

**PERSONAL DETAILS AND CONDENSED CV, PREPARED IN CONJUNCTION WITH
MAKING OF AN AUDIO INTERVIEW WITH RACHEL CHIDLOW 21/08/2015**



ATTENTION: Rachel Chidlow, Science and Engineering Library Manager, The University of Auckland. (edited from an earlier draft.) 03/09/2015,

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Current Positions: Professor of Civil Engineering Emeritus, University of Auckland.
Honorary Professor of Civil Engineering, University of Sydney.

Date of Birth: 21st March 1934.

Place of Birth: Palmerston North, New Zealand.

Marital Status: Widower. My wife was taken ill soon after we retired to Sydney in 2001 to be near our family, and died in 2003.

Family: Three sons, two daughters-in-law, five grandchildren.

CURRICULUM VITAE- Emeritus Prof. P. G. Lowe. (condensed profile.)

Schooling:

- 1947- P.N. Boys' High School. University National Scholarship, 1951
- 1945- Intermediate School, PN.
- 1939- College St, Palmerston North.

Interests: 1940- Cubs and Scouts , Patrol leader; Cycled PN - Taupo - Auckland & return via New Plymouth, in school holiday with two friends.

Degrees: 1964 Master of Arts, University of Cambridge.
 1963 Doctor of Philosophy, Birkbeck College, University of London (Mathematics). Studied part-time while in full-time employment. Birkbeck is the only division of London University devoted to part-time study.
 1958 Master of Engineering Science, University of Sydney. (*I was the first foreign graduate student to hold a University of Sydney, Research Studentship in Civil Engineering.*)
 1956 Bachelor of Engineering, First Class Honours, University of New Zealand.
 1952- University of Auckland, Civil Engineering, College Prize shared(1954)

Professional: 1994 Council, Standards New Zealand, two terms, Ministerial Appointment.
 1993 Fellow, Institution of Engineers, Australia, transfer from Member.
 198x Coopted to IPENZ Council - precise dates not available.
 1979 Fellow, Institution of Professional Engineers, N.Z. Transfer from Member.
 1978 Editorial Board, International Journal of Mechanical Sciences, Oxford.- 2006
 1964- Member of Institution of Civil Engineers, London; Member, N.Z. Institution of Engineers.; Member American Mathematical Society; Life Fellow of the Cambridge Philosophical Society.
 1963- Member London Mathematical Society.

Employment: 2004- Appointed an Honorary Professor of Civil Engineering, School of Civil Engineering, University of Sydney.
 2001 Retired, as Emeritus Professor, University of Auckland.
 1986- Head of Department of Civil Engineering, University of Auckland.
 1981 Personal Chair of Civil Engineering, University of Auckland.
 1977- Professor of Structural Engineering, University of Strathclyde, Glasgow, Scotland. Chairman of University of Strathclyde Library Committee during the planning and move phase to an enlarged Library complex.
 1964- Fellow of Clare College, Cambridge. Subsequently Fellow responsible for Amalgamated Clubs (both sporting and cultural), Supervisor (of degree studies), Tutor and Fellows' Librarian (the original library with it's priceless collection of early science, mathematics and arts books.)
 1963- University Lecturer in Engineering, University of Cambridge, U.K. Supervised several Ph.D.s, most notably Robert E. Melchers' Ph.D, and with whom I later collaborated on a series of journal papers, see below under Publications. (He is Professor of Civil Engineering in University of Newcastle , Australia, and is a former HoD.)
 1962 Engineering Calculation Analyst, Ferranti Ltd., Computer Centre, London. Ferranti were Manchester based electrical engineers who built 'Pegasus', one of the earliest commercial general purpose digital computers, being the commercial version of the Manchester University Mark 1, on which Alan Turing worked, assisting the engineers, Profs Williams and Kilburn.
 1960- Section Engineer, Mitchell Construction Company, Peterborough, UK, on site at the Loch Awe Hydroelectric Scheme, North of Scotland Hydroelectric Board, Argyll, Scotland. (This site was part of the last major hydroelectric scheme built

- in Scotland. This included the substantial Cruachan pumped storage hydro station.)
- 1958- Design Engineer, Ove Arup and Partners, London, Consulting Engineers. multi-story construction and some early stages of Sydney Opera House, there associated with Ronald Jenkins, at that stage the partner in-charge.
- 1956- St Andrews College, University of Sydney. Member of High Table.
- 1955- Design Engineer, Gray, Watts and Beca, Auckland, Consulting Engineers. Today, the Beca Group, is the largest NZ based consulting engineering practice.

