Name: Roberta Lee Farrell

Birthplace: St. Louis, Missouri, USA

Citizenship: New Zealand and United States of America

Present position: Professor
Present employer: The University of Waikato
Present work address: The University of Waikato
Department of Biological Sciences,
Private Bag 3105, Hamilton, New Zealand

Academic qualifications: 1975 BSc University of Missouri, St. Louis, USA
1977 MSc University of Illinois, Urbana, USA
1980 PhD University of Illinois, Urbana, USA
"Molecular and Genetic Relationships of Aromatic Metabolic Plasmids in Pseudomonads" [Dissertation Abstracts Intl Accession No. AAG8017932]

Years as a practicing researcher: 30

Professional positions held:

2008 to present	Adjunct Professor, North Carolina State University
1996 to present	Professor The University of Waikato, Department of Biological Sciences
1995 to 1996	Sabbatical Leave PAPRO, Forest Research Institute, Rotorua, New Zealand
1987 - 1996	Executive Vice President & Chief Operating Officer Sandoz Chemicals Biotech Research Corporation and Repligen Sandoz Research Corporation (same company with name change in 1993), Lexington, Massachusetts, USA
1984 - 1987	Associate Director of Research - Industrial Enzymes Repligen Corporation, Cambridge, Massachusetts, USA
1981 – 1984	Postdoctoral Fellow Massachusetts Institute of Technology, Cambridge, Mass., USA
1980 – 1981	Postdoctoral Fellow – University of Chicago, Chicago, Illinois, USA

Present research / professional speciality:
My general research field is in Biochemistry and Biotechnology.
My special areas of research are fundamental and applied studies on:
Enzymes; activity and production; Cellulose, lignin and resin degradation and modification; Fungal ecology and Biocontrol Research and Products;
Antarctic Historic Hut Wood and artefact degradation;
Antarctic microbial biodiversity and bioprospecting.

Honours, distinctions, membership of committees:

2010 Nature Asia-Pacific highlights PNAS publication 'Highly specialized microbial diversity in hyper-arid polar desert'; see http://www.natureasia.com/A-IMBN/

2009 Distinguished Alumni Award, University of Missouri-St Louis

Companion of The New Zealand Order of Merit (CNZM) in recognition for services to biochemical research.

Invitation Key Note Lecture *Intergovernmental Meeting of Experts on Biological Prospecting in the Antarctic Treaty Area* 3 – 5 February 2009, Baarn, The Netherlands

2008 Hamilton New Zealand Kudos Science Entrepreneur of the Year Award

Appointment Adjunct Professor, North Carolina State University, USA.

Appointment Board New Zealand Foundation for Research Science and Technology (three years).

Invitation Keynote Lecture Bio-08, Grahamstown,South Africa, 23 January 08

2007 Appointment Panel Member Royal Society of New Zealand Travel Grants Committee

Appointment Associate Institute for Microbial Biotechnology and Meta genomics, University of Western Cape, South Africa.

Invitation Sir Holmes Miller Lecture 2007, Wellington Branch New Zealand Antarctic Society, 22 November 2007.

Invitation Keynote Lecture Hokkaido University, 19 October 2007.

2006 Millennium Ecosystem Assessment received the Zayed International Prize for the Environment in the category of “Scientific Achievements in the Environment” (www.zayedprize.org).

Member 50th Anniversary of Scott Base Conference Organising Committee, a joint partnership of Antarctica New Zealand and the Royal Society of New Zealand

Appointed Director ZyGEM Ltd

2005 Elected Fellow of Royal Society of New Zealand

Invitation Speaker II International Colloquium on Eucalyptus Pulp, Concepción, Chile, 22 - 26 May 2005

Invitation Keynote Speaker **China Paper/China Forest 2005** Beijing, China 22 – 24 Sept 2005

Invitation Plenary Lecture AWIS (Association for Women in Sciences), 5th National Conference, 8 July 2005.

Appointed Director ZyGEM Ltd

2004 Invitation from Vice Chancellor Bryan Gould to present in the inaugural lecture at Waikato Lecture Series: 'Celebrating World Class: Science, Research & Innovation' 6th September 2004, celebrating the University of Waikato's 40th Anniversary.

Antarctica New Zealand Honorary Antarctic Explorer Club Member

Invited Participant Ngati Porou Whanui Forests "Launch of Knowledge Creation Strategy at Hinerupe Marae, Te Araroa, 9 September 2004

Awarded Emachu Research Fund Grant for international contribution of the paper Thwaites, J.M., Farrell, R.L., Hata, K., Carter, P., Lausberg, M. (2004). Sapstain fungi on *Pinus radiata* logs – from New Zealand Forest to Export Destination in Japan. Journal of Wood Science, 50: 459-465.

