

ROBERT WILLIAM FITZPATRICK

PERSONAL PARTICULARS

Citizenship: Australian
Birth date: 2nd January 1948
Permanent address: CSIRO Land and Water. Private Bag No.2 GLEN OSMOND, SA, 5064
Marital Status: Married, wife (Alison Anne)
Two Children: Matthew James: d.o.b 20/04/1977. Bruce Robert d.o.b 28/08/1979.

SUMMARY

Professor Rob Fitzpatrick holds a joint appointment as Chief Research Scientist in CSIRO and Professorial Fellow at both Flinders University and The University of Adelaide. He is Director of the Centre for Australian Forensic Soil Science (CAFSS). He is also Director of the joint University of Adelaide/CSIRO Acid Sulfate Soil Centre (ASSC). He is a Fellow of the Australian Academy of Technological Sciences and Engineering (FTSE), Certified Professional Soil Scientist (CPSS) - Grade 3 Leading Professional (highest grade).

His career has focused primarily on the interface of soil science (pedology), geology (regolith science), mineralogy, biogeochemistry, forensic science, mineral exploration and climate change as applied to:

- Landscape processes.
- Advanced techniques to characterize, map, monitor and manage soil-regolith systems.
- Criminal and environmental forensic techniques for soils and regolith.

He has over 40 years experience in leading major multi-disciplinary research projects; conducted over 250 specialised soil-regolith investigations and surveys, covering a wide range of regions and climates worldwide.

- Co-edited six books and is author of over 500 scientific publications
- Career citations of 2560, with 13 papers each exceeding 20 citations.
- Invited keynote speaker at over 75 international and national conferences.
- 16 PhD, 8 MSc and 8 honours students supervised.

AWARDS

- Sir Joseph Verco Medal, Royal Society of South Australia for Scientific Excellence in Science, 1999
- The Prescott Medal of Soil Science, Australian Society of Soil Science, outstanding contribution to Science, 1998
- Gold medal, Chinese Academy of Sciences for distinguished contributions to science in China, 1997.
- Fellow, Australian Academy of Technological Sciences and Engineering, 2008
- Fellow, Soil Science Society of America, 2010
- Honorary Fellow, Soil Science Society of Southern Africa, 2009
- Strategic Excellence for Service from Science, CSIRO Land and Water 2008.
- Outstanding Scientific Achievement Team Award, CRC Landscape Environments & Mineral Exploration 2007.

PROFESSIONAL ACCREDITATIONS

- Certified Professional Soil Scientist (CPSS), Leading Professional - Grade 3 (highest grade), 1997-present
- 4th Harald Jensen Oration Lecture – Australian Society of Soil Science, New South Wales Branch, 2008.
"The Weight of the World on the Shoulders of Soil Science: Amazing new linkages between soil, water quality, extreme drought conditions and criminal investigations".
- 18th Professor GW Leeper Memorial Lecture – Australian Society of Soil Science, Victorian Branch, 2009.
"Soil Science and the role of pedotechnology in solving forensic, water quality, polluted soil, mineral exploration and engineering problems".

CURRENT APPOINTMENTS

- **Chief Research Scientist:** CSIRO Land and Water, Adelaide, 2003-present
- **Professor:** Department of Chemistry and Forensic Science, Flinders University, 2007-present
- **Director:** Centre for Australian Forensic Soil Science (CAFSS), 2004-present
- **Professor:** School of Earth & Environmental Sciences, Univ. of Adelaide, 2002-present
- **Director:** Acid Sulfate Soil Centre (ASSC), 2011–present
- **Team Leader:** Forensic Soil Science, 2004– present
- **Team Leader:** Acid Sulfate Soils, Soil Biogeochemistry, 2006-present

PREVIOUS APPOINTMENTS

- Chemical Technician: 1966-1966, Anglo American Diamond Research Laboratory, South Africa (RSA)
- Professional Officer (Soil Scientist): 1971-1972, Soil & Irrigation Research Institute (SIRI), Pretoria.
- Senior Professional Officer (Soil Scientist): 1973-1977, SIRI, Pietermaritzburg, Natal, RSA
- Chief Professional Officer: 1977-1979, SIRI, Pietermaritzburg, RSA
- Head of Soil Mineralogy Section: 1979-1982, SIRI, Pretoria, RSA
- Research Scientist (Soil Scientist): 1983, CSIRO Division of Soils, Brisbane, Australia
- Senior Research Scientist: 1984-1987, CSIRO Division of Soils, Adelaide, Australia
- Principal Research Scientist: 1988-1992, CSIRO Division of Soils, Adelaide
- Senior Principal Research Scientist: 1992-2003, CSIRO Land and Water (CLW), Adelaide.
- Stream Leader: CSIRO, CLW, Advanced Analytical Techniques in Biogeochemistry (2005-2009)
- Group Leader: CSIRO, CLW Soil Biogeochemistry (2006-2010)
- Project Leader: CRC for Landscape Environments & Mineral Exploration (1999-2008)
- Head of Pedology Section: 1987-1989, CSIRO Division of Soils, Adelaide.
- Project Leader: 1989-1996, Soil & Landscape Processes affecting Dryland Salinity and Waterlogging
- Project Leader: 1996-1999, Soil Processes and Indicators for Land Management & Mineral Exploration
- Research Group Leader: 2000-2002, Soil & water processes in acid sulfate, salt-affected environments.
- Project Leader: 2002-2003, Acid sulfate and saline soils.
- Quality Assurance Consultant: 1995-1998, The Soil Survey for the State of Kuwait
- Sub-program Leader: 1991-1993, Cooperative Research Centre (CRC) for Soil & Land Management
- Project Leader: 1993-1998, Cooperative Research Centre (CRC) for Soil & Land Management
- Project Leader: 1999-2001, CRC for Landscape Evolution & Mineral Exploration (LEME 1)
- Project Leader: 2001-2002, CRC for Landscape Environments & Mineral Exploration (LEME 2)
- Executive committee: 2001-2002, CRC for Landscape Environments & Mineral Exploration (LEME)
- Affiliate Senior Lecturer: 1992-2001, Department of Soil & Water, University of Adelaide

