## Acknowledgements

They say that life's all about the journey, and at the start of this journey I was working as an engineer at Hewlett-Packard. After deciding I didn't have enough expertise in any one area to really drive the field in which I was working, I headed off to graduate school. After five years at Caltech, it's definitely about the journey just as much as it is the goal. On paper, you're a doctor the day you graduate from the Ph.D. program. In reality, it happens somewhere along the way. As painful and stressful as the whole process was, it's definitely made me a better person. Not only because of the additional mountain of knowledge I've digested, but because of the people I've met along the way. Without the help of a great many people, I would not have written this thesis.

The first person I need to thank is my advisor, Harry Atwater. As well as providing all the labs and funding necessary for me to do my research; he was also a constant source of ideas for the projects I was involved in. He encouraged me to attend conferences and made it possible to work with other groups on campus as well as with LETI in France.

My parents deserve as much thanks as anyone. I always tell people that the greatest blessing that my sister and I had was our parents dedication to our educations'. They gave up a great many things so that we could have every opportunity to grow academically, athletically, and musically.

The five years here at Caltech weren't always easy and my close friends were extremely helpful in getting through all the challenges, academic and otherwise. I couldn't have gotten through graduate school without the help of Merrielle Spain, Melissa Archer, Eyal Feigenbaum, Ryan Briggs, Glenn Garrett, and Krista Langeland.

Young-Bae Park was very helpful as a mentor for my first two years at Caltech. He taught me about ferroelectrics, ion implantation-induced layer transfer, piezoresponse force microscopy, how to write a scientific paper, and where to find the best Korean food near Caltech. He was a constant source of new ideas, and discussions with him lead me to the idea for the silver bonding project.

The difficulty in navigating all the labs and equipment within the Atwater Group is on the order of developing cold fusion. A number of individuals within the lab were especially helpful with this task over the years. Luke Sweatlock and Matt Dicken used their wit and sarcasm to guide me through the first few years of graduate school and introduced me to the art of poker. In addition, Luke's work on the plasMOStor project as well as all things plasmonic were key in getting helping me get up to speed. Luke also provided plenty of "help" with the more subtle aspects of IATEX. Mike Kelzenberg knows everything about the optics labs and his desk is the best place

on campus to find batteries. Vivian Ferry was especially helpful when analyzing FDTD and the slit scattering results. Imogen Pryce was helpful with everything in the lab and group during my final years at Caltech. Stan Burgos was helpful with questions about the FIB and FDTD. Jennifer Dionne deserves thanks for extracting the TEM sample for the silver bonding paper and her FIB and simulation work on the plasMOStor project.

I also want to thank everyone else in the Atwater Group including: Koray Aydin, Julie Biteen-Johnson, Shannon Boettcher, Dennis Callahan, Davis Darvish, Michael Deceglie, Michael Filler, Carrie Hofmann, Seokmin Jeon, Greg Kimball, Marina Leite, Henri Lezec, Jeremy Munday, Keisuke Nakayama, April Neidholdt, Deirdre O'Carroll, Domenico Pacifici, Morgan Putnam, Christine Richardson, Katsu Tanabe, Dan Turner-Evans, and Emily Warmann.

The staff of the Kavli Nanoscience Institute were very helpful. Thanks to Guy Derose, Mary Sikora, Nils Asplund, Bophan Chhim, Carol Garland, and Melissa Melendes. None of the focused ion beam work or the silver bonding transmission electron microscope work would have been possible without them. Also, thanks to the administrators that ran Watson while I was there: Eleonora Vorobieff, Irene Loera, and Cierina Marks.

I apologize to anyone I've forgotten, or anything people have helped me with that I've left off the list.

Finally, I'd like to thank my thesis examination committee: Professors Amnon Yariv, Kaushik Bhattacharya, Chiara Daraio, and Harry A. Atwater.

> Kenneth Diest September 2009 Pasadena, CA