Acknowledgements

I would like to thank all the people who contributed in some way to the work described in this thesis. First and foremost, I thank my academic advisor, Professor Julia A. Kornfield, for accepting me into her group. During my tenure, she contributed to a rewarding graduate school experience by giving me intellectual freedom in my work, supporting my attendance at various conferences, engaging me in new ideas, and demanding a high quality of work in all my endeavors. Additionally, I would like to thank my committee members Professor David A. Tirrell, Professor John F. Brady, and Professor Zhen-Gang Wang for their interest in my work.

Every result described in this thesis was accomplished with the help and support of fellow labmates and collaborators. Neal Scruggs and I worked together on several different phases of the
self-assembled gels project, and without his efforts my job would have undoubtedly been more difficult. I greatly benefited from his keen scientific insight, his knack for solving seemingly intractable
practical difficulties, and his ability to put complex ideas into simple terms. Yan Xia joined the group
when I was beginning my last year as a graduate student, and, with his knowledge of chemistry and
relentless work ethic, he was able to successfully carry out the synthesis of the model covalent LC
networks. I gained a lot from his vast chemistry knowledge and scientific curiosity. I was fortunate to
have the chance to work with Dr. Michael Kempe, who patiently taught me his method for synthesizing LC triblocks, in addition to a number of other laboratory techniques, and who worked closely
with me in the synthesis of the LC triblocks I present in this thesis. He was an extremely reliable
source of practical scientific knowledge, and I am grateful for his achievements during his time at
Caltech, from which the work described in this thesis followed. I worked (nonstop) in the laboratory
of Professor Samuel Sprunt of Kent State University for one long week in July 2005, and two very

long weeks in July 2006. Sam graciously allowed us to utilize the dynamic light scattering setup that he built himself, and he fully supported our efforts with with his time, his interest, and his extensive knowledge of light scattering experiments. I am also indebted to Professor Peter Palffy-Muhoray who deserves the credit for initiating the light scattering project. Peter wholeheartedly supported us during our visit to Kent State, and his physical insight was instrumental for the completion of the project. I am very grateful to Professor Robert Meyer of Brandeis University and Dr. Guangnan Meng, who was Bob's graduate student at the time, for their work in understanding the buckling instability. We exchanged several emails and Mathematica files over the course of a year during which we made sense of the buckling instability. Dr. David Uhrig of the Macromolecular Systems Group at Oak Ridge National Laboratory provided a series of diblock copolymers, without which the structural studies into the LC block copolymers would not have been possible. Dr. Jyotsana Lal aided our efforts in designing and carrying out neutron scattering experiments during four separate trips to Argonne National Laboratory.

I would like to thank the various members of the Kornfield group with whom I had the opportunity to work and have not already mentioned: Dr. Eric Pape, Dr. Derek Thurman, Dr. Charles Nickerson, Dr. Rob Lammertink, Dr. María (Luján) Auad, Dr. Erica Thompson, Dr. Wei Shen, Professor Kyunghwan Yoon, Lucía Fernández-Ballester, Michael Mackel, Matthew Mattson, Ralph David, Dr. Suneel Kunamaneni, Dr. Shuichi Kimata, Zuleikha Kurji, Ryan Turner, and Diana Smirnova. They provided a friendly and cooperative atmosphere at work and also useful feedback and insightful comments on my work. I also had the opportunity to mentor a SURF student for one summer, Vivek Narsimhan, who tirelessly and with much enthusiasm tackled a difficult project over the course of several months. I would be remiss if I did not thank Anne Hormann, who deserves credit for providing much needed assistance with administrative tasks, reminding us of impending deadlines, and keeping our work running smoothly. Additionally, Suresha Guptha provided immediate support for any computer problems we encountered.

I am grateful for the funding sources that allowed me to pursue my graduate school studies: The National Defense Science and Engineering Fellowship, the James-Irvine Minority Fellowship, and the AFOSR LC-MURI. The National Science Foundation and the Korean Science and Engineering Foundation, through the East Asia and Pacific Summer Institute Fellowship, provided me with the opportunity to work for a summer in South Korea in the laboratory of Professor Jin Kon Kim.

I would like to acknowledge the Department of Chemical Engineering at Caltech. My graduate experience benefitted greatly from the courses I took, the opportunities I had under Professor John F. Brady and Professor Zhen-Gang Wang to serve as a teaching assistant, and the high-quality seminars that the department organized.

Finally, I would like to acknowledge friends and family who supported me during my time here. First and foremost I would like to thank Mom, Dad, Ceci, Mickey, and Danny for their constant love and support. Justin Bois, Aditya Khair, Alex Brown, Mikhail Kislitsyn, and Matt Lucas made my time here at Caltech a lot more fun. I am lucky to have met Michelle Estuar here, and I thank her for her friendhip, love, and unyielding support. I owe a debt of gratitude to all the members of the Caltech Rugby Football Club of which I was a member for over five years. I would also like to thank the members of the Fuzzy Bunnies of Death, the Two Baggers, Ernie's A. F., and the Laugh Out Louds.