

THE CHALLENGE
of
DIVERSITY

Proceedings
of
The Δ '99 Symposium
on Undergraduate Mathematics

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Foreword

The First Symposium on Undergraduate Mathematics, Δ '97, was held at the Gardens Point campus of QUT in Brisbane and posed the question, *What can we do to improve learning?* The level of participation in the event showed that many tertiary level mathematics instructors are vitally concerned with this matter and eager to learn from the experience of others and to share their own experiences in responding to the challenges faced by all. The theme of this Second Symposium is *The Challenge of Diversity* with special reference to

- catering for different learning styles
- innovative teaching practices
- flexible delivery
- developing dynamic curricula
- special service and bridging courses
- technology in learning mathematics.

The papers published in this volume reflect something of the breadth and depth of the discussion that this topic evokes around the world.

Mathematics, as a discipline, is being subjected to extreme pressures for change. Many mathematics departments are being forced to review course offerings and adjust staff levels to reflect the demand for mathematics courses. The nature of the clientele, its needs and expectations have changed considerably over the past two decades. The needs of the emerging sciences of biotechnology, genomics, and molecular biology, to name just some, requires investigation and liaison. Student numbers have increased dramatically but mainly in service courses, with home departments, keenly aware of the financial implications of student credits, questioning the nature of the mathematics courses offered to *their* students. Project based learning has appeared in various places and in the re-structuring of traditional courses; engineering is an example. These re-structured courses, long serviced by mathematics departments, present a real challenge to the mathematical community to present relevant and appropriate contributions to these users of mathematics. Solomon Garfunkel¹ in an Editorial in a recent edition of the UMAP journal, sums it up with the statement

Undergraduate mathematics education needs work.

It needs new courses and pedagogies that reflect the best aspects of reform.

The Δ '99 Symposium was structured around the presentations of guest speakers Adrian Oldknow of King's College at the University of London, David Smith of Duke University and Robyn Zevenbergen of Griffith University, each with a different and distinct focus. The invited presentations are complemented by forums led by four teams of international coordinators. Johann Englebrecht and team address the issues of management of change in South Africa, whilst Derek Holton and team report on and discuss the challenge of diversity in New Zealand. John

¹Solomon A. Garfunkel, Publisher's Editorial, *UMAP Journal*, 19(3), 1998.

Berry and team debate student-centred learning in the UK, whilst Deborah Hughes-Hallett and her team address how technology has contributed to dealing with diversity in undergraduate mathematics in the US.

Papers contributed to the Symposium provide an in-depth view of the research and innovation taking place nationally and internationally in addressing the challenges of diversity. Without the contribution of these authors, there would be no symposium. Their papers provide focal points for on-going discussions at the Symposium. The Δ '99 Committee has sought to foster debate by providing the full text of all papers over the World Wide Web prior to the meeting and endeavouring to maintain the conference site after the event. Thus papers can be referred to at the touch of a keyboard besides being available more permanently in book form in these Proceedings. The reviewers have put in many hours of effort in their diligent appraisal of submitted papers and in their comments for the improvement of papers recommended for acceptance. Their contribution to the Symposium is much appreciated and essential to maintaining a healthy environment of peer review and criticism.

The generous support of our sponsors, The Australian Mathematical Society, Hewlett Packard Australia, John Wiley and Sons, CEANET and Silverleaf Technology is acknowledged with gratitude and appreciation. We are also indebted to our own institutions for their support: The Department of Mathematics & Computing of the University of Southern Queensland, the Mathematics Learning Centre and the School of Mathematical and Decision Sciences of the Central Queensland University, the School of Information Sciences at Bond University and the School of Mathematical Sciences at the Queensland University of Technology. A particular expression of gratitude is due to the Chancellery of Central Queensland University for its exceptional support.

The Δ '99 Committee hopes that its work in organizing this Second Symposium on Undergraduate Mathematics at Laguna Quays on the Whitsunday Coast over the period 21-24 November, 1999, makes a significant contribution to the profession of undergraduate mathematics teaching and hence ultimately to the experience of students involved in mathematics learning.

Milton Fuller
Chair, Δ '99 Committee
Rockhampton, November, 1999.

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Referees and the Review Process

The Δ '99 Committee would like to express gratitude to the following distinguished university academics and teachers who reviewed the contributed papers.

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All contributed papers to Δ '99 were anonymously refereed by two independent reviewers using a uniform set of criteria. Where the referees decisions were not unanimous, a third reviewer was consulted. Authors of accepted papers were requested to ensure that referees suggestions for improvements were implemented.