Since I arrived at the University of Arizona last June, I have had the opportunity to work on two experiments and one computer modelling project.

Last summer and fall, I worked in Dr. Charles Falco's Laboratory for X-Ray Optics. I learned basic X-ray diffraction and sputtering techniques for the production and characterization of metallic multilayers. I used a scanning electron microscope to analyze STM tips that I etched in the lab. I also did a great deal of computer modelling of metallic multilayers, in which I tried to do a multivariable least squares fit of X-ray reflectivity data to the standard theory. However, the most important lesson that I learned was how to function as a responsible scientist in a large research group.

Since November, I have worked on a cosmic ray experiment to detect "meshugenons" or charged massive particles, which are dark matter candidates, in Dr. Theodore Bowen's High Altitude Cosmic Ray Observatory atop Mt. Lemmon. I have gained much experience in debugging electronics, using the computer for data acquisition, and analyzing large data blocks on the computer. I have also gained experience in standard particle detection techniques.

Since September, I have worked on simulating a randomly-connected neural network, as an independent study with Dr. Johann Rafelski. We have observed the limit cycles characteristic of such a network. Now, I would like to simulate a system of three coupled random neural networks. With this architecture and proper input and output connections, the network will behave as an associative memory with much higher volatility than a solitary random network. I am currently collaborating with Dr. Henrik Bohr of the Technical University of Denmark. We hope to use a random neural network as a hidden layer in a Perceptron network with back propagation. With a random hidden layer, the network should be able to extrapolate from learned examples much better than a normal Perceptron model. We may eventually apply the random hidden layer network to the protein folding problem.

I have had a decent introduction to complex systems already, with Dr. Leo Kadanoff's Computational Physics course when I was an undergraduate at Chicago, Dr. Peter Carruther's Introduction to Complex Systems course here at Arizona, and Dr. Parmenter's course on Chaos and Nonlinearities in Dynamical Systems also here at Arizona. However, I will value as a physicist the techniques that I will learn at your summer school.