PUBLICATIONS: This is a summary of principal publications. *Publications completed since retiring to Sydney, and being associated with the School of Civil Engineering, are shown in Bold.*

- Books:**
- 2005** *Basic Principles of Plates and Slabs*, p.248, **Whittles Publishing, Scotland.** (This is essentially an enlarged, 2nd edition of the next item.)
 - 1982 *Basic Principles of Plate Theory*, p.180, Surrey University Press, Blackie, Glasgow.
 - 1971 *Classical Theory of Structures*, p.215, Cambridge University Press, Cambridge, UK.
 - 1964 V. V. Novozhilov, 2nd English edition, *Thin Shell Theory*, p. 417 Noordhoff, Holland.
 - 1959 My translation from Russian of V.V. Novozhilov's, *Theory of Thin Shells*, p.376. Noordhoff, Holland. 1st English Edition, completed while I was a graduate student in Sydney. (I donated my Royalties from this publication to the Auckland University College, Engineering Library.)

Chapters in Books:

- 2002** *Composite materials in concrete construction*, in the book of same title, eds. **R. K. Dhir et al, Thomas Telford, London.**
- 2002** *Engineering and Education*, in **New Approaches to Structural Mechanics...**- eds: **H. R. Drew and S. Pellegrino, Kluwer Academic, Dordrecht, Holland.**
- 1999 *Steel/Concrete composites- an up-date on the externally reinforced option*, in Innovation in Concrete Structures- eds. R. K. Dhir et al. Telford, London.
- 1997 *Externally reinforced Concrete Composites*, in Advances in Concrete Technology, Ed. V.M. Malhotra, American Concrete Institute, SP 171.
- 1993 *Externally reinforced concrete: a re-think of steel/concrete composites*, in Concrete 2000- eds. R. K. Dhir et al., Spon, London.

Principal Papers:

The papers cited below are selected from a career total of c.50+ papers, mostly single authored. The selection is arranged in **groups**. The first research topic I became involved in on joining the Cambridge Faculty was a study of the fundamental strength properties of concrete. This started as an experimental study and required the construction of a triaxial cylinder, similar in principle to the types of triaxial cells used in geomechanics but capable of resisting far higher pressures. These studies have resurfaced more than once in the intervening years. A typical reference is noted below. There are many theoretical papers dealing with **plate bending optimization**. This was a current vigorous research topic at the time. There is a group of papers dealing with **timber engineering**, a topic of particular relevance in New Zealand and Australia. Since the late 1980's motivation has been to study **external reinforcement** as a means to achieve simpler and safer structures. This structural material is a very strong and ductile composite of steel and concrete, for general purpose use, as an alternative to conventional steelwork or reinforced concrete. The technology has special relevance for repair and strengthening of damaged structures, such

as following an earthquake. Another group of papers deals with, particularly, biographical studies of early engineers. Yet more recently some studies have focused on the **recycling** potential of what would otherwise be waste materials, for use in construction. The particular material studied has been a lightweight concrete made using paper as an aggregate. These studies were underway when I retired. I have not had the opportunity to further them since retirement. I remain confident that there is good scope to produce price competitive, lightweight and highly ductile semi-loadbearing components especially for domestic construction. If there was scope, I would remain interested in continuing the development process in the laboratories in the School of Civil Engineering at Sydney University. There are time overlaps between the various groups.

2004 *Challenges for building construction*, I. E. Aust., **Aust. J. of Structural Engineering**, **5**, 145-151. Proposals for changes in the technology following the exposure of major defects in the Twin Towers building fabric.

2002 *Some Aspects of Australasian Academic Engineering: from Rankine to Southwell*, I.E.Aust. **Trans. of Multi-disciplinary Engineering**, **GE 26**, 57-64

1990's The **major theme in my research during the decade of the 1990's** was the study of the features and prospects for **Externally Reinforced Concrete**. Many papers were written and experimental work undertaken, some of this with support direct from Industry. Two patents were filed and granted.

1994 *Conjectures relating to rigid-plastic plate bending*, (with J. D. Allen and I. F. Collins), Phil. Trans. Roy. Soc., London, A **347**, 113, and several other related papers, mainly in Int. Journal of Mechanical Sciences, and conference papers, over a twenty year period. This theoretical approach was first outlined in the 1970's.

1992 *Externally reinforced concrete – a new steel/concrete composite*, Trans. IPENZ, **19**, 1/CE, 42. **Prize winning paper**. See also under Prizes. There are many other related papers and book chapters on this general topic, which has been studied continuously for about twenty years and continues to be elaborated and refined.