DIPLOMAS, DEGREES and THESES

- **National Diploma for Chemical Technicians** (Part 1), 1966
- **Mine Assayer's Certificate of Competency** (Part A), 1970
- **BSc. (Agric.)**, 1972, Soil Science (First Class pass) and Chemistry, University of Natal, Pietermaritzburg. Inorganic and Analytical Chemistry BSc (Hons).
- **MSc (Agric.)**, 1974, University of Natal, Pietermaritzburg. Thesis "Mineralo-chemical studies on soils and related material from pedosystems in the Southeastern Transvaal"
- **PhD**, 1978, University of Natal, Thesis title: "Occurrence and properties of iron and titanium oxides in soils along the eastern seaboard of South Africa"

EDITORIAL BOARDS/EDITOR

- **Associate Editor**, Soil Systems *TheScientificWorldJOURNAL* - ISSN 1532-2246, 2001-present
- **Associate Editor**: Applied Clay Science, 1983-1997
- **Associate Editor**: CATENA, 1988-1995
- **Associate Editor**: Transactions of Royal Society of South Australia, 2000-present
- **Co-editor**: Proceedings 10th International Clay Conference, Adelaide, 1993-1995
- **Editor**: Proceedings 1st International Workshop on Criminal and Environmental Forensics, 2006
- **Co-editor**: Regolith 2006: Consolidation and Dispersion of Ideas. CRC LEME, Perth. 355pp
- **Co-editor**: Inland Acid Sulfate Soils, 2008-2009
- **Co-editor**: Soils of South Australia, 2004-present

CURRENT PROFESSIONAL AFFILIATIONS AND ACTIVE POSITIONS

- **Vice Chair**: International Union of Geological Sciences (IUGS), Initiative on Forensic Geology 2011-present
- **Foundation member**: National Committee for Acid Sulfate Soils (NatCASS), 2005-present
- **Committee Member**: Royal Society of South Australia, 2007-present
- **Fellow**: Royal Society of South Australia, 1987- present
- **Awards Committee**: Royal Society of South Australia, 2000-present
- **Member**: Soil Science Society of America, 1978-present; **Fellow**, 2010
- **Member**: American Society of Agronomy, 1978-present
- **Life Member**: International Union of Soil Science, 1971-, 1983- Life Member

- **Life Member:** International Association for the Study of Clays (AIPEA), 1975-Member, 1984-
- **Honorary Fellow,** Soil Science Society of Southern Africa, 1971-2008; Honorary Fellow, 2009-
- **Life Member:** South African Society for Quaternary Research, 1974-; Life Member, 1983-
- **Member:** Australian Society of Soil Science, 1983- present
- **Member:** British Society of Soil Science, 1977- present
- **Member:** Australian Clay Minerals Society, 1983- present
- **Member:** Australian Soil and Plant Analysis Council (ASPAC), 1996- present
- **Member:** The Australian and New Zealand Forensic Science Society (ANZFSS), 2000-present

FORMER PROFESSIONAL AFFILIATIONS AND POSITIONS HELD

- **Chair:** Commission C2.4 (Soil Mineralogy) International Union of Soil Sciences, 2002-2006
- **1st Vice Chair:** Commission 7 of the International Union of Soil Science, 1998-2002
- **President:** Royal Society of South Australia (2005-2006); Vice Pres, 2002-2004; 2007-2008
- **President:** Australian Clay Minerals Society (2002-2004), Vice President, 2005-2006
- **President:** Australian Society of Soil Science, South Australian Branch, 1998-2000
- **Steering Group Committee Member:** International Union of Geological Sciences, Commission on Geoscience for Environmental Management (IUGS-GEM) Working Group on Forensic Geology, 2009-2011
- **Chair:** 10th International Clay Conference, Adelaide, 1987-1993
- **Representative:** of the International Union of Soil Sciences (IUSS) on the “Geohazards Working Group” with members from the International Geographical Union (IGU), International Union of Geological Sciences (IUGS) and International Union of Geodesy & Geophysics (IUGG), 2007-2009
- **Member:** Soil Micromorphology Committee, Soil Science Society of America, 2005-2009
- **Member:** Soil Education Committee (K-12), Soil Science Society of America, 2005-2009
- **Reviewer:** Queensland Acid Sulfate Soils Program (for DNR & Mines, Queensland), 2007
- **Accreditation Board Member:** of Certified Professional Soil Scientists (CPSS), 1999-2004
- **Secretary:** Soil Science Society of Southern Africa, 1978-1981
- **Council member:** Australian Society of Soil Science, S.A Branch, 1985-1988; 2003-2009
- **Council member:** Mineralogical Association of South Africa, 1979-1982
- **Secretary:** Australian Clay Minerals Society, 1987-1993; 2008-2010
- **Member,** South African Soil Classification Working Group, 1979-1982
- **Research Review Committee:** Soil & Water Cons. Branch of S.A. Dept. Agric., 1988-1992
- **Assessment Panel,** Roseworthy Agricultural College Master of Applied Science, 1989
- **Advisory Committee:** Roseworthy Agricultural College Master of Appl. Sci., 1989-1992
- **Foundation member & member:** South Australian Dryland Salinity Committee, 1988-2003
- **Dryland Salinity Working Group:** Murray-Darling Basin Ministerial Council, 1989-1992
- **Science Advisory Council** CRC for Landscape Evolution & Mineral Exploration, 1996-1999
- **Scientific Advisory Committee:** Environment Australia’s Coastal Acid Sulfate Soils Program, 1999-2005
- **Steering Committee:** CRC for Landscape Evolution and Mineral Exploration, 2000-2001
- **Executive Committee:** CRC Landscape Environments & Mineral Exploration, 2001
- **Member:** The Australian Institute of Agricultural Science and Technology, 1997-2002
- **Member:** Geological Society of South Africa, 1975-2002
- **Member:** Mineralogical Association of South Africa, 1979-1990
- **Member:** International Confederation for Thermal Analysis, 1984-2003

