INDIANA UNIVERSITY

DEPARTMENT OF
MATHEMATICS

11.30.03

A reference letter for Dr. David Holcman,

It is a pleasure to write a recommendation letter for **Dr. David Holcman.** I first met David during a visit by him to the Technion a few years ago. I met him again at a conference at Stanford last year, and invited him to spend a week at Indiana University last spring.

David has traced so far a remarkable career. His early education was in engineering, but also in mathematics. In his graduate studies he concentrated on pure mathematical problems in geometry. Later he started a second line of work in theoretical biology and physiology.

David's early papers are on PDEs related to problems in Riemannian geometry. While I am not an expert in this area, I had the impression (spending some time with him at the blackboard) that he has attacked some of the basic problems in the field with considerable success. His more recent theoretical papers (papers 13,14,18) on singular perturbation of PDEs are closer to my interests. I found this work to be beautiful. This applies in particular to papers 18 and 22.

What I found even more remarkable is his transition about 4 years ago to work in theoretical biology (while not abandoning his research activity in pure math!). David made this difficult transition in an excellent way – by collaborating with biologists (Korenbrot, Miller) or applied mathematicians with extensive background in biology (Schuss). This enabled him to concentrate on real biological problems. I also noticed that when working in biology-motivated problems, David is using just the right amount of math that is needed, and does not indulge in unnecessary complicated math that would obscure the application.

David's first work in mathematical biology (paper # 19) dealt with the problem of ionic transport in dendrites. This is the fundamental mechanism for propagation of neural activity. The model the authors used is a very simple, but it includes all the required mechanism (including fluid flow). This paper was later extended in several ways in collaboration with Schuss. Another line of math biology work that occupies David relates to vision (both on the local level of photoreceptors – papers # 20,27, 28, and the more global level of the visual cortex – paper # 29). In fact, David's decision to spend two years in the physiology department of UCSF was an excellent one. It brought him into contact with one of the leading vision labs in the world, and thus to perform groundbreaking theoretical work. The work on transport of chemicals in rods and cones is very important and sheds light on very basic visual processes. I had a number of discussions with David on potential applications of his models to well know physiological phenomena such as the Stiles-Crawford effect. Similarly, his work on

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correlations in area V1 of the visual cortex has very interesting potential applications to several aspects of amblyopia and maybe even to the understanding of optical illusions.

David is a very productive and very serious scientist. He is critical of others and of himself. The only authority he accepts is that of scientific truth. I view him not just as a mathematician but also as a first-rate scientist. His results so far are already impressive; his potential is enormous.

I am not familiar with David as a teacher. I attended 2 lectures by him and they were excellent – well prepared and delivered in an exciting way.

To summarize, I highly recommend David to a tenure track position in a department with a strong research orientation. In light of his experience and high productivity I would seriously consider hiring him at the Associate Professor level.

Rubinstein

Jacob Rubinstein
Professor of Mathematics

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