CBD

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Letter for Jan Karbowski

I knew Jan for about three years (1997-2000), during the time he was a postdoctoral fellow with my group at Boston University. Jan arrived on a Fulbright Fellowship from Poland to do condensed matter physics, and became entranced with neurobiology. During that time, he very actively reinvented himself as a computational neurobiologist.

What initially impressed me about Jan was his ability to do amazingly complicated analytical calculations, and come out with surprising answers. The project that he did with me generalized some work Bard Ermentrout and I had done to clarify a mechanism of Roger Traub and collaborators for synchronization of neural rhythms over substantial distances. The mechanism involved doublets displayed by interneurons in parameter regimes in which there was long-distance synchronization (and found in the slice preparations by Miles Whittington). Jan started with the ideas Bard and I had used for a pair of local circuits, and showed how these ideas could work in the context of a large, distributed network. One of the things he had to do was to find a specific class of models to work with, since the more generic approach Bard and I had used was not tractable for the large networks. This specific class of equations had to have some properties essential for the synchronization, be physiologically justifiable and still be analytically tractable. He came up with a model that was a generalization of integrate and fire, having a pair of thresholds to reflect the relative refractory period; he realized that he could use this to embody the critical property of "type 1" neurons that was used in the earlier work. The conceptualization was very creative. The calculations were beyond anyone else I can think of, using techniques from statistical physics to do a long (only the outline was published) and complicated analysis to show that doublets can still play the same role in large networks that they did in the small network, providing the nonlinear feedback signal essential for synchronization. He showed further that, though the feedback could be accomplished through triplets and larger number of spikes per period, the doublet configuration yields synchronization over the largest parameter regime. Finally, the analysis showed the (to me) surprising result that an anatomically noisier network (less regular in its configuration) could produce synchronization over a larger parameter region.

Jan is extremely self-reliant, reading widely and thinking hard about projects. While finishing his project with me, he started another independently, on accuracy of population coding, using ideas from information theory. This project, now done, was another impressive piece of work. His interests include applications of information theory in neuroscience and optimal wiring and scaling in the cortex. He has published in Phys. Rev Letts, as well as other physics and neural computation journals.

Personally, Jan is intense and extremely independent; he can be quite stubborn, but also can laugh at himself. He keeps to himself more than most, but is very eager to be part of a experimental group with whom he can share his scientific skills. He has collaborated successfully with me and Bard Ermentrout, and others earlier in his career. He thrives on difficulty, and is tenacious and persevering through what might discourage others. His previous career in physics also garnered accolades for him, including the National Award of the Foundation for Polish Science in 1995 as well as his Fulbright Fellowship.

Jan is a unusual candidate. He is extremely smart and scientifically very intense; he also has some rough edges to his personality (at least this was true during the time I knew him). I'm not sure of how he would be as a teacher. I think that he can be real asset to a research group that can make use of his intellect, talent and drive, and I'm happy to recommend him.

Sincerely,

Nancy Kopell

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