DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service

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To: Biocomplexity Faculty Search
c/o C. Howard
Department of Physics
Indiana University
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8 December, 2004

Dear Madames/Sirs:

This is to recommend Dr. Hongxue Cai for a faculty position in the Department of Physics at Indiana University. I have known Dr. Cai since he joined the NIH over four years ago. I share research interests and collaborate with his supervisor, Dr. Richard Chadwick, of the National Institute for Deafness and other Communication Disorders (NIDCD) over a number of years. For that reason I have closely followed Dr. Cai's work and the impressive progress he made in his projects since joining that group.

Dr. Cai arrived at the NIH without previous exposure to auditory science. His very strong mathematical and computer skills enabled him in no time to start planning and implementation on his research project while he brought himself up-to-date in the field. I was impressed with the speed at which he adapted to a new country, language and work environment and his drive to perfect his language skills. His personal and scientific maturity and research talent became evident at the outset.

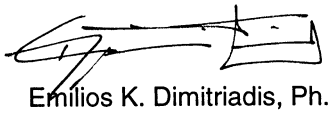
There had been discussion about the usefulness of realistic, finite element-based models of the cochlea in the otolaryngology research community for many years. The complexity of the fluid-solid interaction problem was recognized in early attempts to create finite element models that had very limited success. Upon his arrival, Dr. Cai undertook to explore the possibility of a unique hybrid analytical-finite element approach to reduce the problem to a manageable size. The uniqueness of the approach meant that there were no commercial numerical software packages available. Instead, Hongxue devised the most creative use of available numerical software, building anew as needed, to add feature after feature in the new cochlear analytical mathematical model. His ability to conceive, plan and execute efficiently and quickly are simply astounding. As a result and contrary to some reservations expressed from outside his section about the feasibility of such a feat, he now has what admittedly is the most advanced mathematical cochlear model there is. This is recognized by the otolaryngology community and he has been invited to present the results of his model on a number of occasions. It has also resulted in several

prestigious, peer-reviewed journal publications. He has impressed everyone with his systematic work in implementing a very complicated numerical model, which was made possible by his solid mathematical foundation and his computer skills. While working on his main project, he needed to quantify motion in video images in order to compare his model responses with experimental data. Finding existing tools in the image processing literature unsatisfactory, together with his supervisor he devised a novel method of "optical flow" which extracts decidedly better information from video microscopy images. I believe this is an important contribution in a field completely new to him.

His versatility would extend to any number of problems he might encounter in the future in Biomechanics, Biophysics and Computational and Mathematical Biology. He is mature and an independent thinker, who will have no problem developing his own research program and excel in it. In addition, he will not be a novice in teaching since he already has plenty of teaching experience, albeit in a different setting and language. He is fluent in English and French as well as in his native Chinese. Having attended a number of his talks, I believe he will be an excellent teacher. I have interacted with Hongxue often and watched him interact within and outside his section. I can say that he is a very easy and pleasant person to work with as he will hear and respond to any suggestion or criticism always in a very thoughtful and friendly manner. He is selflessly helpful whenever asked and, I cannot imagine him ever expressing impatience or anger.

Overall, I strongly believe that Hongxue's capabilities and qualities will always lead him to scientific success. He has done very well in three very different environments and I believe he will also excel in the future. Had I an appropriate position opening in my division, I would try to keep him here. He would be a valuable asset to any organization he is part of. I unreservedly support his application for the position in your department.

Sincerely,



Emilios K. Dimitriadis, Ph.D.