ASM chooses as Journal Highlights, May 2004, the paper Blanchette, R.A., Held, B.W., Jurgens, J.A., McNew, D.L., Harrington, T.C., Duncan, S.M., and Farrell, R.L. (2004). Wood Destroying Soft Rot Fungi in the Historic Expeditions Huts of Antarctica. *Appl. Environ. Microbiol*, 70, 1328-1335.

2003 Invited Lecturer Royal Institute of Technology, Stockholm, Sweden, 2 October 2003.
Invited Lecturer New Zealand Ministry of Research Science & Technology, BioIssues Forum "bioRemedi" 6 November 2003, Wellington, New Zealand.

Appointed Judge The Wolf Foundation Prize 2003

Invited Speaker Australasian Research Management Society Inc 2003 Conference "Lifting R&D Performance-Australasian Best Practice" Auckland, NZ, 14 October 2003.

Invited Keynote Address "Bioprospecting in Antarctica Workshop", Gateway Antarctica at the University of Canterbury, 7 April 2003.

Participant and Academic Organiser of Hui at University of Waikato with Te Raukawa Trust Board and Carter Holt Harvey, 1st April 2003

Participant and Academic Organiser of Hui at University of Waikato with Bay of Plenty Iwi. Tainui and Carter Holt Harvey, 6th August 2003

Membership Cold Spring Harbor Laboratory Alumni Association

Invited to contribute Chapter "NOVEL PRODUCTS AND INDUSTRIES FROM BIODIVERSITY" in *Millennium Ecosystem Development Programme*, documenting

what biodiversity has contributed to the human economy, sponsored by Food and Agriculture Organization of the United Nations (FAO).

2002 Appointed Judge The Wolf Foundation Prize 2002
Appointment Chairperson Tellers Committee for International Academy Wood Science (2002 – 2005).

2001 Invited Keynote Address Lecturer, International Research Group for Wood Preservation, 32nd Annual Meeting, Nara, Japan, May, 2001.

Chaired International Academy of Wood Science "New Zealand Conference 2001: Productive Research, Globalisation and Forestry", Paihia, 27 Feb – 2 March.

Programme Committee Member & Session Chair B2B2B: bioscience to bio-enterprise to bio-business, 16.11.2001, sponsored by the Academy Council of the Royal Society of New Zealand
Committee Member New Zealand Royal Society Committee on Human Resources in Science and Technology, 2001 – on going.

1998 Elected to the *Academy Board* of International Academy of Wood Science (1998 – 2004).

Invited Speaker "Leadership Priorities for New Zealand Science and Technology" sponsored by the Academy Council of The Royal Society of New Zealand, 5-6 November 1998.

1995 Appointed to the Board of Associates of Whitehead Institute for Biomedical Research, Cambridge, Massachusetts, USA; (1995-2001).

1990 Awarded Sandoz USA, Innovation Award "In recognition of your outstanding contribution to the growth and success of "Cartapip®".

1990 Elected Fellow of International Academy of Wood Science.

1985 Chosen one of "The Year's Top 100 Innovations and the Men and Women Behind Them" for part in cloning Lignin-Degrading Enzymes. *Science Digest* 93, 34-35.

Major Grants Awarded (>NZ100,000/grant) past ten years:

2008-2011	NZFRST Understanding, valuing and protecting Antarctica's unique terrestrial ecosystems: Predicting biocomplexity in Dry Valley ecosystems
2002-2007	NZFRST Defining Quality, Expanding Markets and Related Technologies
2000-2002	NZFRST, Biocontrol & Biosecurity: Pathogen Dynamics in Forestry, Diagnostics and Risk Analysis
2001	Carter Holt Harvey – Japan Peeler Trials
1998-2000	NZFRST, Cause and Prevention of Sapstain in Radiata Pine

1999 -2000 Ministry of Agriculture and Forestry (MAF) Import Risk Analysis
2000 –2001 Ministry of Agriculture and Forestry (MAF) Rapid Identification of target pathogens in imported packaging
1996-2002 New Zealand Forestry Consortium – Cause of Sapstain and Albino Biocontrol Product Development

Other Grants Awarded (>NZ25,000/grant):

2000-2002 Rayonier Corporation - Survey of East Cape, NZ
1998-2001 Kimberly-Clark Australia Biopulping/Resin Reduction
1998-2000 Sapstain Fungi–with University of Bio-Bio, Concepcion, Chile
1997-1998 Nippon Paper, Tokyo Resin Acid Degradation

Teaching/Supervision

My specialist teaching areas are biochemistry, particularly enzymology including protein stability, purifications and enzyme applications, genetics, microbiology and biotechnology including fermentation and applications of biological organisms, and microbial biodiversity.

