CREATING THE VIRTUAL SEISMOLOGIST: DEVELOPMENTS IN GROUND MOTION CHARACTERIZATION AND SEISMIC EARLY WARNING

THESIS BY

GEORGIA B. CUA

REPORT NO. EERL 2004-12

PASADENA, CALIFORNIA
FEBRUARY 2005

(DEFENDED DECEMBER 2, 2004)
Creating the Virtual Seismologist: Developments in Ground Motion Characterization and Seismic Early Warning

Thesis by

Georgia B. Cua

In Partial Fulfillment of the Requirements for the Degree of Doctor of Philosophy

California Institute of Technology
Pasadena, California

2005
(Submitted February 9, 2005)
Acknowledgements

I’d like to thank my advisor, Tom Heaton, for his sage advice and unfaltering enthusiasm for this project over the past 7 years. I never left Tom’s office without a renewed sense of excitement for my research. Working with and knowing Tom has been an incredible learning experience and adventure.

The members of my advisory and defense committees, Jim Beck from Civil Engineering, and Hiroo Kanamori and Egill Hauksson from Seismolab, were all very generous with their time and ideas. I especially thank Dr. Beck for introducing me to Bayes’ Theorem, Hiroo for teaching a class where I was the only registered student, and Egill for encouraging me to finish and for my extended use of his computers. I’d also like to thank John Hall for his support and advice.

I will miss Case Bradford’s calm and rational assessments of all imaginable crises. Thank you to Carolina Sustaita and Viola Carter. Javier Favela, Jascha Polet, Brian Savage, Chen Ji, and Vala Hjorleifsdottir from Seismolab were always ready to help on a variety of issues.

My family in the Philippines has always encouraged and supported my endeavors, no matter how far from Manila they end up taking me. My mother, Maripaz, is ever with me in spirit and on the phone, constantly reminding me (most effectively by her example) that moderation and balance are the keys to a fulfilled and happy life. My brother, Chen, spent many hours babysitting while I attended classes and John surveyed the South Atlantic. My father, Jimmy, my stepmother, Eliza, and my younger siblings, Speedy and Michelle, have always been encouraging. I’d also like to thank my grandparents, Nellie and Serafin Buenaventura, and Florence and Johnny Cua for their prayers and examples. Leah Isla, Eloisa Buenaventura, Edgardo Angeles, and Joey Buenaventura have always had sound advice for all occasions. Tita Cecile, thank you for watching over all of us.

John, Peete, and I have many homes away from home in the US. My thanks to
the family of Cori and Ernie Reyesh, for the adventurous Walnut years, to the family of Ana and Elias Mubarakh, for opening their homes to us, whether in Kansas or California, to the family of Guia and David Querns, for making Peete an honorary Querns, and to Anabelle Buenaventura, for introducing me to the library. To my cousins, thank you for spoiling Peete so much.

I’d also like to thank my in-laws, Peter and Margaret Clinton, for their good humor and support in all shapes and forms, and for raising John to be the exemplary husband, father, and friend that he is.

Ultimately, home is wherever Johnnie, Peete, and I are together. To Johnnie and Peete (and any other additions to our family), thank you for this adventure. Here’s to wherever it takes us.