SELECTED CLIENTS AND PROJECTS: INDUSTRIAL CONTRIBUTIONS

- State and Federal Police Departments across Australia (South Australia, NSW and Victoria): Conducted over 70 forensic investigations involving soil and geological materials, 2007-2011
- Soil Fertility Evaluation/Advisory Service in Negara Brunei Darussalam: An evaluation of Acid Sulfate Soils, development of a Soil Identification Key for Major Soil Types, 2006-2008
- Murray Darling Basin Commission, Several Consulting companies in South Australia: Conducted over 30 investigations involving Acid Sulfate Soils, 2007-2008
- State and Federal Police Departments across Australia (South Australia, NSW and Victoria): Conducted over 20 investigations of soils on clothing, shoes, boots, vehicles, shovels, mattocks, rakes, road-sides for homicide, abduction and sexual assault cases, 2004-2006

- South Australian Department of Water, Land and Biodiversity Conservation: An evaluation of the soils of Tilley Swamp and Morella Basin, South Australia, 2005
- South Australian Water Commission: Evaluation of floodplain soils along the Salt Interception Scheme pipeline corridor near Loxton, South Australia, 2005
- Australian Federal Police: Comparison of dinosaur nest materials from imported samples and samples provided by the Victorian and South Australian museums sourced from Henan Province, China, 2005
- Victorian Department of Sustainability and Environment: Forensic soil investigation of eight soil samples from Victoria and Tasmania, 2004
- Environment Protection Authority: Forensic soil investigation of dust samples from Adelaide Brighton Cement, and vehicles and adjacent soils, 2004
- U.S. Agency for International Development (USAID) contracted under the Development Alternatives, Inc. Water Indefinite Quantity Contract: The Iraq Marshlands Restoration Program on “Changes in soil and water characteristics of natural, drained and re-flooded soils in the Mesopotamian marshlands: Implications for land management planning.” 2004
- Harwood Andrews Lawyers for City of Greater Geelong, Victoria: Legal case involving application of sulfur and its likely effects on the soil and turf at Kardinia Park, 2003
- Rouse Hill Infrastructure Pty Ltd, salinity and acid sulfate soil investigations at second ponds creek, Sydney, NSW for housing purposes, 2002
- Southcorp Pty Ltd. Administrative Appeals Tribunal Court, Adelaide: Involving a boundary dispute in the Coonawarra District, South Australia, 2000-2001
- Pima Mining Pty Ltd; 2 Consultancies involving geochemistry and mineralogy of saline acid sulfate soil seepages for mineral exploration purposes, 2000
- Physical Investigation Branch: South Australian Police/ Federal Police; 4 consultancies homicide investigations: soil and mineral specimens on spades and boots, 2000-2002
- Torrens Catchment Board/University Of South Australia consulting spatial measurement and information group (SMIG) catchment indicators for the Upper Torrens, South Australia, 1999
- Kyndalyn Park Almonds Pty Ltd: Soil survey of Kyndalyn Park for horticulture: Victoria, 1999.
- Australian Defence Department/ DSTO: 7 consultancies involving the characterisation and mapping of soil properties at several Australian Defence Department landmine sites across Australia. 1997-2003
- BHP Australia. 5 Consultancies: Assessment of Soils on Waste-Rock Dumps for rehabilitation purposes: Bowen Basin, Queensland, 1995-2000
- Acer Vaughan Darwin Pty Ltd. 8 Consultancies: Assessment of Acid Sulfate Soils Near Darwin Harbour: Darwin, 1983-2000
- AACM International Pty Limited and KISR (Kuwait Institute of Scientific Research) Quality Assurance Consultant for “The Soil Survey for The State of Kuwait”, 1995 - 1999
- PPK Consultants. Assessment of Acid Sulfate Soils, Gillman MFP Australia Site, SA, 1992
- COMALCO. Mass Magnetic Susceptibility and Mineralogy of Weipa Kaolin, 1991
- Department of The Arts, Sport, The Environment, Tourism And Territories. Selection of suitable soil materials to cover the fossiliferous deposits on Norfolk Island, 1990
- Telecom Australia/ Telstra: 45 Consultancies: Inspections of Soils along the optical fibre cable routes across Australia, 1990-2001
- Lochiel Collieries Pty Ltd: Differential Thermal and Thermogravimetric Analysis coal ash, 1989
- Ranger Uranium Mines Pty Ltd: 6 Consultancies Assessment of Soils on Waste-Rock Dumps for rehabilitation purposes in NT, 1986-1992
- Anglo American Corporation: Jwaneng diamondiferous Kimberlite occurrence, Botswana, 1982
- Piet Retief Town Council: Lotzaba Forest Ltd: Soil Survey & Land use for Forestry, 1972-1979
- H.L. Hall & Sons, Ltd. Survey of Soils, Nelspruit area (Mataffin) for horticulture (RSA), 1971

