Counting Australia In
The People, Organisations and Institutions of Australian Mathematics

Graeme Cohen
Halstead Press 2006, ISBN: 1-920-831-398

This book is a history of mathematics in Australia. Graeme Cohen has succeeded in the difficult task of combining a comprehensive survey with an interesting story. I can't say that I liked the too-cute title, but I did enjoy reading everything that follows it.

The extent of the coverage can be seen from the titles of the chapters, namely:

1. Mathematics and the beginnings of the colonies
2. Mathematics and the rise of the universities
3. Mathematics outside the universities
4. Mathematics in the universities in the first half of the twentieth century
5. Australia's mathematicians in World War 2
6. Post-war mathematics in the older universities
7. Mathematics in Canberra's colleges and universities
8. National organisations and mathematics
9. Mathematics and the later universities
10. The Australian Mathematical Society

which are supplemented by appendices consisting of articles originally written by Horatio Carslaw in 1914 and Keith Bullen in 1956, lists of Society members, office holders and award winners, and comprehensive bibliographic end-notes and indices.

For example, there are about 1200 names in the 'Names Index', almost all of whom are mathematicians, and a further 600 entries in the 'General Index'. At various times while reading the narrative, I began to think 'Graeme has omitted X', only to find that X got an appropriate mention within a page or two, and such X's invariably also appeared in the Names Index (if X was a person), or the General Index (if X was an organisation or an event). Chapters 1 to 5 constitute the first half of the book, and perhaps make the most interesting and informative reading, as they describe people who lived and events that occurred before most of the book's present-day audience were born. In my own case this is almost true, but in addition, as a participant in some of the events described in the second half of the book, I feel less able to make a dispassionate review.
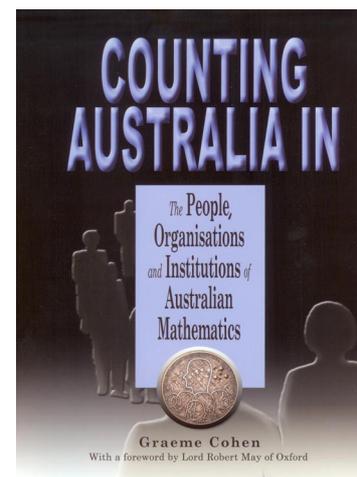
As the title of Chapter 1 suggests, Cohen starts right at the beginning, when few of us would have thought there were any mathematicians in the colonies at all. Actually, he starts even before there were colonies, with mention of the mathematical competence of James Cook himself and others on his ship when it arrived in Botany Bay in 1770. (Going even further back, he briefly documents Aboriginal and Islander mathematics.) Then we hear about other explorers such as La Perouse (who nearly had the mathematician Gaspard Monge in his crew when it arrived in Sydney in 1788 and was lost with all hands soon after) and Nicolas Baudin (whose 1802 place names like Bai Laplace and Cap l'Hopital sadly were replaced by more boring names due to Flinders).

Once New South Wales was established as a colony, a need for some form of mathematical education and activity became apparent by the beginning of the 19th century. Thomas Brisbane, governor from 1821 to 1825, took a great interest in science including mathematics. Brisbane hired Carl Rumker, who Cohen claims to be Australia's first practising mathematician, as a private astronomer. However, little real mathematical activity occurred until the middle of that century.

Statistics played a somewhat more substantial early role and even the first governor Arthur Phillip demanded from 1788 that almost everything be counted and recorded meticulously. Later in the mid-19th century, there was some professional activity in statistics via the census, and in areas like surveying, geodesy and genetics (the last by the famous wheat breeder William Farrer) which depended to some extent on mathematics. At the same time, tentative beginnings of scientific societies like the Philosophical Society of New South Wales involved mathematics, including a paper by James Cockle in the first issue of its Transactions in 1866. Cockle was the Chief Justice of Queensland, but was already an FRS, and remained an active amateur in mathematical research for decades.

But mathematics as a profession could only really get a start with the universities, beginning with The University of Sydney in 1852. Australia's first professor of mathematics was Morris Pell, and Cohen records not only the names of the selection panel (which included Herschel and Airy), but also those of Pell's rivals for the chair. This is a pattern repeated throughout the first part of the book, and in particular Cohen documents some famous names who served on early selection committees. Neither Pell nor his 1876 successor Thomas Gurney had a great influence on the development of the profession, either inside or outside Australia. The same can be said of the first two professors at The University of Melbourne, William Wilson from 1855 and Edward Nanson from 1875, even though the latter stayed for 48 years, still a record professorial tenure.