1990's Historical essays, commissioned by the Editor-in-Chief, Dictionary of New Zealand Biography. This is a recently completed prestige five volume work published by the N.Z. Department of Internal Affairs. My essays all dealt with subjects who were engineers in earlier times in New Zealand. There are essays of mine in all five volumes, totalling eleven essays in all.

1980's When we as a family made the change to Auckland in 1981, the first of the steps were being taken to implement the policies associated with the Thatcher/Reagan, Big Bang/Deregulation era. The civic universities, in Scotland in particular, were earmarked for staff reductions and austerity. New Zealand was soon plunged into the Muldoon pay freeze period. The topics being researched in the Dept. of Civil Engineering were quite different from my then particular research interests. The newly established emphasis on timber engineering seemed the best fit for my involvement. Timber Engineering was added to my active interests. I brought with me my concrete triaxial equipment. The IPENZ annual conferences of the period were the most productive of the venues for reporting research results. The text *Basic principles of Plate Theory* was completed and was published in 1982. The Timber Engineering Research Fellowship, which was wholly financed from Industry, particularly by NZ Forest Products through their Technical Director, the late David Fowlds Hon. M.E.,

had been negotiated by late Professor P. W. Taylor and Dr. A. H. Bryant, and was a particularly successful venture.

1977- Chair of Structural Engineering, University of Strathclyde, Glasgow, Scotland was a big change in focus, from the dual role of being a College Fellow and Faculty member in the Cambridge environment, to being one of three professors in a civic, Scottish university department. The student body now was drawn from local schools and colleges and with a bias towards science and engineering. The city of Glasgow had been a world centre for ship building and railway locomotive production, and both of these industries were declining rapidly in importance. In the field of civil engineering, Glasgow and Scotland generally had a proud and continuing presence. I found the environment invigorating and conducive to teaching and research. This period was also an ideal opportunity to be drawn into the realm of historical study of engineering and the sciences in general. For me the key historical figure was, and is, W. J. M. Rankine (1820-1872). He spent the bulk of his adult years occupying the Regius Chair of Civil Engineering at Glasgow University. He was the most prolific academic engineer of his era. The bulk of my first *Basic Principles* ..text book was written in Glasgow, seated at my home-made large desk, in the evenings.

1970- A series of papers dealing with timber engineering in New Zealand. A more fundamental series of papers dealt with the solution of plate bending mechanics problems by the use of **Isoperimetric Inequalities** to obtain **Lower Bound** estimates of Collapse Loads. Development of this topic was the main novelty in my 1982 book, *Basic Principles of Plate Theory*. This book was largely completed while I occupied the Structural Engineering Chair at University of Strathclyde in Glasgow in the late 1970's.

1963- A series of papers on Optimal (Minimum Weight) Theory of structures for a wide range of plate bending problems. Several of this group of papers were co-authored with R. E. Melchers (see above). The first papers appeared while he was my graduate student in Cambridge, UK. For some years he has been Professor, and is a former HoD, at The University of Newcastle, NSW. Most of the joint papers were published in the Journal of Mechanical Sciences, the first of which is I.J.Mech.Sc, **14**,311 (1972).

1958- I was in full-time employment on site and in a computing bureau within the computer manufacturer, Ferranti Ltd. for the first four years of the decade. During all of this time I was a part-time Ph.D. graduate student in the mathematics department at Birkbeck College, London University. I graduated Ph.D. in 1964. Arising from the thesis, papers relating to the theory of plate bending from my Ph.D. thesis were written in collaboration with my supervisor, Prof R.W. Tiffen, and were published in the Journal and the Proceedings of the London Mathematical Society. Appointed to Cambridge University Engineering Faculty in September 1963.

Professionally related projects and papers participated in while associated with the School of Civil Engineering, University of Sydney. 2004-2015

2013 Discussions with Laing-O'Rourke , Engineering Excellence Group, Sydney

2009 'Queen's Wharf International Design Competition', Auckland, New Zealand. *Entry in design competition associated with 2011 Rugby World Cup competition. It formed part of the display of entries included on the Competition Web Site.*

- 2006 A Proposed Use for Externally Reinforced Concrete. Prepared for Bluescope Lysaght Division, Chester Hill , NSW 2162.
- 2006 **In partnership with P.W.B. Myers, practising architect, Entry No:3466 to the Hobart Waterfront International Design Competition. (Closed 1st December 2006)**
- 2006 *Sydney Passenger Transport Infrastructure – The Future, Part Zero, with P. W. B. Myers., p. 12, Infrastructure Studies, Sydney.* This series continues.
- 2005 **In partnership with P.W.B. Myers, Entry No: 70081 in the East Darling Harbour International Design Competition. (Closed August 2005).** Later studies have built on the basic concepts outlined in this competition entry. The most relevant of these is the item preceding this one - the Part Zero of the Infrastructure Studies series.