SELECTED RESEARCH GRANTS

- Acid Sulfate Soil investigations in Murray Darling Basin, especially Lower Lakes region in South Australia: several grants: \$3.3 million (with Dr Paul Shand), 2009 – 2011
- Acid Sulfate Soils investigations in Murray Darling Basin, especially in Coorong, Lower Lakes and Murray Mouth; several grants: \$2.2 million (with Dr Paul Shand), 2007-2008
- Acid Sulfate Knowledge Project. NHT, Research grant, \$K350, 2005-2007
- Frontier Conflict Archaeological Sites Project, (with Assoc Prof Donald Pate and Dr Pamela Smith, Flinders University), Research grant, \$K65; 2005-2006
- Conference on Criminal & environmental soil forensics, ATSE/ DEST, grant \$K30; 2005-2006

- WA Wheat belt Drainage Acidic Groundwater geochemistry, CRC LEME, \$K250; 2004-2006
- Inland acid sulfate soils: distribution and regolith processes, CRC LEME, \$K150; 2004-2006
- National Atlas of Coastal Acid Sulfate Soils. NLWRA 2, Research grant, \$K40, 2004-2005
- Soil & water characteristics Mesopotamian marshlands, Iraq: USAID/ DAI, \$K80; 2004-2005
- Salinity mapping and management: Jamestown, NAP, \$K120, 2001-2003
- Geochemistry of Inland ASS/saline seepages, CSIRO Glass Earth LEME, \$K355; 2000-2003
- Biogeochemical/physical processes in saline soils, NDSP, Research grant, \$K190, 2000-2003
- Biogeochemical/physical processes of saline soils, NDSP, Research grant, \$K190; 2000-2003
- Viticultural Soils. GWRDC, Research grant (with Alfred Cass), \$K300; 1999-2003,
- Coastal Acid Sulfate Soils, CASSP, EA, Research grants, \$K950, 1999-2003
- Regional Water & Soil Assessment for Managing Sustainable Agriculture in China, ACIAR, (with David Jupp), Research grant, \$1.30 million, 1997-2002
- Sustainable agricultural systems, RIRDC (with Dr Reuter), Research grant, \$K70; 1999-2001
- Dundas Tablelands, Victoria: Murdock Trust/NAP/L&W Australia, \$K120; 2000-2003
- Soil Survey of Kuwait, Quality control consultant, AACM/ URS, Consulting, \$K78; 1996-1999
- GIS and remote sensing: waterlogging & salinity, EOC, Research grant, \$K54; 1996-1999
- Adelaide Hills/Woorndoo Landcare Group: Field book: NAP Research grant, \$K55; 1996-1998,
- Inspections of soils along the optical fibre cable routes in Australia, Telecom Australia/ Telstra: Research grants and 45 consultancies: \$1.2 million. 1990-2001

Total Value approximately \$50 million.

INVITATIONS AS GUEST SPEAKER TO INTERNATIONAL MEETINGS

- 5th Congress, International Association for the Study of Clays (AIPEA), Mexico City, July 1975.
- North of England Soils Discussion Group Meeting, Middleton on Teesdale, UK, 8-10 September 1975.
- British Society of Soil Science Autumn Meeting, Bangor, Wales, UK, 22-26 September 1975.
- 11th World Congress of Soil Science, Edmonton, Canada, 19 June -7 July 1978.
- 6th Congress of International Association for the Study of Clays (AIPEA), Oxford, UK, 10-14 July 1978.
- International Conference on "Soils with Variable Charge", Palmerston North, New Zealand, 11-18 February 1981.
- Research Fellowship, CSIRO Division of Soils, Adelaide, Australia. February-May 1981.
- 7th Congress, International Association for the Study of Clays (AIPEA), Bologna & Pavia, Italy, 6-12 Sept. 1981. Chairman Symposium: "Amorphous and ill-crystallized components of soils --".
- NATO Advanced Study Institute on "Iron in Soil and Clay Minerals" Bad Windsheim, Germany, July 1985.
- 8th Congress of International Association for the Study of Clays (AIPEA), Denver, USA, August 1985.
- International Conference on Agricultural Development in Pacific Islands in the 90's, Fiji, April, 1989.
- 28th International Geological Congress, Washington, USA (July 1989). Co-convener Symposium: "Biomineralization of Fe and Mn from Macro to Micro".
- 9th Congress, International Association for the Study of Clays (AIPEA), Strasbourg, France, September, 1989.
- Kuwait Institute of Scientific Research, Consultant to AACM International Pty Limited to initiate The Soil Survey for the State of Kuwait, 14-22 March, 1990.
- 14th World Congress of Soil Science, Kyoto, Japan, Invited presentation at the Symposium on: "Mineralogy, Classification and Management of Soils", August, 1990.
- 8th International Soil Correlation Meeting. Classification and Management of wet soils, Louisiana and Texas, USA). Invited paper presentation, October 7-20, 1990.
- American Society of Agronomy Annual meeting, San Antonio, Texas, USA (October 21-26, 1990).
- International Symposium on Strategies for Utilizing Salt Affected Lands, Bangkok, Thailand (Feb. 17-25 1992).
- Norfolk Island Consultant: Soil survey and establishment of a routine soil analysis laboratory" to identify suitable soils to replace the sandy soils overlying historical sites, 16-24 February, 1991.
- 4th International Symposium on Acid Sulphate Soils, Ho Chi Min City, Vietnam, March 2-10, 1992.
- 10th Congress of International Association for the Study of Clays (AIPEA), Adelaide, Australia, July 1993.
- 18th Soil Science Society of South Africa Congress at Potchefstroom, South Africa, 10-14 January, 1994.
- 7th International Rainwater Catchment Systems Conference: Beijing, China, June, 21-25, 1995.
- Research Fellowship (18 June - 18 July, 1995) People's Republic of China Chinese Academy of Sciences.
- "Soils and Environment" Freising, Germany, Deutsche Forschungsgemeinschaft (DFG), 20-23 November, 1995.
- Kuwait Institute of Scientific Research, Quality Assurance Consultant for the Soil Survey for the State of Kuwait for AACM International Pty Limited/ Dames & Moore, 16 May-7 June 1996.
- American Society of Agronomy/Soil Science Annual Conf. Indianapolis, Indiana, USA (Nov. 3-8, 1996).
- Ten Day Research Fellowship, People's Republic of China Funded by Australian Centre for International Agricultural Research (ACIAR), 11-21 November, 1996.
- Kuwait Institute of Scientific Research, Quality Assurance Consultant for the Soil Survey for the State of Kuwait for AACM International Pty Limited, 15 January- 2 February 1997.
- 11th Congress of International Association for the Study of Clays (AIPEA), Ottawa, Canada, 14-22 June, 1997.
- International Symposium on Soil Erosion and Dryland Farming, Xi'an, China, September 11-19 1997.
- Work shop on "Global Climate Change & Pedogenic Carbonates, Tunis, Tunisia, 13-17th October, 1997.
- Kuwait Institute of Scientific Research, Quality Assurance Consultant for the Soil Survey for the State of Kuwait for AACM International Pty Limited, 17-26 October 1997.

