumen to study this question on a neural and behavioral level. His paper demonstrating neural correlates of exploration behavior in the monkey brain was published in a high profile journal (Current Biology) in 2009. The explore/exploit dilemma is also important from a translational point of view, since addiction, OCD, and other disorders can be thought of as a dysfunction in the regulation of exploration and exploitation behavior. In fact, John is spear-heading a new project

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that aims to determine whether people addicted to nicotine show impaired regulation of the explore/exploit trade-off, with obvious implications for treatment. His data show that nicotine addicts are "sticky" and have difficulty switching away from an option with diminishing payoffs. Notably, these tendencies were not revealed by other standard decision-making assays like the Iowa Gambling Task.

John's body of work includes several high profile papers (Science, Nature Neuroscience) on which he is second author. Let me make plain that John was an equal partner in those studies, and probably should have gotten first author-ship, from the beginning. He helped to identify the problem, devise the experiments, and, critically, develop the computational models necessary to test alternative hypotheses to account for both the behavior and the neurophysiological findings. Both studies—fictive learning and foraging—directly flowed from his earlier work on the explore/exploit problem. It's fair to say that without John, these studies would not have been as elegant as they were, and would not have been published in those journals.

John has also made some important purely theoretical advances. He synthesized the decade of work we had done on the posterior cingulate cortex, a poorly understood region of the brain, and, combining with observations from the fMRI literature, developed a novel theory of the contribution of the PCC to change detection and policy selection. This paper was published in Trends in Cognitive Science. Notably, he just completed a paper in which he applied Dan Wolpert's MOSAIC model of motor control to change detection and policy selection—essentially the computational embodiment of his change detection theory. This is an exciting development, and I expect this new implementation will draw attention.

Recently, John has decided to invest himself in learning to record from single neurons in human surgical patients. He has partnered with a neurosurgeon here—Dennis Turner—on a project aimed at studying the role of neurons in the subthalamus in impulse control. To get this project off the ground, John needed to overhaul and in some cases completely manufacture new equipment, adapt his tasks to the surgical setting (varying engagement levels of patients, short time scales for recording, etc.), and develop new analytical routines. He has succeeded in making this happen, and has done so completely independently of me or Dennis. John has begun collecting neurophysiological data and it looks promising. What is important is not necessarily what insights come out of this particular study but the fact that John now has the toolkit, experience, and expertise to go out and get important empirical data with which to work and on which he can test his theories and models. He can literally leverage his skills and acumen to nearly any model—be it rodent (he has done some behavioral and modeling work on transgenic mice), monkeys, or humans.

I hired John because I realized that his background in physics and computational modeling gave him the tools to make really unique contributions to our understanding of the brain mechanisms underlying

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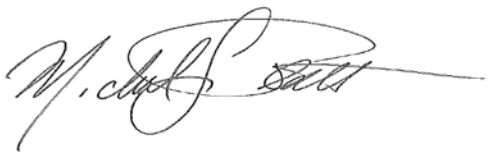
decision-making. What I did not know is that John is an exceptional teacher and mentor as well as a wonderful writer. Consequently, I have delegated ever more responsibility for hands-on mentoring and teaching of graduate students, undergraduates, and research staff in my lab to John. He has tutored students through the rigors of higher math, decision theory, and even behavioral ecology. John is an extraordinary teacher. He is kind and patient, and can present complex problems in a straightforward, easy to understand manner. John is also wonderfully eloquent, and I have enjoyed writing several very difficult papers with him, as well as several successful grant proposals.

John has an array of skills that make him ideally suited for teaching a wide range of complex courses. As noted, he has an excellent computational modeling background, having received his PhD in physics from Princeton, where he was an NSF graduate research fellow. John has twice taught a 3-week mini-course in the use of MATLAB to analyze neurophysiological and fMRI data for our Institute. John has also been an avid contributor to science journalism, and I have read his work with admiration. Finally, John is intellectually driven and highly motivated to accomplish his goals.

In summary, John Pearson has the research experience, skills, high mental acumen, drive, and communicative flair to add materially to any department serious about leveraging theory and computation to understand the way the brain generates intelligent behavior. I believe he would be an outstanding addition to the neuroscience community at Brown, and if I could hire him for a faculty position here at Duke I would do so immediately. You should do the same.

If I can provide any additional information or can be of any further assistance, please do not hesitate to contact me.

All the best,



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