From 1996 -2008 at The University of Waikato I have been chief supervisor of completed 18 M.Sc. students, 5 Ph.D. and 1 M. Phil. students, and co-supervisor of another completed 6 Ph.D. students and 1 M.Sc. student. These graduate and postgraduate students have received numerous scholarships and fellowships, including four MSc students and one PhD awarded Tuapapa Putaiao Maori Fellowships.

Research associated activities

- Program Committee Member of 3rd, 4th, 5th, 6th, 7th, 8th and 9th "Biotechnology in the Pulp and Paper Industry" (1986-2004, in Stockholm, Charlotte, Kyoto, Vienna, Vancouver, Helsinki and Durban).
- Chairman of 1997 TAPPI Biological Sciences Symposium, San Francisco, California, Oct 1997.
- Chairman "Modern Agriculture and Environmental Concerns" Conference, Jerusalem, May, 1999.
- Invited Speaker to more than 2 dozen international conferences from 1985 – 2004.
- Reviewer US National Science Foundation and Department of Energy, Australian Research Council, and National Science and Energy Research Council, South African National Research Foundation and numerous journals.
- Inventor and Developed Commercialisation of biotechnology (enzyme and microbial) products.

PUBLICATIONS

Research papers and book chapters: 93

Granted Patents: USA, 28 [others >200]; Current provisional patents, 10.

Significant other publications: 40

Book Chapters

1. Farrell, R. L., S. Duncan, R. A. Blanchette, B. W. Held, J. A. Jurgens and B. A. Arenz. 2008. Scientific evaluation of deterioration of historic huts of Ross Island, Antarctica. In: Historical Polar Bases – Preservation and Management. Edited by S. Barr and P. Chaplin. ICOMOS Monuments and Sites No.XVII. International Polar Heritage Committee, Oslo, Norway pp.96. ISBN 978-82-996891-2-0.

2. Thwaites, J.M., Farrell, R.L., Duncan, S.D., Lamar, R.L., White, R.B. 2006. *Fungal-Based Remediation: Treatment of PCP contaminated Soil in New Zealand*, In **Environmental Bioremediation Technologies,** Ed. S.N. Singh, Springer Verlag, pages 465-479.

3. Farrell, R.L., Duncan, S.M., *Uniqueness of Antarctica and potential for commercial success*, In **Antarctic Bioprospecting**, Eds. A. Hemmings and M. Rogan-Finnemore. Published by Gateway Antarctica Special Publication Series, No. 0501, University of Canterbury. ISBN 0-476-01647-9, pages 10-40. 2005

4. Held, B.W., Blanchette, R.A., Jurgens, J.A., Duncan, S., Farrell, R.L., *Deterioration and conservation issues associated with Antarctica's historic huts*, In **Art, Biology and Conservation of Works of Art**, Ed. Koestler, R.J., Charola, A.E., Nieto-Fernadez, F.E., Metropolitan Museum of Art, New York, 2003, pages 370-389.

5. Farrell, R.L., Blanchette, R.A., Auger, M., Duncan, S.M., Held, B.W., Jurgens, J.E., Minasaki, R., *Scientific Evaluation of Deterioration in Historic Huts of Ross Island, Antarctica*. In **Polar Monuments and Sites Cultural Heritage Work in the Arctic and Antarctic Regions.** ISBN: 82-996891-1-2**,** ICOMOS, Oslo. 2004.

6. Beattie, A.J., Kheng, C.T., Prance, I., Barthlott, W., Elisabetsky, E., Farrell, R.L., Simpson, D., Rosenthal, J. *NEW PRODUCTS AND INDUSTRIES FROM BIODIVERSITY* In **Millennium Ecosystem Assessment. Ecosystems and Human Well-being: A Framework for Assessment**. Island Press, Washington, D.C. 2004.

Research papers

1. Duncan, S.M., Farrell, R.L., Jordan, N., Jurgens, J.A., Blanchette, R.A. Monitoring and identification of airborne fungi at historic locations on Ross Island, Antarctica. 2010. Shona M. Duncan, Roberta L. Farrell, Neville Jordan, Joel A. Jurgens and Robert A. Blanchette. Polar Science. In press.

