An Automated Pollen Recognition System

A Thesis submitted to
Massey University, Turitea, Palmerston North, New Zealand
in fulfilment of the requirements for the degree of
Master of Engineering.

By
Gary Allen

December 2006

Institute of Information Sciences and Technology

Massey University

Abstract

A system was developed with the aim of demonstrating that the tedious tasks of classifying and counting pollen on slides could be performed automatically to a standard comparable with that of human experts. Automation of pollen classification and counting will advance the science and range of applications of palynology.

The system developed is a completely functioning prototype. After initial set up and training it is automatic in operation.

System tests have demonstrated that the concept is viable and that the prototype developed is at a stage that it is of practical use to palynologists. There are opportunities for improvements and added functionality. Now that the system is developed and characterised, it provides a benchmark for gauging the efficacy of future improvements and adaptations.

The system is presently adaptable to many different classification problems within palynology and would be adaptable for other automated microscopic classification or imaging tasks.

Acknowledgements

Thesis supervisors were Prof. Bob Hodgson and Rory Flemmer and their efforts are well appreciated.

Special thanks go to Prof. Bob Hodgson, who offered the project to me, and spent many hours in helpful discussions and reading reports and drafts.

The Pollen Research Team at Massey University includes: Prof. Bob Hodgson, Prof. John Flenley, Prof. David Fountain, Dr. Stephen Marsland, Greg Arnold. They are an integral part of this project and provided sound and experienced advice and help along the way.

Thank you to Dr. Roger Brown who checked my work on depth of field.

Many thanks are owed to Steve Denby and the crew at the special works and mechanical workshop of the Institute of Fundamental Sciences, Massey University, who built the AutoStage.

Manual pollen counters were: Xun Li (PhD), Kevin Butler (laboratory technician), Alistair Clements (student), Prof. John Flenley and Prof. David Fountain. Many thanks for the time taken to count these slides and again to David, for supplying the pollen for the slides.

Thanks to Xiuying Zou for conventional image capture of reference pollen.

And to my wife, Linda, who encouraged and supported my decision to study again, my love.

Contents

List of Tables and Figures