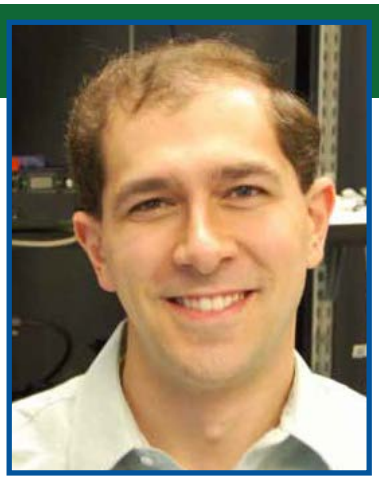
Nicholas B. Schade



Graduate Institution: Harvard University

Graduate Discipline: Soft Condensed Matter Physics

Hometown: Andover, MA

Relevant SC Research: Basic Energy Sciences

Research Interest:

I am interested in the physics of self-assembly and metamaterials. Scientists have never before been able to create a bulk metamaterial exhibiting negative refractive index in the visible range. Such a material would have important technical applications, including stealth technology and novel approaches to electronics. Perhaps most exciting, however, is the prediction that a bulk negative refractive index material could be used to create a "super lens" with unlimited imaging resolution, meaning that this substance could be used to image individual atoms or molecules with visible light.

My research goals are to use colloidal self-assembly techniques to build nanostructures whose electric and magnetic properties can be tuned with precision over a range of frequencies, into the near infrared and visible bands. I want to produce them with precision in bulk and in high yield such that an isotropic optical metamaterial can be achieved.

About Me:

I have approached my graduate education with two professional goals. First, I want to contribute to the scientific community through original research in soft condensed matter physics and materials science. Second, I intend to make an impact on science education by developing physics curricula, providing educational consulting, and continuing to work with students through public outreach so I can help inspire and train the next generation of scientists and engineers.

I graduated in 2005 with a BS in mathematical physics from Brown, where I conducted research in biophysics with Prof. James Valles. After college, I spent a few years working at MIT Lincoln Laboratory, where I performed systems analysis for US Air Force leadership and developed algorithms for new sensors as part of the laboratory's rapid prototyping effort. I received a Lincoln Laboratory team award and a letter of gratitude from the Secretary of the Air Force for this work. I also spent one year as a full-time high school physics teacher; I taught AP Physics, Physical Science, and Electronic Engineering.

I started working toward my Ph.D. at Harvard in 2009 and earned my A.M. in Physics in 2011. I have been working with Prof. Vinothan N. Manoharan for three years and in my research I have focused on DNA as a self-assembly mechanism for colloidal clusters. We have developed a way to assemble polystyrene microspheres into tetrahedral clusters in arbitrarily high yield, and we are now working on scaling this method down to gold nanoparticles for making metamaterials. We are preparing a paper about our results with polystyrene particles and I have presented about this work at various conferences, including the 2012 APS March Meeting and the 2012 Gordon Research Conference on Plasmonics.

Outside of research and classes, I enjoy playing in ultimate frisbee leagues and I tutor students in physics and mathematics at the high school and undergraduate levels. This year I also helped develop a public outreach program for the Harvard physics department called "Science Weeks." The theme of the first Science Week was "The New Science of Self-Assembly." I gave a public talk with two other graduate students at an event called Science In The News, where the topic of our talk was, "Programming Matter: Smart Surfaces, Molecular Machines, and Invisibility Cloaks." I also helped prepare an "Activities Expo" for visitors of all ages to engage with graduate students at Harvard about self-assembly and related topics in science.