The same could definitely not be said of the first two professors at The University of Adelaide, Horace Lamb (author of the famous textbook 'Hydrodynamics') from 1876 and William Bragg from 1885. Both were professors of mathematics and physics, but both were more active in mathematics in their early years at Adelaide, although Bragg later became more famous as a physicist, and won the 1915 Nobel prize in physics jointly with his son Lawrence who was born in Adelaide. The fourth Australian university was the University of Tasmania, and Alexander McAulay was appointed the first professor of mathematics in 1893, subsequently to make good contributions in physics-oriented mathematics.

Chapters 4 and 5 take us into the first half of the 20th century, and establishment of The University of Queensland (1911) and The University of Western Australia (1912). Charles Weatherburn, the second Professor of Mathematics at UWA, from 1929, became very well known for his often-reprinted text on vector analysis. Also at UWA, Margaret Moir was

notable for at least two reasons, as (perhaps) Australia's first female lecturer in mathematics in 1929, and later as (perhaps) Australia's first retrenched mathematical academic, in times of financial hardship in 1931.

Meanwhile the next generation of professors at the older universities was also to become very well known internationally. Horatio Carslaw at Sydney (from 1903), John Michell at Melbourne (lecturer from 1891 and promoted to professor in 1923), and John Wilton at Adelaide from 1920 were perhaps Australia's first group of truly outstanding mathematicians on a world scale. I have had to point out Michell and Wilton's Australian-ness to colleagues overseas, who doubted that such a backwater could produce mathematicians of stature in the early 20th century. Michell in particular deserves mention as the first Australian-born mathematical FRS in 1902, though sadly that year also signalled the end of his period of published research activity.

The next pre-war group of professors also included very important researchers on a world scale, such as Thomas Cherry at Melbourne, Thomas Room at Sydney, and Edwin Pitman at Tasmania. World War II then intervened, and Cohen tells some fascinating stories about mathematicians involved in the war effort, including code-breaking and operations research. After the war, a significant build-up occurred, and again some outstanding professorial appointments were made, including Keith Bullen at Sydney, Eric Barnes and Ren Potts at Adelaide, Fenton Pillow at Queensland, and Larry Blakers and John Mahony at UWA. Cohen gives ample discussion of each of these appointments, not glossing over difficult matters like the Room–Bullen antagonism, which damaged mathematics at Sydney for decades.

Cohen also does not confine his narrative to professors, giving almost everyone who contributed to the mathematical profession a generous mention. He is almost too democratic, and perhaps the real stars could have been given a little more proportionate space. For what it is worth, Room is the citation star of the book, being mentioned on 34 of its pages, with Cherry next on 28 and Bullen on 24.

He is also perhaps a little too kind. We have not always performed well on the international mathematical stage. Cohen does mention the very negative quantitative review in *Vestes* (1968) by Ian MacDonald, who essentially concluded that George Szekeres was the only significant (pure) mathematician working in Australia at that time. This particular review was neither impartial nor entirely acceptable in its methodology, but nevertheless not too many at that time were close to the Szekeres standard.

Expatriate Australian mathematicians of distinction (such as George Batchelor and most recently Terry Tao), closely-associated short-term or visiting mathematicians (such as Ronald Fisher, Hans Schwerdtfeger, Richard Meyer and John Miles) and almost or should-have-been appointees (such as William Young, Edward Ince, Louis Milne-Thomson and Norbert Wiener) are also well discussed, as are people whose connection to mathematics is perhaps minimal but nevertheless interesting. The latter group includes Princess Mary of Denmark (daughter of the Tasmanian mathematician John Donaldson), the politician Herbert Evatt and the political commentator Mungo MacCallum who both were mathematics honours graduates, astronauts such as Paul Scully-Power Philip Chapman and Andy Thomas, and the wife-murderer Rory Thompson (incidentally surely not the only CSIRO theoretical oceanographer worthy of mention in a history of mathematics in Australia).

As anticipated, I shall say little about the second half of the book, which mainly deals with relatively contemporary events and persons. But here again the coverage in the book

appears to be comprehensive and accurate, and in particular documents the role of mathematics in each of the universities founded in the second half of the 20th century. Specific rankings of mathematical departments are not emphasised by Cohen, but it is possible to discern a clear leadership by Monash University during the last three decades of the 20th century, from references quoted by Cohen. These involve data on honours and postgraduate student numbers collected over that period for the Society by Jim Douglas, Peter Petocz and Peter Johnson, and separately in 1982 by Martin Bunder (I hesitate to note which university consistently came second!). Although output of research-oriented students is only one measure of strength, other measures such as publication rates generally (except in the case of the ANU) correlate well with it. In the same period there was a relatively poor performance by the senior universities in Sydney and Melbourne, a problem that has now been very substantially remedied, even reversed.

