



December 7, 2004

I strongly recommend Dr. Hongxue Cai for a tenure-track position in biocomplexity, with specialties in mathematical biology, tensor calculus, and computational continuum mechanics, including fluid-solid interaction. Dr. Cai came to my laboratory as a Visiting Fellow in March 2000. He recently received a highly competitive National Research Council Senior Research Associateship to continue his work in cochlear mechanics. This attests to Dr. Cai's ability to write effective grant proposals.

After joining our group Dr. Cai made a switch from his previous subject, cardiac mechanics, to his present subject, cochlear mechanics. He has made tremendous contributions in his new subject. I think it is fair to say that he is now a world-class researcher in this field. His 2004 publication in the Proc. Natl. Acad. Sci. USA: 101(16) 6243-6248, attests to this fact. In addition, Dr. Cai has been making a strong contribution to our efforts in contact mechanics at the micro and nano scales, which we need for our atomic force microscope studies of biological tissue. Contact mechanics involves solving mixed boundary-value p.d.e. problems in classical elasticity.

Dr. Cai is very strong in both theory and computational methods in continuum mechanics, and he is now an expert in fluid-solid interaction. He has also done original work in image motion analysis. He has a good grasp of physiological and biophysical subjects, which makes him very effective in interacting with biologists. These qualities make him an ideally suited for a career in mathematical biology. I think that Dr. Cai's greatest strengths are his ability to have very clear thoughts and to simplify complicated phenomena. This clarity of thought will continue to be of great benefit to him not only in his future research, but also in teaching. I am very impressed with Dr. Cai's advances in communication skills. He is now able to give very effective lectures in English. His communication ability will be of great benefit to students, both at the undergraduate and graduate levels.


In cochlear mechanics, Dr. Cai has been developing hybrid analytical-finite element methods to make significant advances in our understanding of the properties of the traveling wave. Specifically, he has addressed the difficult problem of determining the transverse vibration patterns associated with the traveling wave and how these patterns affect the bending of hair cell stereocilia bundles, which initiates the activation of the mechano-sensory cells. This kind of work cannot be done directly with existing commercial software, and it takes a great deal of patience. Nevertheless he has been able to succeed where others have failed.

I value Hongxue's scientific perspectives and his abilities to formulate and develop the methods required for solving what I consider to be important problems in biomathematics. Hongxue is eminently suitable for a tenure-track teaching position in

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applied mathematics. You can rest assured that he represents the highest of scientific standards.

Sincerely,



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