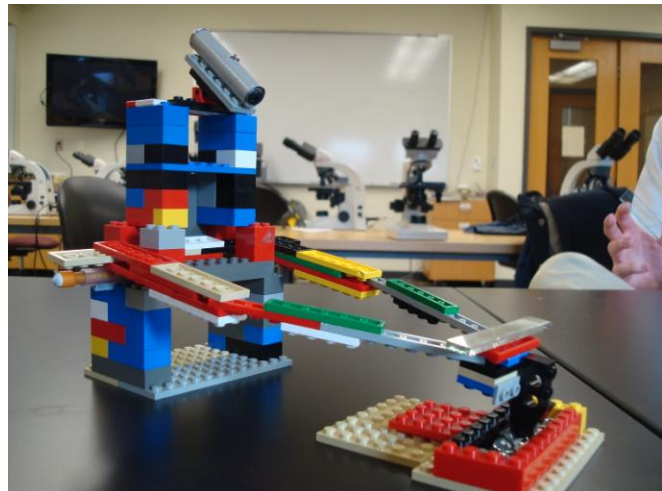


## **Creative Inquiry Project: MacroAFM**

Instructors: Vladimir Reukov and Aleksey Shaporev  
Fall 2011, BioE 451 Section 011, Clemson University

The optical microscope with the highest magnification cannot see anything smaller than the wavelength of visible light – about  $0.2\ \mu\text{m}=200\ \text{nm}$ . But there are a lot of things sized below 200 nm – viruses, buckyballs, proteins, [DNA](#)! If we cannot see it, maybe we can touch it with something equally small. For example, on the macroscale, you could figure out that you're touching a football even if your eyes were covered! Such a tool that helps us study things which cannot be seen is called Atomic Force Microscope (AFM).

This project is aimed at reconstructing a working Atomic Force Microscope (AFM) at the macroscale using a Lego® set. We first start with an introduction to a real, working AFM machine (our new [Asylum Research BioMFP-3D!](#)) and learn how it works and what it can do. We also will run some nanoscale samples to better understand the principles of AFM. After that, the team will study the existing designs of AFM models and build their own scheme. The team then uses their macroAFM to collect data to reveal the contours of prepared macro-roughened surfaces – models of different molecules and biological systems, such as proteins, viruses, etc.



This macroAFM will be an excellent demonstration tool for the education of summer undergraduate and high-school students. The project will be radical, fun, and useful, offering hands-on experience with basic concepts in biology, engineering and physics, and will have the possibility of continuation into the next semester, when we're going to extend and modify our macroAFMs for magnetic imaging or other modes.

*“Use the force, see the nanoworld!”*

### **There's still time to join our team! Please contact:**

Vladimir Reukov ([reukov@clemson.edu](mailto:reukov@clemson.edu)) or Aleksey Shaporev ([ashapor@clemson.edu](mailto:ashapor@clemson.edu)).

Class prerequisites: basic MatLAB and/or LabView knowledge.