10:10 **Aircraft Boarding Queues**
Matthew Roy, Olin College, Class of 2009

Abstract: The steady state cases of a plane boarding scenario are studied, considering the factors which can be minimized and maximized to afford the least total time to board all the passengers on board. Beginning with an M/M/1 queuing model progress is made toward a somewhat more sophisticated M/G/1 model that utilizes controlled queue exiting parameters to simplify the representation of inter-passenger seat blocking. The model is compared to existing agent-based models of aircraft boarding.

10:25 **Another Thread in the Web - A Model of Intertwining Spider Silk Molecules**
Daniel Bufford, Olin College, Class of 2007

Abstract: Spider silk has long been recognized for its strength and extensibility. We model spider capture silk in order to investigate claims that molecular springs play a significant role in the silks unique behavior under mechanical loading. We form a geometrical model of the silk molecule-intermolecular bond system. Using Cartesian tensors, we construct a mathematical model based on the geometrical model and the expression of Hookes law in multiple dimensions. This Hookes law basis is modified by the inclusion of additional Hookian bonds between the molecules attached at varying angles. A discrete version of the model is used to plot the force-extension relationships of the capture silk molecules for a displacement in the direction perpendicular to the fiber axis. The resulting plots are compared to experimental data and evaluated. Further study is necessary to include nonlinear behaviors at large extensions, such as those behaviors associated with unfolding protein domains.

10:40 **What the Eye Sees**
Kyle Rader, Olin College, Class of 2008

Abstract: Digital cameras are often marketed with the claim that higher resolution means a better picture. This claim was investigated to determine if there is a discernable difference between pictures of different resolutions, and to generate an image of what the eye actually sees. A model of the retina and its photoreceptors was constructed, using distribution density functions of both rods, which measure light intensity, and cones, which measure color intensity. Using ray tracing to map an image onto the retina, the original picture was compared to other pictures of lower resolutions. From that, the optical differences that the eye can detect between the pictures could be determined.

11:00 **Optical Character Recognition by Eigenvector Addition**
Jonathan Raphael, Olin College, Class of 2009

Abstract: A particular method of computerized image processing is explored for possible use in Optical Character Recognition (OCR). OCR is an application in the field of Computer Vision, where an image containing text is translated into machine. In this papers model, the computer utilizes eigenvectors to describe the characteristic properties of the images subspace. Beginning with a base set of characters A-Z in Times New Roman, the program constructs a set of orthogonal vectors that can combine to form each image. Test characters in Arial Black, Arial Narrow, and Harrington fonts are introduced and projected onto the eigenspace, with positive identification in a significant proportion of the samples. The results show that Arial Narrow is made up of eigenvector combinations most similar to Times, with a success of 13 out of 26, Arial Black was recognized 11 out of 26 times, and Harrington 6 times. This model has promise for application to handwritten documents, due to its ability to dynamically learn new characters.

11:15 **Fluid Dynamics of Moth Antennae**
Lee Edwards, Olin College, Class of 2007

Abstract: In order to better understand how moths use their antennae to detect air pressure, we propose a fluid mechanical model of moth antennae. Presuming an antenna to consist of several cylindrical segments at varying yaw angles, we use a phenomenalogical model to examine the affect of yaw angle on the maximum effective pressure on a the moth antenna in a regime of $100 < Re < 170$.

11:30 **Hedging Risk on Risky Loans**
Kent Munson, Olin College, Class of 2009

Abstract: In this paper, we will assess how much creditors need to charge for loans with a high risk of default in order to turn a profit. Recently, many lenders have exposed themselves to high risk by taking on loans such as these, and are now losing money as debtors default. By understanding how and when these defaults occur, we can determine what mortgages rates banks need to use to better protect themselves from this type of risk.