- 16th World Congress of Soil Science, **Montpellier, France**. Convenor symposium "Processes and patterns in spatial soil differentiation & horizonation", August 20-26, 1998.
- British Society of Soil Science Autumn Meeting, **Belfast, N. Ireland, UK**, 6-9 September 1998.
- Kuwait Institute of Scientific Research; Quality Assurance Consultant for the Soil Survey for the State of **Kuwait** for AACM International Pty Limited/ Dames & Moore, 18-25 September 1998.
- Chinese Academy of Science, Beijing and Nanpi research station **China**, October 10–19 1999.
- 6th International Meeting on Soils with Mediterranean Type of Climate (IMSMT), **Barcelona, Spain**. Convenor of symposia on "Paleopedology and Soil mineralogy". 1-5, July, 1999.
- Symposium on Rehabilitation of Grassland and Control of Desertification in Dry Areas" (RGCD) in **Guyuan City, Hebei Province, China**, 28 June– 4 July, 2000).
- 2nd Joint New Zealand Society of Soil Science and Australian Soils Conference 2000, **Lincoln University, New Zealand**, 3-8 December 2000.
- Chinese Academy of Science, **Beijing, China**, 29 March-10 April 2001.
- American Society of Agronomy/Soil Science Annual meeting, **Charlotte, North Carolina, USA**, October, 21-26, 2001. Keynote address "Advances in Soil classification in Australia".
- 12th International Soil Conservation Organisation Conference, **Beijing**, May 26-31, 2002.
- 17th World Congress of Soil Science, **Bangkok, Thailand**, August 14 - 21, 2002. Convenor Symposium on "Mineralogy and geochemistry of regolith".
- 5th International Acid Sulfate Soils Conference, **Tweed Heads, Australia** 25 to 30 August 2002. Invited keynote address: "Inland acid sulfate soils a big growth area".
- **Southern Iraq Marshlands and Basra, Iraq**: Soil-water consultant for The Iraq Marshlands Restoration Program funded by the U.S. Agency for International Development (USAID) contracted under the Development Alternatives, Inc. (DAI) Water Indefinite Quantity Contract (IQC). To investigate the Changes in soil and water characteristics of natural, drained and re-flooded soils in the Mesopotamian marshlands. February 2004.
- The Australian Institute of Building Surveyors (AIBS) keynote talk on "Acid Sulfate Soil properties, environmental hazards, risk mapping and policy development in South Australia". Whyalla, **South Australia**, March, 2004.
- International workshop and conference on "Clay Mineralogy & Geophysics for Environmental Management & Mineral Exploration" (ClayGEMME 2004): Chairman of organising committee in association with The Australian Clay Minerals Society (19th Biennial Conference), International Union of Soil Sciences Soil Mineralogy Commission of IUSS), The Australian Society of Exploration Geophysics (ASEG), The Australian Society of Soil Science, Incorporated (ASSSInc) and CRC for Landscape, Environments and Mineral Exploration (CRC LEME). **Adelaide, Australia**, September, 27-30 2004.
- American Society of Agronomy/Soil Science Annual Conf. **Seattle, USA, November, 1-4, USA** 2004. Keynote address at Symposium on "Education & Employment Opportunities in Pedology: Dying, Thriving, or Just Changing?" entitled "How pedology and mineralogy helped solve a double murder".
- International Salinity Forum, keynote address entitled "Global overview on Saline Inland Acid Soils" – **Riverside USA** April, 2005.
- 8th International Conference on the Biogeochemistry of Trace Elements (ICOBTE 2005), **Adelaide Convention Centre, South Australia**, 3-7 April 2005. Member of the Organising Committee.
- Joint tri-meeting of the Royal Society of South Australia, Field Geology Club of **South Australia** and Geological Society of Australia SA, entitled "Acid Sulfate Soils in the Garden of Eden: southern Iraq Marshlands", June 2005.
- Summer School, University of Lleida University 2005, invited lecturer: field study of soils in the La Cerdanya, Pyrenees, **Catalonia, northeast Spain**, July 2005.
- The Macaulay Institute, **Aberdeen, Scotland**, public talk at entitled "Soil properties as evidence in forensic investigations", August 2005.
- 20th Congress of the International Union of Crystallography, Keynote address at Microsymposium on Crystallography and Forensic Science, **Florence, Italy**, August 2005.
- 22nd International Geochemical Exploration Symposium, **Perth, WA** paper: Inland Acid Sulfate Soils – a new geochemical sampling medium, September 2005.
- 1st International Workshop on Criminal and Environmental Soil Forensics: A Post Symposium Workshop following the 18th International Symposium on the Forensic Sciences. **Fremantle, WA, Australia**. Chairman of Organising Committee; keynote address "Forensic Soil Science: An overview with reference to case investigations and challenges". April 2006
- 18th World Congress of Soil Science, **Philadelphia, USA**. Chairman of "Soil Mineralogy Commission", International Union of Soil Science (IUSS) organised and develop 3 symposia: (i) Soil Mineralogy and Geophysics for Environmental Management and Mineral Exploration, (ii) Poorly crystalline minerals in Soils (iii) Acid Sulfate Soils. Presented keynote paper at the Acid Sulfate Soils Symposium on "Mineralogy of inland ASS" and paper on the "National Atlas of Acid Soils", July 9-15, 2006.
- 17th Conference of The Southern African Society for Quaternary Research (SASQUA), 11-13 April 2007, Howick, KwaZulu-Natal **South Africa**. Keynote address: "Acid Sulfate Soils"; Public lecture: "Forensic Soil Science".
- 2nd International Conference on Criminal and Environmental Soil Forensics (ISF): Member, Organising Committee; keynote address "Forensic soil science: current research and case work activities in Australia. **Edinburgh Scotland, UK**, 30 October-1 November 2007.
- The Department of Agriculture of Negara **Brunei Darussalam**, Evaluation of Soil Fertility/Advisory Service to assist country's commitment to achieve a significant degree of food security. Field work in April 2007; May 2008.
- 6th International Acid Sulfate Soil Conference joint with the Acid Rock Drainage Symposium, Guangzhou, **PR China**. 15-19 September 2008.
- Combined Congress of the Soil Science, Crop Science, Horticulture and Weed science societies of South Africa: Stellenbosch, **South Africa**. Keynote address. 17-19 January 2009.
- 14th Congress of International Association for the Study of Clays (AIPEA), **Castellaneta Marina, Italy**. Keynote address on "Soil minerals in the environment, industry and the justice system". 14–20 June, 2009.
- International Conference on Soil Classification and Reclamation of Degraded Lands in Arid Environments (ICSC2010) **Abu Dhabi** Keynote address on "Demands on Soil Classification and Soil Survey Strategies: Special purpose soil classification systems for local practical use to understand, predict and solve practical problems". Appointed international reviewer of the Abu Dhabi Soil Survey, 17-19 May 2010.