2. Blanchette, B.A., Held, B.W., Arenz, B.E., Jurgens, J.A., Baltes, N.J., Duncan, S.M., and Farrell, R.L. 2010. An Antarctic hot spot for fungi at Shackleton's historic hut on Cape Royds. Microbial Ecology. In press.

3. Pointing, S.B., Chan,Y., Lacap, D.C., Lau, M.C.Y., Jurgens, J., Farrell,R.L.. 2009. Highly specialized microbial diversity in hyper-arid polar desert . *Proc Natl Acad Sci*.USA, On line: www.pnas.org/cgi/doi/10/1073/pnas.0908274106.

4. Li Y., Pickering, K.L., R.F. Farrell. 2009. Determination of interfacial shear strength of white rot fungi treated hemp .Compos Sci Technol. In press.

5. Farrell, R.L. 2008. Priorities: yesterday, today and tomorrow. AWIS Issue 4 December 2008, p11.

6. Duncan, S.M., Minasaki, R., Farrell, R.L., Thwaites, J.M., Held, B.W., Arenz, B.E., Jurgens, J.A., Blanchette, R.A. 2008. Screening fungi isolated from historic *Discovery Hut* on Ross, Island, Antarctica for cellulose degradation. Antarctic Science, 21, pp 1-8. http://journals.cambridge.org/repo_A187GtFw

7. Farrell, R.L. 2007. Scientific Evaluation of Deterioration of Historic Huts of Ross Island, Antarctica. NZ Science Teacher 114:12-14.

8. K. L. Pickering, Y. Li, R.L. Farrell and M. Lay "Interfacial Modification of Hemp Fibre Reinforced Composites using Fungal and Alkali treatment", Journal of Bio-based Materials and Bio-energy, 1 (1) 2007, pp109-117.

9. K. L. Pickering, Y. Li and R.L. Farrell. 2007. Fungal and Alkali Interfacial Modification of Hemp Fibre Reinforced Composites, Key Engineering Materials, 334 , pp493-496.

10. Wu, C., Te'o, V.S.J.., Farrell, R.L., Bergquist, P.L., Nevalianen, K.M.H. 2006. Improvement of the secretion of extracellular proteins and isolation and characterization of the amylase I (*amy1*) gene from *Ophiostoma floccosum*. Gene 384: 96-103.

11. Pickering, K.L., Li, Y., Farrell, R.L., Lay, M. 2006. Interfacial Modification of Hemp Fibre Reinforced Composites using Fungal and Alkali treatment, *Journal of Bio-based Materials and Bio-energy*, in press.

12. Reay, S.D., Thwaites, J.M., Farrell, R.L. 2006. Survey of Ophiostomataceae associated with *Hylurgus ligniperda* (Curculionidae: Scolytinae) in New Zealand. New Zealand Entomologist 29: 21-26.

13. Duncan, S.M., Farrell, R.L., Thwaites, J.M., Held, B.W., Arenz, B.E., Jurgens, J.A. & Blanchette, R.A. 2006. Endoglucanase-producing fungi isolated from Cape Evans historic expedition hut on Ross Island, Antarctica. *Environmental Microbiology* **8** (7), 1212-1219.

14. Arenz, B.E., Held, B.W., Jurgens, J.A., Farrell, R.L., Blanchette, R.A., 2006. Fungal diversity in soils and historic wood from the Ross Sea region of Antarctica, Soil Biology and Biochemistry 38: 3057-3064.

15. Held, B. W., J. A. Jurgens, S. M. Duncan, R. L. Farrell and R. A. Blanchette. 2006. Assessment of fungal diversity and deterioration in a wooden structure at New Harbor, Antarctica. Polar Biology 29: 526-531.

16. Thwaites, J.M., Farrell, R.L., Duncan, S.M., Reay, S.D., Blanchette, R.A., Hadar, E., Hadar, Y, Harrington, T.C. 2005. Survey of potential sapstain fungi on *Pinus radiata* in New Zealand. New Zealand Journal of Botany, 43(3): 653-663.

17. Reay, S.D., Thwaites, J.M., Farrell, R.L. 2005. A Survey of Ophiostoma species vectored by *Hylastes ater* to pine seedlings in New Zealand. For. Path. 35: 1-9.

18. Held, B.W., Jurgens, J.A., Arenz, B.E., Duncan, S.M., Farrell, R.L., Blanchette, R.A. 2005. Environmental factors influencing microbial growth inside the Historic Expedition Huts of Ross Island, Antarctica. International Biodeterioration and Biodegradation, 55: 45-53.

