Statement of Purpose

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In my time as an undergraduate at Arizona State University, mingling with seasoned physicists and collaborating with my own peers, I have gained a vision of competence and community. On the road to becoming an experimental physicist, I understand that there is much more ground to cover from where I presently stand. I take my studies seriously, and for me, graduate work is quickly approaching. In order to enhance my preparations, I am actively participating in research. This semester for upper-division breadth-course credit I am doing nanomaterials research with Dr. Stuart Lindsay, Director of the Center for Single Molecule Biophysics at the Biodesign Institute. In addition, I am a research assistant to Dr. R. Bruce Doak of the Physics Department, who is engaged in multidisciplinary research based on molecular and droplet beams. Both of these opportunities are enriching; however, in this statement of purpose, I will specifically emphasize my efforts with Dr. Doak to refine and extend the ASU Gas Dynamic Virtual Nozzle (GDVN).

These novel liquid jet injectors have particular relevance and importance in the field of molecular imaging. Their ability to run continuously for days without clogging, as well as their ability to inject single-file micron-sized droplet beams into ultra high vacuum, makes them ideal for the structural determination of membrane proteins via x-ray diffraction using Free Electron Lasers (FEL). During the spring and summer, I will work to refine and extend the GDVN operating parameters by exploring *subsonic* *converging-diverging* nozzles, whereas heretofore only a convergent nozzle under supersonic gas expansion has been explored. I am currently collaborating with Dr. Alexandra Ros from the Department of Chemistry and Biochemistry to design well-defined 2D sidewall profiles for the nozzles using microfluidic fabrication techniques.

There is more work to be done beyond our current plans for the nozzle. A well-defined nozzle profile, if successful, will allow us to find optimal flow conditions and open doors for other applications. For example, the microfluidics fabrication process could be used create a “tall” channel in which a liquid sheet would flow through the gas dynamic nozzle to produce sheets of droplets (of interest in certain applications).

I am interested in continuing research on the nozzle design through the end of the year (Fall 2011 semester). I feel that as a recipient of this scholarship, I would be enabled to promote this research and prepare for my future.