ND*nano* Undergraduate Research Fellowship (NURF)
2012 Project Summary

1) Student name: Lucas de la Fuente Munita
2) Faculty mentor name: Scott Howard
3) Project title: Low cost & portable DNA detection device

4) Briefly describe any new skills you acquired during your summer research:
Cleanroom training (maskmaking, stepper, contact lithography, vaporizer), Software use (Inkscape, Microsoft Excel, L-Edit, GitHub), Hardware (Arduino) and how to apply skills that I already had (programming, soldering, etc.).

5) Please briefly share a practical application/end use of your research:
My research developed and actual product: a low cost PCR. The PCR is intended for making genetics technology available for smallholder farmers in West Africa so they can control insect plagues more efficiently although this innovation is potentially useful for any kind of biology field study.

Project summary:
Field portable DNA detection is an important technology for evolutionary biology studies and monitoring of invasive species. ND Nano is developing multiple rapid DNA detection technologies, such as surface acoustic wave (SAW) detection, laser transition spectroscopy (LTS), and microfluidic membranes. While these technologies have the potential to not require DNA amplification through conventional polymerase chain reaction (PCR), low cost and portable DNA amplification would have immediate impact for researchers. We have, designed, constructed, and characterized a portable PCR thermocycler prototype; this device amplifies a specific strand of DNA to facilitate its identification. The device cost about $100 (while commercial lab-oriented versions cost ~$10,000) and can be solar powered. This prototype is available as an Open Source License allowing the thermocycler to be built, modified and adapted locally. The next step is incorporating tunable laser spectroscopy on an aerosolized sample of DNA, LTS, or microfluidic membrane sensor in order to detect the presence of amplified insect DNA.

Publications (papers/posters/presentations):