Curriculum Vitae of Michael G. Cowling

Personal details

I was born in Melbourne, Australia, on July 9, 1949.

I am a citizen of Australia and of the United Kingdom.

I am married to Maria Cristina Mauceri; we have one child, Arianna, born 1983.

My interests/hobbies include reading, music, swimming, cycling, and yoga.

Summary of Training and Employment

I was awarded the degree of Bachelor of Science (with First Class Honours in Pure Mathematics) from the Australian National University in April 1971.

I completed work for the degree of Doctor of Philosophy at the Flinders University of South Australia, under the supervision of Dr G.I. Gaudry, in January 1974.

I was Postdoctoral and Teaching Fellow at the University of British Columbia (Canada) from April 1974 until September 1975.

I was C.N.R. Visiting Professor at the University of Genoa (Italy) during the (northern) academic years 1975–76 and 1976–77.

I was a *Professore Incaricato* at Genoa for 1977–78.

I was a Visiting Assistant Professor at Washington University in St Louis (U.S.A.) during 1978–79.

I was reappointed *Professore Incaricato* at Genoa for 1979–80.

I became Professor of Mathematical Analysis at the University of Genoa from the beginning of the 1980–81 academic year.

I took up the position of Professor of Pure Mathematics at the University of New South Wales in November 1983.

I held an Australian Research Council Senior Research Fellowship from 1991 to 2000.

Scholarships, Honours, etcetera

I was awarded the Special Exhibition for Chemistry and a General Exhibition at the 1966 Victorian Matriculation Examinations, and was Dux of Melbourne Grammar School.

I was a National Undergraduate Scholar at the Australian National University 1967–70.

I held a Commonwealth Postgraduate Research Award 1971–74.

I was awarded the Australian Mathematical Society Medal in 1989.

I held Australian Research Council Senior Research Fellowships 1991–2000.

I was elected to Fellowship of the Australian Academy of Science in 1993.

I was awarded an Anthony Mason Fellowship by UNSW in 1995.

I was given the title of Scientia Professor in 2001.

TEACHING

Undergraduate Teaching

At U.B.C., I taught one section of Mathematics 100.

At the University of Genoa, I taught a range of courses: Functional Analysis, Probability and Statistics, Mathematical Analysis I, and Mathematical Analysis II.

I taught several courses at Washington University in St Louis, namely, Mathematics 117 (elementary differential calculus), Mathematics 218 (calculus of several variables), and Mathematics 411 (rigorous one-variable calculus).

At the University of New South Wales, I have taught a variety of subjects. These include the General Studies subject "The Computer — Its Impact, Significance and Uses" and the first year subjects Discrete Mathematics (10.081), Mathematics I (10.001) — Algebra, and Higher Mathematics I (MATH1141) — Algebra. At second year level I have taught Multivariable Calculus (10.1113) and Complex Analysis (10.1114). At third year level, I have taught the ordinary level subjects Ordinary Differential Equations (10.1125), Differential Geometry (10.1522), and Foundations of Calculus (10.1128), and the higher level subjects Functional Analysis (10.122B), Higher Ordinary Differential Equations (10.1425), Topology and Differential Geometry of Surfaces (MATH3760), Calculus on Manifolds (MATH3770), and Geometry (MATH3780).

I have also presented fourth year courses at UNSW, on Lie Groups, on Groups of Isometries of Manifolds and Graphs, on Banach Algebras, on Wavelets, and on Fermat's Last Theorem; these were conceived and presented as introductions to mathematical research areas.

In Italy, I supervised the (4th year) theses of E. Mantero and M. Mazzarello. At UNSW, I supervised the (4th year) theses of M. Masuda, L. Walsh, A. Banner, A. Mah, T.M. Cao, A. Thomas and D. Harvey; I am currently supervising the project of R. McCallum.

Postgraduate Teaching and Supervision

I supervised the Ph.D. theses of Hendra Gunawan, Brian Dorofaeff, Wilfried Paus and Alessandro Veca (Milano; joint with S. Meda), and the M.Sc. theses of Adrian Banner and Oldrich Klima. I also supervised the M.Sc.Tech. thesis of Dimas Touma. I am currently supervising the Ph.D. theses of Abdul Alghofari, Ben Warhurst, and Keith Rogers.

I have taught a number of postgraduate courses in Italy, on Real Analysis, on Harmonic Analysis and on Representation Theory.

At UNSW, I organised a seminar "Analysis on the Sphere" for members of staff and graduate students; this ran in 2001 and 2002.

RESEARCH

Research Interests

My research is centred on Harmonic Analysis. This branch of Mathematics attempts to understand complex phenomena in terms of simpler phemonena. For instance, early astronomers who worked in terms of geocentric models of the universe observed that the planets moved around the heavens in a somewhat irregular fashion. Ptolemy of Alexandria is credited with the idea of resolving these complex motions into a sum of circular motions; I consider this attempt to be an early example of harmonic analysis. Another instructive example is musical; a violin and a flute sound different even when they are playing the "same" note. This is now explained by saying that a flute produces a "pure" (or harmonic-free) tone, while a violin produces a "complex" tone rich in "harmonics", which are resonances at frequencies which are multiples of the basic frequency. The characteristic timbre of an instrument is determined by the harmonics present in its sound, and by their relative intensities. One area in which I work, multiplier theory, can be explained in this model. Muting or damping an instrument alters the timbre by altering the relative intensities of the various harmonics. The fundamental tone may be reduced in intensity by 20% (say), while the first harmonic is reduced by 30%, the second by 40%, and the other harmonics are reduced by other factors. Multiplier theory examines the effect on the whole of multiplying each of the components by a given factor.