- 19th World Congress of Soil Science: Soil Solutions for a Changing World, **Brisbane**, Australia. Convenor of Symposia: Urban Soils; Co-convenor of Symposia: Hydropedology and Micromorphology. August 1–6, 2010.
- 16th International Forensic Science Symposium, **INTERPOL General Secretariat, Lyon, France** Thematic session, “Environmental Crime” Forensic Soil Science: Support for Environmental Crime Investigations, 5-8 October 2010.
- 2010 International Annual Meetings of the Soil Science Society of America, **Long Beach California, USA**. Keynote speaker at two Symposia, 31 October-4 November, 2010.
- 3rd International Conference on Criminal and Environmental Soil Forensics, **Long Beach California**, 2 Nov, 2010.

SUMMARY OF PROFESSIONAL PUBLICATIONS

Author or co-author of:

- 74 Journal papers
- 4 Encyclopaedia Chapters
- 85 Book and Monograph Chapters
- 5 Books and manuals written
- 10 Editor: Books, Monographs and Conference proceedings
- 117 Conference proceedings papers
- 127 Consulting reports
- 150 Technical / End of Grant reports
- 154 Abstracts published from selected conferences, symposia, lectures and seminars
- 23 Non-technical papers, book reviews, parliamentary presentations, visual presentations.

Career citations: 2560; with 3 papers exceeding 100 citations; another 10 papers each exceeding 20 citations.

Professional Background and Capabilities

Land-use planning and capability

Initiated and undertaken over 250 specialised soil-regolith investigations and surveys for industry, mineral exploration companies, governments and the justice system (criminal and environmental soil forensic investigations), which required wide expertise in soils, regolith, landscapes, mineralogy and chemistry. Most of these have required strong collaboration between various scientists to focus on complex soil related problems associated with the following industries and issues:

- **Managing Soil damage to optic fiber cable networks.** Developed a special-purpose Soil Assessment Manual to minimise soil damage from shrink-swell soils and soil corrosion to the Australian telecommunication optic fibre cable network. Telstra engineers use the methodology he produced in installing its telecommunications network. Saved millions of dollars.
- **Managing Acid Sulfate Soils (ASS):** (See Website: <http://www.clw.csiro.au/acidsulfatesoils/index.html>). Achievements and impacts include:
 - Developing and leading the “Atlas of Australian Acid Sulfate Soils” program under the auspices of the National Committee for Acid Sulfate Soils.
 - A new technical soil classification and regional risk maps for ASS, which have led to best management principles, management options and new policies for several regulatory agencies.
 - Publication of the first ever book on inland ASS, establishing the importance, extent and severity of inland ASS in major regions in the world.
- **Mineral exploration.** He has demonstrated that inland ASS may contain anomalous concentrations of elements such as Cu, Pb, Zn, Se, As and Sr, and as such he successfully introduced and applied this as a new geochemical sampling medium for mineral exploration.
- **Draining saline soils.** A new system he developed has changed how land managers, policy makers, and teaching institutions view, monitor, and manage drained/disturbed saline soils
- **Land-use planning in catchments.** His method of displaying descriptive information on soils, hydrology, and best management practice along toposquences has opened new ways of communicating complex information with land managers. It has changed the management of saline and waterlogged soils in several high rainfall catchments in Australia.
- **Land-use planning of regions.** His development of a new generic GIS up-scaling approach for the broad-scale mapping of factors such as waterlogging, acidity, salinity and catchment health has been extended to several other regions in Australia.
- **Minesoils.** He developed a technical classification system for soils forming on waste-rock and spoil dumps at open-cut mining operations in Australia, based on management-related properties. The system has been used to develop proposals to modify the Australian Soil Classification and Soil Taxonomy.

