

To my parents and all friends

who have witnessed my intellectual growth,

To the great Mozart

Bach, Beethoven, Brahms, Wagner, Strauss . . .

Acknowledgements

Six years has passed since I came to Caltech, which has become the longest period I ever spent at one school. Yet this past six years at Caltech has transformed me from an “A” student, to a keen problem-solver, and finally, a critical thinker. For my intellectual growth, first I need to thank my advisor, Professor Zhen-Gang Wang. In addition to his impressive depth of knowledge and insights, as an advisor, he can always gauge the right amount of help and advice, and leave the rest to myself. It could be a little stressful sometimes: whenever I made some progress and felt that I can tackle one class of problems, the next task turned out to be even more challenging. Nonetheless, it is only through this process of excellence that I learn to enjoy doing research.

Professor John Brady gave me the first lecture at Caltech. I still remember our discussions of the topics for the class project, which gave my first exposure to independent research. I am impressed by his broad interests, which are reflected in his research as well as the problems he designed for the qualifying exams: from coffee stirring to the Lost Ark. I thank him for many discussions on various subjects, in particular, for his meticulous and critical reading of my candidacy report and final thesis.

Professor Rob Phillips introduced me to the area of biophysics, or physical problems in biology. I am deeply impressed by his infinite passion in exploring all kinds of topics, but what is truly remarkable is his determination and courage in moving from mechanics into experimental biology. We have had several discussions, but attending Rob’s talks or lectures, and listening to his questions or comments, impact me the most.

Theorists “are a special group of people who live upon our colleagues.” As a theorist, I have had the fortune of working in collaboration with Professor David Tirrell’s group. Dave, and students in his group, Kechun, and Wei, are the main resources of new ideas and new problems for us to work on. They have also been the best audience and collaborators when we want to discuss and test our results. In particular, I want to thank Dave for his encouragement when I meet difficulties.

I must say, though a cliché, that our department has the best staff members. Both as graduate student assistant and as secretary to Zhen-Gang, Kathy has been offering the most and best help that I can ever expect. Anne also did a great job in organizing the CSEM annual meetings and it has been pleasant to work with her. I need to thank Suresh—as the only computer assistant in the

department, he offers timely help and deals with all sorts of computer issues. I also want to thank Martha, Laura, Yvette, and Marcy (who has left Caltech), for receiving all my packages.

During my stay at Caltech, I have met many good friends. Justin Bois, who became “Dr. Bois” several months ago, and Jennifer Witman, are the first friends I met in the chemical engineering department, and incidentally we all joined the “Wang group”, and quadrupled the size of the group then with only Andrew Spakowitz. All my group members, including the later joined Shelby Hutchens, have offered me a lot of suggestions and encouragements. I need to thank Yizhen Zhang, Xinwei Yu, and many other house mates at Braun house, for offering me a lot of help during my first year at Caltech. Zhipu Jin is the first Chinese student I met at Caltech: we shared many fun stories and experiences; Zhaoyan Zhu and I shared some of the best memories and sweetest moments, which colored my monochromatic life; Kai Shen and I have been cheering up each other in the past two years: without his help I would not have gone through the difficult moments in writing up the thesis. In addition, I want to thank Ying Huang, Rongjing Zhang and Junhua Yuan, Hua Long, George X. Ouyang, Xin Guo, Yu Liu, Changlin Pang, Jian Wu, and many others whom I have talked to and benefited from.

In the past six years I have undergone not only intellectual, but also mental growth. My parents witnessed this whole process, I am indebted to their comforts and encouragements, even though we are at two ends of the globe. Without their support I could never come to this point. I also treasure the friendship of Liang Qiao and Hongzhou Jiang: we have been arguing with each other since college, and continue to share our individual opinions on all sorts of issues.