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Achievement Rewards for College Scientists  
ARCS Foundation, Inc.  
Phoenix Chapter

Dear Sir or Madam,

I am pleased to write a letter in support of an ARCS fellowship for Cody Petrie. I first met Cody two years ago when he began his graduate studies in physics here at Arizona State University. He chose as his first research rotation a project with me to work on novel quantum Monte Carlo methods applied to nuclear structure. The name quantum Monte Carlo means that we use statistical techniques to compute the large number of integrals and sums required for these quantum mechanical calculations.

During his research rotation, Cody impressed me with his ability to quickly understand the quantum mechanical many-particle problem that must be solved to be able to predict the properties of nuclei. He learned both the needed quantum mechanical theory and was able to write computer programs to implement the calculations.

After completing his first two semesters of core courses and research rotations, Cody chose to work with me on his Ph.D. research. A major fundamental problem is understanding the abundances of different elements and isotopes on earth and in the solar system. In particular, the nuclei beyond iron 56 are produced by what is called the r-process (r stands for rapid) where neutrons are captured during supernovae explosions. Most of these neutron rich nuclei cannot be created in laboratories, so an understanding of these processes requires good theories and accurate methods of computation.

Cody's current project is to improve the trial wave function that guide the quantum Monte Carlo methods. Improved trial wave functions can greatly lower the statistical errors and make these neutron rich nucleus calculations feasible. Cody has now successfully included new correlations into the nuclear trial wave function. Wave functions with these correlations, unlike the best previous wave functions used for large systems, allow multiple pairs of particles to have quantum mechanical correlated amplitudes. He has integrated these changes into our auxiliary field diffusion Monte Carlo method, and has been working on optimizing these correlations. I reported some preliminary results of this work at an

international conference at the European Center for theoretical studies in nuclear physics and related areas in June 2016. Cody is preparing this work for publication.

Cody is a talented scientist. He is making good progress on this research. His work has the potential to make a substantial impact on the field. The ARCS fellowship would allow Cody to devote more time to this research.

Please feel free to contact me if you require any additional information.

Best regards,

Prof. Kevin E. Schmidt

A handwritten signature in black ink that reads "Kevin E. Schmidt". The signature is written in a cursive, flowing style with a large initial 'K' and a stylized 'S' at the end.