- **Soils for Viticulture.** He developed and published a national system that identifies restricted soil layers affecting root growth. Researchers and grape growers have used it successfully to relate rootstock performance to soil properties, and deliver soil-specific packages for land development and soil management.
- **Forestry and water quality.** He developed and published strategies for evaluating soil types to improve commercial afforestation. New methods to ameliorate soils in reservoir catchments for Water Supply Authorities have been developed to overcome contaminants (dissolved organic carbon loads, salt, iron and manganese), and to plan land management.

Forensic Soil Science and Geology

- Founding director of the Centre for Australian Forensic Soil Science (CAFSS), which is a national and international body that combines research, training and services in soil forensics to fight crime, terrorism and environmental pollution (CAFSS Website: <http://www.clw.csiro.au/cafss/>).
- Conducted over 85 soil forensic investigations for police forces, government agencies and non-government organizations with the search, location and recovery of soil and mineral samples from: (a) murder, cold murder and cover-up murder cases; (b) counter-terrorism cases, (c) assault, rape and kidnapping cases; (d) armed robbery and theft cases; (e) environmental contaminant cases (dust and toxic metals), (f) forensic archaeology cases in Australia and overseas, including diverse projects such as stolen dinosaur eggs and ferns from national parks and military applications. The impact of solving crimes using soil information has prevented several lengthy court cases and saved millions of dollars.
- Developed “Guidelines for Conducting Criminal and Environmental Soil Forensic Investigations”, which is being used by several state and federal agencies as the methodology/protocol for sampling and analysing soil-regolith in forensic investigations.
- Responsible for pioneering and organizing the 1st (Perth, 2006) International Conference on Criminal and Environmental Soil Forensics. Member of organizing committee of 2nd (Edinburgh, Scotland in 2007), 3rd (Long Beach, USA in 2010) and 4th (The Hague, Netherlands in 2012).
- Conducted workshops, seminars and training courses on soils for police, other institutional professionals and undergraduates.
- Provided opportunities for postgraduate students to undertake research projects related directly or indirectly to questions posed by clients.
- Expert witness in several Supreme Court hearings.
- Expert witness in several multi-million dollar legal cases, namely: (i) Litigation case involving Acid sulfate turf soil on the Kardinia Park football field in Melbourne, (ii) Expert witness in the Appeals Tribunal Court involving the Coonawarra wine district boundary dispute.
- Written several major Encyclopedia, book chapters and popular papers on Soil Forensics:
- Developed and supplied interactive exhibits/displays, which depict the role of soil-regolith science in crime investigations. These, have been put on permanent display in several institutions around the world.
- Organized and run hands-on Soil-regolith forensic courses for students and police.
- Convenor, Forensic Geoscience Symposium, 34th International Geological Congress (IGC) in Brisbane, Australia 2012.

Soil-regolith landscape processes

- Developed new knowledge on pedology, regolith science, soil mineralogy and biogeochemistry as applied to soil-regolith processes. Experienced in the design and development of advanced techniques to characterise, map and monitor Acid Sulfate Soils. Provided national and international leadership in recognising and establishing the importance, extent and severity of ASS as an environmental issue in both public and government arenas. The following is a selection of some of his more significant research achievements:
- Pioneered work in showing the importance of Al-substituted goethite as an indicator of pedogenic and other weathering environments and synthesizing Fe-Ti oxides at near ambient conditions, provided the basis for the mineral pseudorutile to be synthesized for the first time. Demonstrated importance of the form and composition of the soil oxides of iron and titanium in relation to soil processes, pollutant element retention, soil degradation and water quality. Contributed to the natural discovery and naming of the mineral schwertmannite – now commonly found in ASS.

- Developed new methods, protocols and models to sample, characterize and map ASS at catchment, regional and national scales in Australia, Brunei and Iraq.
- Developed new field instrumentation and methodologies for characterising and mapping complex ASS and salt-affected soils. Produced the first national map and atlas of Australian ASS and has contributed significantly to debate and the scientific underpinning of public policy.
- Developed mechanistic models to account for changes with time in biogeochemical and physical properties occurring in the various forms of land degradation. The models enable prediction and management of risk at scales from field, to farm, to regions.
- Established new conceptual models to explain and predict the formation and distribution of ASS with sulfuric materials (pH<4). These models describe, for the first time, the significance of extreme drought conditions in causing: (i) new kinds of inland ASS to form as water levels recede in rivers and lake systems and (ii) new assemblages of sulfate-containing evaporite minerals and Fe/Al-oxyhydroxysulfate minerals to precipitate as acidic pore waters (pH 0.8 to 2) evaporate at soil surfaces.
- Unravelling the role, importance and impact of formation and transformation of new minerals, which precipitate as acidic pore waters evaporate and are powerful indicators of changing soil-water processes in degrading landscapes.
- Developed a generic framework for constructing soil process models and applied them to predict soil-landscape properties for land management, water quality, mineral exploration, greenhouse gas emission and for forensic science purposes. His advice, analysis and particularly his synthesis of scientific understanding of ASS, salt-affected soils and soil forensics is regularly sought and used by clients and police.