Chapter 10 concerns the Australian Mathematical Society, founded in 1956, and its publications and offshoots, and seems to be an accurate summary. There is almost no actual mathematics in this book, except in Appendix 2, where Bullen was attempting to define 'Applied Mathematics', though this article appears to have been mainly written as his excuse for not joining the Society (whereas some quoted by Cohen felt that the real reason was that if Room joined, Bullen would not).

Graeme Cohen has done a superb job of surveying the development of our discipline in Australia. It is hard to imagine how anyone could have compiled a more complete story, and yet it is eminently readable. Read it!

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Introduction to Modern Number Theory
49 Number Theory 1, Second Edition

I. Manin and A.A. Panchishkin
Springer 2004, ISBN: 0938-0396

From the introduction:

> Among the various branches of mathematics, number theory is characterised to a lesser degree by its primary subject ('integers') than by a psychological attitude ... The question whether a given article belongs to number theory is answered by its author's system of values.

The purpose of agreeing to review a book is to acquire a free copy. I was therefore annoyed with myself to find I already owned the 1995 edition, likely acquired on some occasion from Springer filling my hands with golden books as reward for some task I had performed. Whatever, I had barely looked at the book, somehow put off by its austere presentation as volume 49 in Springer's Encyclopædia of the Mathematical Sciences.

I was, and am, mistaken, several times over. First, this book was, and remains, a *good book* in the sense that George Szekeres once defined such a thing for me: an article or book is *good* if you're (not too unfavourably) quoted in it. Second, this book *is* good also in a less subjective sense, as I suggest below. Third, this edition feels altogether different from the earlier one, in meaningful part, I suspect, because of better editing and typesetting (with more white space on the page). And, frankly, a less forbidding cover — a useful reminder not to pay attention to false truisms about roses with another name or how to judge books.

In any case, there is much new and more in this edition than in the 1995 edition: namely, one hundred and fifty extra pages. Of course, more is not necessarily better, but here the 'more' is fifty helpful pages on the proof of the Modularity Conjecture and Fermat's Last Theorem, and a hundred page survey 'Analogies and Visions' dealing *inter alia* with analogies and differences between numbers and functions and specifically providing an introduction to Arakelov geometry and noncommutative geometry.

The purpose of reviewing a book is to explain to the reader why she personally, or at the least her institution's library, should promptly order a copy. In the alternative, the reviewer illustrates that, had he bothered, he could and would have written far better on the subject than did the authors (actually, many reviewers do that in both circumstances, but are less scathing in the first alternative). For my part, I come to praise this fine volume.

This book is a highly instructive read with the usual reminder that there are lots of facts one does not know. But it also has the less usual charm that lots of things one did know are true for rather more insightful reasons than one had recalled. Of course, the book is an encyclopædia volume, so many topics are treated somewhat telegraphically giving you, as reader, a little more to do. Nonetheless, the quality, knowledge, and expertise of the authors shines through. The notion of an encyclopædia also connotes a certain completeness. I noticed that some relevant topics seemed to get excessively cursory treatment, but then realised both that this volume is dedicated to *modern* number theory, and that it has three companion volumes: Number Theory II: Volume 62, 'Algebraic Number Fields', by H. Koch (1992); Number Theory III: Volume 60, 'Diophantine Geometry', by S. Lang (1990); Number Theory IV: Volume 44, 'Transcendental Numbers', by N.I. Fel'dman and Yu.V. Nesterenko (1997).

The present volume is almost startlingly up-to-date, in part because plainly just prior to publication the authors added updates on very recent significant results (for example, the Green–Tao Theorem on primes in arithmetic progressions).

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Researching Mathematics Classrooms:
A Critical Examination of Methodology

Editors: Simon Goodchild and Lyn English
Information Age Publishing 2002, ISBN: 1-59311-182-7

This collection represents a novel approach to developing a stronger understanding of researching mathematics education. All chapters explore particular (and different) approaches to methodologies for exploring classroom practice. There is a very good diversity in representation of approaches ranging from longitudinal, statistical approaches (Yates) to the microculture of classrooms (David and Lopes; Goodchild). The chapters represent an excellent collection of approaches in which the authors discuss the ways in which they planned, executed and reflected on their studies. The detail in which each chapter is written provides a very sound overview of the methods and methodological issues for each study.

