1–10 Myr-old Low Mass Stars and Brown Dwarfs in Nearby Star Forming Regions

Thesis by

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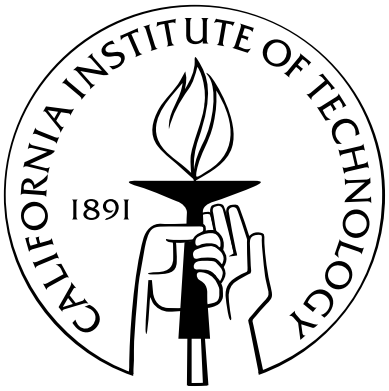

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Dedication

I dedicate this thesis to the 2001–2002 inhabitants of 05 Robinson,
and to Rim, who clearly knew what she was doing.

Acknowledgements

The list of people without whom this thesis would not have been possible is long, and I will try to be brief.

First and foremost, I would like to thank my advisor, Lynne Hillenbrand, who is primarily responsible for my growth as a scientist during the past six years. I could not have asked for a better advisor, and I feel fortunate to have been able to work with someone for whom I have such deep respect both scientifically and personally. Thank you for being my advisor when I needed it, and my collaborator the rest of the time, for knowing when to guide me, and when to allow me to find my own way.

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Abstract

My thesis research has focused primarily on identifying and characterizing pre-main sequence stars in nearby star-forming regions. To this end, I carried out wide-field ($\sim$150–250 deg^2) optical photometric and spectroscopic surveys in and near the star forming regions of Taurus and Upper Scorpius.

In Taurus, the aim of my optical photometric/spectroscopic survey was specifically to probe for a population of intermediate-age pre-main sequence stars outside of the young subclusters that are known to contain most of the young Taurus population. From this work I found tens of young ($\sim$1–3 Myr) and intermediate-age ($\sim$5–10 Myr) stars both near the known Taurus population and to the east, but relatively few pre-main sequence stars of any age to the west. I argued that the new pre-main sequence stars identified far from Taurus can not have originated from the vicinity of the 1–2 Myr-old subclusters and I proposed instead that they comprise a new, previously undiscovered region of recent star formation.

In USco, the aim of my optical photometric/spectroscopic survey was to probe beyond previously explored regions to identify large numbers of 5 Myr-old low mass stars. From the spectroscopic data I have discovered 145 low mass members of USco. Using Monte Carlo simulations I showed that, taking into account known observational errors, the observed age dispersion for the low mass population in USco is consistent with all stars forming in a single burst $\sim$5 Myr ago. I also derived the first spectroscopic mass function for USco that extends into the substellar regime and compared results to similar mass functions derived for stars in four other young clusters and associations.

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