- Prizes:**
- 1993 **Freyssinet** Structural Engineering Award, The IPENZ structural concrete technology award.
 - 1992 The **Fulton-Downer Gold Medal.** IPENZ' **premier technical** Award.
 - 1991 **Goodman-Fielder-Wattie Book Award,** (shared), N.Z.'s premier literary prize at that time, for the *Dictionary of New Zealand Biography*, vol.1. Essays contributed to all five volumes of the Dictionary. *The volumes were published at intervals over a ten year period through the Department of Internal Affairs*

- Patents:**
- 1993- Australian and New Zealand Patents relating to the construction method described as 'Externally Reinforced Concrete': Aust No: 629887, NZ No: 227555.

Personal and family interests and circumstances:

Many interests were shared with my late wife and family, including history, early furniture, ceramics, car club - Aston Martin, and a book collection with special interest in early science and engineering. NZ items include Maori language and pre Treaty materials. I benefitted from woodwork and metalwork classes at Intermediate School in the 1940's. I have made all the beds used by my immediate family, and other items of furniture including a large, demountable desk on which all of my books have been written. Over the years the bookcases for the growing book collection have resulted in making about 100m of multi-level, adjustable shelving bookcases, shared with the family.

An important segment of my younger years was the duration during WW2 when my farther was in the 2nd NZEF, from 1939 till 1946, serving in Egypt and Italy. My elder brother and I were cared for by my mother on her own. The family finances were very tight. She had trained as a nurse in Edinburgh in the 1920's before emigrating to NZ. My parents met as a result of the 1931 Napier Earthquake when nurses from P.N. hospital were moved to Napier, short term, to fill the gaps left in staff numbers when the Nurses Home collapsed and killed many of the night shift.. Our paternal grandfather was the important male influence on us boys during those years. He was a farmer with a modest dairy farm about 30 km from Palmerston North. Circumstances combined such that he constructed the family home from insitu, lightweight, insitu concrete using beach scoria as the aggregate. This structure was erected in the 1920's and still serves as the residence on the farm. Many items of equipment and fixtures he constructed as needed, using the forge he had constructed and that found regular use.

Appendix. Further List of Contributions including those associated with the School of Civil Engineering, University of Sydney 2002-2015. Reviews of papers for journals and book reviews are excluded.

This appendix includes a list of the publications and activities undertaken by the author during the period 2004 - 2015. For this period I have held a post as Honorary Professor of Civil Engineering in the School of Civil Engineering, University of Sydney. These publications and submissions include the following:

2015 Five additional Parts, 6 - 11, in various stages of preparation. Included are further studies of Externally Reinforced Concrete, and further Engineering Heritage papers.

2013: Sydney Infrastructure - the Future - Part Five - Christchurch (NZ) Earthquake of A February 2011 - a Discussion . This E/Q had some very unusual and most damaging aspects. This paper proposes a possible mechanism to explain the very high vertical components of the ground motion. Infrastructure Studies, Sydney, 1013.

2010: Revision of 'Sydney Infrastructure - the Future. Part one - Energy and Water, Infrastructure Studies , Sydney, 2007'. *Renewable energy sources are a current and future priority for the whole community, both locally and nationally. The content of this study examines a novel means for achieving large-scale generation of renewable energy, additional to the schemes under discussion elsewhere.*

2010: Submission to the University of Sydney on the Green Paper following the invitation to graduates to make submission's on the future structure and functioning of the University.