Soil-regolith mapping and soil classification

- Conducted detailed investigations on the distribution, formation and mineralogy of a wide variety of soils: (i) Periglacial soils with fossil permafrost horizons in southern Africa (identified and reported their occurrence and properties for the first time), (ii) Vertisols in slope sequences in Australia, supplementing earlier work in Africa; (iii) Podzols (Spodosols) developed from coastal sands in Australia (chronosequences and heavy mineral weathering) and Africa, (iv) Sesquioxidic soils in South Africa (with ferricretes, bauxites and thick humic A1 horizons), New Zealand (wet soils) and Australia (gravely maghemitic soils), (v) Sodic and saline soils and environmental consequences in Australia and South Africa, (vi) Acid Sulfate Soils (ASS) in coastal and inland regions in Australia, Iraq and Brunei (identified and reported the occurrence and properties of inland ASS for the first time), (vii) Arid Soils in Kuwait, Iraq, Abu Dhabi, Australia and South Africa.
- Experienced in the use of international soil classification systems (Soil Taxonomy and the World Reference Base for Soil Resources), and the national systems of Australia, South Africa, Kuwait, Iraq and Brunei. Provided numerous contributions to International Committees working towards updating these systems, and proposals to which he contributed have been included.
- Carried out numerous strategic consulting projects for several Consultants and government authorities, on the assessment of the properties and hazards of acid sulfate soils at several regions in South Australia (Gulf of St. Vincent; Coorong and Lower Lakes), Northern Territory (Darwin harbour, Ranger Uranium Mine), Queensland (Cairns), Victoria (Corangamite District) and in Tasmania. He was appointed for a period of 4-years as the Quality Assurance Consultant for "The Soil Survey for the State of Kuwait". He has also conducted major soil investigations in the southern Iraq marshlands, Brunei and at numerous Landmine Experimental sites in Australia for the Australian Defence Department.
- Experienced in mapping of soil-regolith of agricultural, horticultural and mining regions in South Africa and Australia. A major contribution was completion of several soil-terrain-climate surveys in South Africa. Between 1971 and 1979 while employed as a soil surveyor at the Soil & Irrigation Research Institute in South Africa, he conducted research on soil survey methodology at small (1:250 000) and large (1:1000) scales for a diversity of purposes (land type survey of whole country, irrigation, urban and forestry planning). In 1972 he completed a soil-terrain-climate survey of the Southeastern Transvaal covering some 30,000 sq. km. at a publication scale of 1:250,000. Between 1973 and 1977 this survey was extended to cover the coastal and mountainous regions of Natal, covering some 85,000 sq. km. His involvement with the planning and soil survey mapping work for this major project has resulted in their being a unique breakdown of the land surface of the country into homogeneous natural resource regions. The resulting soil maps and soil data information enabled him, in collaboration with others, to construct a map showing the distribution of liming resources in relation to acid soils

in South Africa (scale 1:1,500,000). In 2005, he provided leadership in developing the first National map and atlas of coastal and inland Australian Acid Sulfate Soils, underpinning enhanced procedures and guidelines for identification and remediation strategies of ASS in environments across Australia; and policies.

Teaching, Extension and Industrial Education

- **Undergraduate Teaching:** From 1976 to 1979 he lectured Soil Chemistry, Pedology and Soil Mineralogy in the Department of Soil Science at University of Natal. In 1986 he lectured the Structural Geology course in the Department of Geology at the University of Adelaide. From 1990 to 1994 he assisted in the coordination of and in the lecturing of students enrolled in the Master of Agriculture and Graduate Certificate Courses in Soil Conservation (Soil Survey and Land Evaluation elective) and Environmental Geology/ Pedology III courses at the University of Adelaide. He co-ordinated 5 day field soil survey camps and was primarily responsible for initiating and actively organising a series of 5 day annual Soil Classification Courses (Soil Taxonomy and Australian Classification System) from 1990 to 1994 .From 1989 to 1996 he lectured to the final year Soil Science, Environmental Geology and Earth Science students at both Adelaide and Flinders Universities. In 1989, he helped to formulate the Master of Agriculture and Graduate Certificate Courses in Soil Conservation at the University of Adelaide and was responsible for Soil Survey and Land Evaluation. Since 1996 he has given a series of lectures on Water Quality and Pollution (Acid Sulfate Soils) to final year students at Flinders University and the University of Adelaide.
- **Postgraduate supervision:** Supervised 16 PhD, 8 MSc and 8 honours students.
- **Acid Sulfate Soils (ASS) training:** Developed and ran a 1-day-long Acid Sulfate Soil course for soil science and geology students at the University of Adelaide (1992 to 2010), which is routinely attended by students and staff from several consulting companies across the Australia. He has also developed and run three 2-day-long inland Acid Sulfate Soils courses in 2007, 2008, 2009 and 2011 for practicing wetland scientists and extension staff – 150 professionals having attended them. He also developed five 1-day-long Acid Sulfate Soil courses in 2008 and 2009 for community groups in South Australia – 70 people attended them.
- **External examiner** Served as external examiner of 25 masters and doctoral theses.
- **University administration:** Member, Roseworthy Agricultural College Master of Applied Science Assessment Panel (1989). External Member, Roseworthy Agric. College Master of Applied Sci. Advisory Committee (1989-1992). Member, Adelaide University, Research Quality Framework (RQF) shadow Assessment Panel (2007)