Another area in which I work, harmonic analysis on Lie groups, is a more recent development. For many years, Fourier analysts studied phenomena in space by resolving them into so-called plane waves, which are mathematically very simple objects, at least in a space which is the same in all directions and "flat", i.e., in which the laws of Euclidean geometry hold. Since Einstein's theory of general relativity, there has been much speculation that "space-time" is not flat, and various cosmological models are based on "curved space-time". Harmonic analysis on Lie groups attempts to describe in a "natural" way (in terms of the symmetries of the "space-time") the appropriate simple phenomena which are the building blocks for complex phenomena, and how to effect the analysis.

I spent one year working with the Investments Division of the AMP insurance company. Large financial institutions are faced with the problem of investing their funds in such a way as to maximise the returns and to minimise the risk. Asset allocation is a problem of stochastic optimisation; the returns on assets such as shares can not be foretold accurately, but they can be modelled probabilistically. For a given portfolio, the expected return and the risk can be calculated, and optimal portfolios are those which minimise risk for a given expected return. I designed and wrote an optimiser to do this. If one measures risk using the variance of a portfolio, this is straightforward; my contribution is to do this using "below target variance" (also known as "downside risk") as the measure of risk.

Research Grants

I have a well-established history of successful applications for competitively funded research grants. In Australia, my main source of funding has been the Australian Research Grants Scheme and its successor the Australian Research Council. I have been a Principal Investigator of thirteen A.R.G.S.–A.R.C. funded projects, which, together with my Senior Research Fellowship, have brought in about three million dollars.

International Contacts

I have been a "keynote speaker" at a number of international conferences, including the following, in the last five years:–

- I outlined the mathematical achievements of Alessandro Figà-Talamanca at the Conference to Celebrate his Sixtieth Birthday held in Ponza, Italy, in June 1998.
- I was one of the principal speakers at the Satellite Meeting of the International Congress of Mathematicians on Harmonic Analysis and Banach Space Theory, held at the University of Kiel in August 1998.
- I gave the Rubio de Francia Memorial Lecture at the *Universidad Autonóma de Madrid* in June 2000.
- I was one of the plenary speakers at the Indonesian National Mathematics Conference at the *Institut Teknologi Bandung* in July 2000.
- I was one of the principal speakers at the conference on Harmonic Analysis held at the *Accademia Nazionale dei Lincei* in May 2001.
- I was one of the plenary speakers at the Indonesian National Mathematics Conference at the University of Malang in July 2002.
- I was one of the principal speakers at the Satellite Meeting of the International Congress of Mathematicians on Harmonic Analysis held in Hangzhou, China, in August 2002.

I have held visiting appointments for one month or more at the universities of New South Wales (1981), Nancy I (1982), Heidelberg (1982), Chicago (1983 and 1996), Mathematical Sciences Research Institute (1988 and 1992), Genoa (many times), and Metz (1995), and at the Technion (1998).

I have given invited lectures, colloquia, seminars, and so forth, in universities and at mathematical meetings in Australia, Canada, Denmark, France, Germany, Indonesia, India, Israel, Italy, New Zealand, Poland, Singapore, Spain, Sweden, Switzerland, the United Kingdom and the United States of America.

PROFESSIONAL SERVICE

Service in my own University

Over the years, I have been involved with many aspects of academic administration. This began at the University of Genoa, where I was Director of the Mathematics Institute for the 1982–83 academic year.

At the University of New South Wales, my involvement with administration has been almost continuous. Here are some of the recent highlights of my activity:–

- I represented the School of Mathematics on the Faculty of Science Research Committee in 1989, 1990, 1995–97, and 2002.
- I represented the School of Mathematics on the Faculty of Science Professorial Promotion Committee in 1990, 1992, 1996, 2001 and 2002.
- I have been a member of the Academic Board since June 2000.
- I have been Head of the School of Mathematics since August 2002.

Conference organisation

I have organised a number of conferences, workshops and meetings; the most recent of these was a short international conference in June 2001 to celebrate Emeritus Professor George Szekeres' ninetieth birthday.

Editing, reviewing and refereeing

I was Editor of the *Bulletin of the Australian Mathematical Society* from July 1996, to July 2002. I am a (non-managing) editor of the *Journal of Lie Theory*.

I have written hundreds of reviews for *Mathematical Reviews* and *Zentralblatt für Mathematik*. My contribution includes reviews of six books.

I have refereed research grant proposals for governmental grant-giving bodies in Australia, Canada, Italy and the USA, and for Sydney University, Macquarie University, and Latrobe University.

I have refereed mathematical papers for the many journals, including *Acta Mathematica*, *Annals of Mathematics*, *Journal of the American Mathematical Society*, *Probability Theory and Related Fields*, and *SIAM Journal on Mathematical Analysis*.

Other service

I have been involved in selection, promotion and tenure evaluations in various ways. I have written many references for colleagues. On request of the University involved, I have refereed selection, promotion and tenure applications from countries around the world, including Italy, Switzerland, Singapore, Malaysia, Bahrain, Brunei, the U.S.A., and Australia.

I have served as an examiner for M.Sc. and Ph.D. theses in Switzerland, India, Italy and Australia, and for a *Habilitationsschrift* from Germany.

I was a member of the Examination Committee in Higher School Certificate Mathematics in New South Wales from 1994 to 1998, and chaired the Committee in 1995–98.

I have given talks and advised potential students about University courses at UNSW Open Days and Courses and Careers Days.

I am a member of the American and Australian Mathematical Societies, and of the *Unione Matematica Italiana*.

I was a member of the Australian Academy of Science Sectional Committee, whose rôle is to propose new fellows of the Academy, during 1996–99, and chaired this committee in 1998 and 1999.

I have served on the Council of the Australian Mathematical Society from 1996, and am currently Vice-President of the Society.