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Recommendation for Dr. Yi Jiang:

In the past six years while I have followed Yi's research Los Alamos, she has demonstrated her creativity and mathematical ability by groundbreaking interdisciplinary research on important nonlinear nonequilibrium problems in soft condensed matter physics, biological systems and the material sciences. She has been proactive in seeking out projects where mathematical modeling can give important new insights into biological systems. The breadth of her research and the speed with which she has mastered and advanced new interdisciplinary research opportunities is among the best I have seen in a junior researcher in the past 20 years. Her unifying and important contribution to the nonequilibrium science of foams, materials and biological cellular patterns, has established her as an authority and moving force in modeling biological systems.

Her research into the dynamics of cellular and granular materials is revealing how their underlying structures self-organize under external driving. These cellular granular materials have unique rheological and mechanical properties that are different from conventional solids or fluids. She studies cellular dynamics in the context of evolution of foam structures focusing on the role of defects, boundary effects and external stress; all of which are very important to predictive materials preparation and to providing fundamental insights into the physics of complex fluids.

In her research in lipid membranes, she has studied the common structure that underlines all biological membranes: a very thin film of lipid and protein molecules, which are able to move about in the plane of the membranes. In the laboratory, a wide range of artificial membranes can be made from amphiphilic molecules, which assemble to build lipid bilayers and vesicles. In addition to their applications medical, food and cosmetics industries, these lipid bilayers and vesicles are simple models of biological membranes and cells, especially for studying physics properties such as shape transformation, elasticity and transport. They show an amazing variety of shapes and shape transformations that affect their properties and functions. In order to be able to control and regulate the functions of membranes, we need to understand the mechanisms. She has made some remarkable advances in understanding the physics underlying the shape transformation and elasticity. She has developed powerful new methods and computer simulations to study the dynamics and phase separation in such systems.

Cell migration is essential to many processes within an organism, from embryonic development to wound healing to cancer metastasis. The goal of this aspect of her research is to apply the quantitative methodology of physics to the study of complex biological processes and to understand cell motion from a physicist's point of view. She has developed a novel model for cell migration in aggregates and has been using it to study the dynamics of biological morphological evolution. Specifically, she investigates self-organization of cell motion observed in cell aggregates, bacterial colonies and the human immune systems. This is directly

contributing to studies at Los Alamos National Laboratory in biophysics and nonlinear dynamics.

Although the above research topics have quite diverse applications, she approaches them with a novel combination of theoretical and computational techniques that emphasize their role as a unifying and well-defined set of problems in nonlinear nonequilibrium dynamics in complex systems. Her unifying and important contributions to the nonequilibrium science of foams, materials and biological cellular patterns, has established her as an authority and moving force in these areas, and therefore as an alien of distinguished merit and ability.

Last year, Yi received the Los Alamos Women's Career Development Award for her outstanding mentoring of women award. She is as ideal a mentor as a student can ask for. Two students nominated her for the award. Their joint nomination stated that "Dr. Yi Jiang is an amazing person whose brilliance is expressed in everything she does: whether it is her career as a scientist, her role in her family, or by being a mentor. She had profound influence on my decision to start my graduate education, and her success assures me that once it is time for me to have my own family - I will be able to manage it. I cannot think of anyone more deserving of the award that recognizes extraordinary mentoring of female students. …. She excelled in providing sound, expert academic guidance, setting an inspiring example of success, and striking a good balance between empathy with a student; giving advice with honesty and sensitivity, and with professionalism and respect for personal and cultural differences."

In this era of specialization it is extremely rare to find a highly creative scientist who is so equally adept in theory, computation and collaborates so well with experimentalists. And in the particular field of soft condensed matter, especially as it relates to biological systems, such a powerful synthesis has been achieved by no more than a handful and is sure to provide exciting new advances and insights. Yi is one of this handful of scientists with bountiful talent, a unique multidisciplinary background, and more than the necessary drive to be come a key player in the increasingly important arena of biological modeling and analysis.

Sincerely,

James M. Hyman
Group Leader, Mathematical Modeling and Analysis
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