In writing this review, it is not my intention to provide a summary of each chapter as this has been done by the invited series editor, Professor Leone Burton. Each chapter is a personal account of the six chapter authors' research methodologies. Each chapter represents a very different approach to very different research problems and contexts. This is a strength of the book and provides the reader with a very clear idea of the research process and decision making processes undertaken by the chapter authors as they go about their projects. Burton's opening chapter provides a context for the book by proposing a contextualising problem — the 'why' of methodology — why researchers make the decisions they do as they go about their research processes. This is a strength of the book in that each of the authors seek to articulate the decisions they make as they go about their work. Each chapter addresses this to varying degrees, depending largely on the problem under investigation and the approach that was taken.

There is a good diversity in the chapters in that they give a strong representation of methodological approaches to the conduct of research (qualitative, quantitave, longitudinal, ethnographic); foci of problems in mathematics education (preservice, special needs, primary classrooms, whole school); theoretical positions; problems of learning, metacognition, affect, engagement. This collection is an interesting read just of the basis of the diverse problems that are addressed by the chapter authors.

Unlike traditional accounts of methodology, the editors clearly set up a process for the chapter writers in which they would outline their approaches, discussing the background to the study. This included an in-depth discussion about the dilemmas, issues, problems, and resolutions to such problems, the outcomes and consideration of ethical issues. This format, while not explicitly stated, is evident throughout the chapters, thus giving an overall coherence to the book. This makes the book easy to read and gives the reader a sense of what to expect in each chapter. The accounts are very personal stories of the studies in which the authors tell a 'warts-and-all' account of their research. This is a strength of the book as it shows the critical decisions that researchers make as they undertake their projects. This represents a considerable step forward in research methodology since it shows that research is not a clear case of logical and objective processes but one fraught with human decisions. For beginning researchers, this represents a challenge to the dominant approaches in research design and methodology where there is little said about the human-ness of research.

While this last point may be seen as problematic in terms of the conduct of research and engender a highly individualistic 'anything goes' approach to research, this is not the case

with the book. One of the interesting and novel approaches offered by the book is the genre. Each chapter has a respondent whose task has been to critically appraise the chapter. Each of the respondents has taken this task seriously and been quite open in drawing out both strengths and issues with the chapter. For new researchers (whether new to research or the particular approach of the chapter), this process achieves two major goals. First, it highlights the important and relevant processes in the methodology of any chapter. Second, it then discusses what might have been done in the research process that would have enhanced the project. Of course, these reactions are a reflection of the respondents' views of the research process but they draw out considerations that could be made in the conduct of similar work.

The reflexivity between the chapter authors and reviewers is similarly adopted with the overall book where the editors have employed Leone Burton to provide an introduction to the book and then to provide a final response to all of the chapters. This style gives further coherence to the book. Burton's chapters reflect her particular approach to understanding methodology; that is, that the chapters should have a stronger focus on the beliefs and dispositions of the authors about their particular choices and reactions to problems/issues in the research process. This perspective comes out strongly in Burton's introduction and conclusion and is perhaps a reflection of Burton's position on methodology. The authors have, to varying degrees, embraced Burton's challenge to make explicit their subjective positions in terms of methodology.

Overall the book is a very good read and highlights the processes undertaken by the authors in the research process. This is done to varying degrees of success by each chapter author. Some chapters are quite rigorous in how they justify their approaches whereas others are very subjective accounts and articulate the pragmatics of their decision making. While this can be a very open and frank process, there is some sense that it may not be a very structured approach to the conduct of research. This is particularly the case where a conservative agenda governs a considerable amount of research. Clearly, the world views of the authors are instrumental in the decisions that are made in the conduct of research but these must be made explicit but within justifiable and legitimate frameworks. This has been undertaken to greater and lesser strengths by different authors. The respondents, in all cases, have highlighted these issues, drawing attention to the problematic nature of such decision-making.

For early career researchers, these justifications are extremely critical and it would be highly contentious for a new researcher to adopt, unproblematically, the highly subjective position of some of the authors. Having such decision-making counter-balanced by respondents is a very effective strategy used by the editors. In some cases, the bias of the respondent can be evident. For example, the study outlined by Yates (a longitudinal, statistical study) was complex in design because of the original catalyst for the study (a problem of one school) along with the design features of a statistical study. Burton was particularly critical of this study — in part, I would contend, due to the positivist worldview of the author. However, the inclusion of this chapter by the editors is critical since it portrays a balanced view of research potentials. Its inclusions ensures a balance of approaches and does not prioritise qualitative approaches over quantitative approaches.

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