2010: Revision of 'Sydney Passenger Transport Infrastructure. Part Zero - Introduction, Infrastructure Studies, Sydney, 2005.' *Provision of additional public transport capacity in the Greater Sydney Region is a primary need for the future growth and prosperity of the City. Most agencies who express an interest in this topic ignore the Underground rail option as being impractical. In this revised study the case for standard gauge, small diameter tunnel, underground rail systems suitable for Sydney is further extended.*

2009: 'Queen's Wharf International Design Competition', Auckland, New Zealand. *An entry into the design competition, associated with the 2011 Rugby World Cup competition. It formed part of the display of entries included on the Competition Web Site.*

2009: 'Engineering Archive - Preservation and Prospects', 3rd Australasian Engineering Heritage Conference, Dunedin, New Zealand, published by IPENZ as a CD. Also available, unillustrated, as part 4 of Infrastructure Studies, Sydney. *This paper is a 15 thousand word essay dealing with a series of engineering heritage issues and includes suggested educational initiatives.*

2008: 'Where to from here?' Magazine of Concrete Research, **60**, p.569-574, Thomas Telford Ltd., London. *This paper continues the theme, started a considerable time ago, of future scenarios for concrete construction and was contributed to a Festschrift meeting for a Cambridge colleague, Dr. C. T. Morley.*

2008: 'Sydney Infrastructure - the Future Part Three - Building Construction in a carbon constrained environment, Infrastructure Studies, Sydney'. *A theme that I have been concerned with for two decades has been innovation in building construction. This study is a further contribution to this topic in which the global warming implications of the technology are considered.*

2008: 'Sydney Infrastructure - the Future Part Two - Building Materials. The prospects in a carbon constrained future, Infrastructure Studies, Sydney'. *Here the global warming aspects of the sourcing of building materials are considered. In particular, the use of waste materials in new permanent construction, and especially domestic construction, are considered.*

2007: 'Sydney Infrastructure - The Future Part One - Energy and Water, Infrastructure Studies, Sydney'. *This is an outline study of a novel means to supplement Sydney's electrical energy supply from a renewable source, while at the same time strengthening aspects of the city's water supply. If the technology is successful there could be scope to supply a substantial part of the Sydney region electrical power requirements.*

2006: Entry (with P.W.B. Myers, architect) into 'Hobart Waterfront International Design Competition'. *Our entry emphasized the scope to achieve enhanced passenger rail transport services in Tasmania, and in particular the service between Hobart and Launceston.*

2006: Productivity Commission Inquiry Report No: 41 - Road and Rail Freight Infrastructure Pricing. Australian Government. *I made a submission and attended a hearing of the Commission.*

2005: Monograph: 'Basic Principles of Plates and Slabs', Whittles Publishing, Caithness, Scotland, pp 248. *This is an expanded and updated edition of my 1982 book of somewhat similar title. Both theory and construction method are considered. It is not an exhaustive study of the subject and hence the description 'Basic...' in the title. Much of the content is novel and is put forward to seek to influence the future shape of the relevant parts of the building and construction sector. The book is not a textbook in the usual sense but could be self-studied if the material is not studied in class. The need to consider the future shape of the sector is highlighted by the technical limitations of the Twin Towers. Such a discussion has still to occur.*

2005: (with P.W.B. Myers) 'Sydney Passenger Transport Infrastructure - the future. Part Zero-Introduction. Infrastructure Studies, Sydney'. *This study is a follow-up to the EDH Design Competition entry 70081 (see next item, below). It is also the initial Part of a series of publications in which Infrastructure relating to public transport, building, energy, global warming and other issues are discussed from a viewpoint different from that conventionally adopted.*

2005: (with P.W.B. Myers) Entry No 70081 in 'East Darling Harbour International Design Competition, City of Sydney.' *This was one of the 137 valid entries received for this widely discussed design competition. Though not a successful entry in competition terms, there are respects in which the emphasis adopted in our entry may yet produce some changes to the plans for the redevelopment of this most important City of Sydney owned site.*

2004: 'Challenges for Building Construction', Australian J. of Structural Engineering, **5**, 145 - 151, The Institution of Engineers Australia. *This paper follows on from several earlier papers in which innovation in building construction is discussed.*

2004: 'Theory, Practice and Engineering Heritage' Australian Journal of Multi-Disciplinary Engineering, **2**, p.73 - 81, The Institution of Engineers Australia. *This paper follows on from several earlier Engineering Heritage related papers.*

2002: 'Some Aspects of Australasian Academic Engineering - from Rankine to Southwell', Transactions of Multi-Disciplinary Engineering, **GE 26**, p. 57-64, The Institution of Engineers Australia. *Engineering heritage has been a longstanding interest that continues to interest and motivate me.*

2002: 'Engineering and Education', a paper in 'New Approaches to Structural Mechanics, Shells and Biological Structures' Editors: H.R.Drew and S. Pellegrino, Kluwer, Dordrecht, The Netherlands, p.165 - 174. *This volume contains papers assembled to mark the considerable distinction that Professor C. R. Calladine FRS has brought to these several fields of engineering mechanics, on the occasion of his retirement from his post in the Engineering Department at Cambridge University.*