An Ultra-Deep Survey of Low Surface Brightness Galaxies in Virgo

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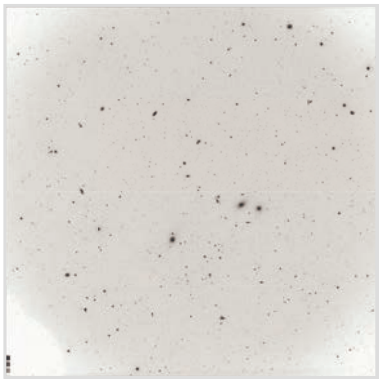

This thesis is presented for the degree of

Master of Philosophy in Physics

Dedicated to all the sentient beings living in galaxies
in the Virgo Cluster

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SYNOPSIS AND STATEMENT BY CANDIDATE

Synopsis:

Originally planned as a PhD project, but curtailed to a Master of Philosophy due to time constraints and numerous other commitments, the principal objective of this project was to undertake a survey of low surface brightness (LSB) galaxies in the Virgo Cluster. This thesis presents background material and the results of that survey. As considerable research has already been conducted on galaxies in the Virgo Cluster, the early chapters cover: LSB galaxies; current knowledge of the Virgo Cluster; and the luminosity function that describes a galaxy population.

The base data for this project is a unique resource - the Virgo Deep Stack - made from 63 digitally-scanned photographic films centred on the core of the Virgo Cluster. Subsequent chapters describe the data and analysis techniques and compare these new data with previously published work.

On the specific question of the characteristics of the faint end of the luminosity function in the Virgo Cluster, where the low surface brightness dwarf galaxies predominate, most survey results disagree. This project addresses the reasons for the disagreement and explores the quality of the published data sets by comparison with data from the Virgo Deep Stack. Finally, the catalogue of newly-identified galaxies is presented and discussed. The new galaxies and their properties will contribute to the body of scientific knowledge about the cluster and its low surface brightness population.

Statement by Candidate:

This thesis has not been submitted for a higher degree to any other university or institution. The work contained in this thesis was carried out while the author was a research student at Macquarie University, Sydney, from February 2005 to May 2008, under the supervision of A/Prof. Quentin Parker.

This thesis is the result of the author's own investigations. All material from external sources is fully referenced.

Signed:

Date:

Acknowledgements

Many people have contributed to this project in different ways. Several astronomers have given me good advice and helpful support at critical times, particularly in the early stages of the project. My thanks go especially to Stuart Ryder for teaching me the 'black art' of surface photometry, Bryn Jones for sending me the detailed notes on performing photometric calibration, Warren Reid for guiding me through the Gemini PIT the first time around and Steve Phillipps and Simon Driver for offering helpful advice and collaborating on our Gemini observing proposals.

I also wish to thank Kristin Chiboucas and Simon Chan for their very good company at the Gemini North Telescope. The fabulous behind-the-scenes tour was certainly an enjoyable consolation when the dome was frozen shut and we were unable to observe.

Closer to home, there are my friends at Macquarie University (staff and students), without whom I doubt I could have stayed sane through the difficult times. Staff members who always managed to be there with support and encouragement include Alan Vaughan, Peter Browne, Mark Wardle, Judith Dawes and Agnieszka Baginska. To Catherine, Korinne, Sarah, Andrew, Brent, Anna and all the rest also go my thanks for sharing the work, the stories, the plans, the frustration, the lollies, the *hugs*, the knitting patterns and the recipes. I hope all these good friends manage to finish that which they undertook to achieve. I'm planning to stick around for a while for purposes other than study, so I hope I may continue to give them the same support they've given me. And I'll apologise now for always being so noisy every time I come into the office!

My family have been wonderful throughout my 10-year-long mid-life crisis, of which this project has been just one component. I thank Husband, my dad and 'Mrs Moore'

for their moral support and pride in my achievements, Jim for all the dinners, Tom for all the smiles and Carol and Harley for finally getting married. Once again, Elaine has done a stupendous job of proof reading for me and I can't thank her enough.

Special thanks, of course, go to Quentin Parker, my supervisor. Quentin has done so much for me, not just in the context of this project, but in offering me so many other opportunities along the way. I also thank Quentin and his lovely family, Carolyn and Sebastian, for their hospitality at the barbecues. Somehow Quentin manages to find a balance between work, which at times must seem overwhelming, and the lighter side of life. I relied on him to be understanding and sympathetic when I hit my 'lows' (I'm sure every PhD student has these) and he responded by pulling me through to the point where I've managed to salvage this Masters thesis from the project. I suppose I am a little sad that it didn't quite turn out to be the PhD, and there are many people, I know, who looked forward to seeing the 'best ever' luminosity function of the Virgo Cluster. To those people, I apologise for not being a better student. Nevertheless, I have no regrets about doing the work, enjoying the distractions and realising the dream of getting to the top of Mauna Kea. None of this would have happened without Quentin's unquenchable enthusiasm and undying support. Thanks Q!

Quentin, Lesa and the Gemini North Telescope

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