19. Thwaites, J.M., Farrell, R.L., Hata, K., Carter, P., Lausberg, M. (2004). Sapstain fungi on *Pinus radiata* logs – from New Zealand Forest to Export Destination in Japan. Journal of Wood Science: 50: 459-465. [Translated Japanese abstract appears in Mokuzai Gakkaishi Volume 50, Number 6.]

20. Blanchette, R.A., Held, B.W., Jurgens, J.A., Aislabie, J., Duncan, S.M., and Farrell, R.L. (2004). Environmental pollutants in Antarctica from the Robert F. Scott and Ernest H. Shackleton expeditions during the 'Heroic Era' of exploration. Polar Record, 40: 143-151.

21. Blanchette, R.A., Held, B.W., Jurgens, J.A., McNew, D.L., Harrington, T.C., Duncan, S.M., and Farrell, R.L. (2004). Wood Destroying Soft Rot Fungi in the Historic Expeditions Huts of Antarctica. Appl. Environ. Microbiol, 70, 1328-1335.

22. Farrell, R.L., Rhodes, P.L., Aislabie, J. (2003). Toluene-degrading Antarctic *Pseudomonas* Strains from Fuel-contaminated Soil. Biochem. Biophys. Res. Commun., Vol 312/1 pp 235-240.

23. Schirp, A., Farrell, R.L., Kreber, B. Effects of New Zealand Sapstaining Fungi on Structural Integrity of Unseasoned Radiata Pine. (2003). Holz als Rohund Werkstoff, 61, 369-376.

24. Schirp, A., Farrell, R.L., Kreber, B., Singh, A.P. (2003). Advances in understanding the ability of sapstaining fungi to produce cell-wall degrading enzymes., Wood and Fiber Science, 35, 434–444.

25. Held, B.W., Thwaites, J.M., Farrell, R.L., Blanchette, R.A. (2003). Albino Strains of *Ophiostoma* Species for Biological Control of Sapstaining Fungi. *Holzforschung,* **57**, 237-242.

26. Blanchette, R.A., Held, B.W., Farrell, R.L. Defibration of wood in the expedition huts of Antarctica: an unusual deterioration process occurring in the polar environment. (2002). *Polar Record* **38** (207): 313-322.

27. Reay, S.D., Walsh, P.J. Ram, A. and Farrell, R.L. The invasion of *Pinus radiata* seedlings by sapstain fungi, following attack by the Black Pine Bark Beetle, *Hylastes ater* (Coleoptera: Scolytidae). *Forest Ecology and Management*, (2002). **165** (1-3): 47-56.

28. Kay, S.J., Ah Chee, A., Sale, P.O., Taylor, J.T., Farrell, R.L. (2002). Variation amongst New Zealand Isolates of *Sphaeropsis sapinea*. *European Journal of Forest Pathology*, 32: 109-121.

29. Vanneste, J.L., Hill, R.A., Kay, S.J., Farrell, R.L., Holland, P.T., (2002). Biological control of sapstain fungi with natural products and biological control agents: a review of the work carried out in New Zealand. *Mycological Research,* 106:228-232.

30. Reay, S.D., Thwaites, J.M., Farrell, R.L. & Walsh, P.J. 2001. The role of the bark beetle, *Hylastes ater* (Coleoptera: Scolytidae), as a sapstain fungi vector to *Pinus radiata* seedlings: a crisis for the New Zealand forestry industry? *Integrated Pest Management Reviews* 6(3/4): 283-291.

31. Minasaki, R., Duncan, S., Farrell, R.L., Blanchette, R.A., Held, B.W., Jurgens, J.A., Watson, N. (2001). Mycological Biodiversity Associated with Historic Huts & Artefacts of the Heroic Period in Ross Sea Region. Scientific Committee on Antarctic Research. VIII SCAR International Biology Symposium. *Antarctic Biology in a Global Context*. Handbook. S6P19.

32. Farrell, R.L., Thwaites, J.M. (2001). Future Directions for Biological Control & BioActivity®. International Research Group for Wood Preservation Secretariat, KTH, Sweden, 2001IRG/WP 00-10329.

33. Aislabie, J., Fraser, R., Duncan, S., Farrell, R.L. (2001). Effects of oil spills on microbial heterotrophs in Antarctic soils. *Polar Biology*, 24:308-313.

34. Harrington, T.C., McNew, D.M., Steimel, J., Hofstra, D., Farrell, R.L. (2001). Phylogeny and taxonomy of the *Ophiostoma piceae* complex and the Dutch Elm disease fungi. *Mycologia*, 93:110-135.

35. Schirp, A., Farrell, R.L., Kreber, B. (2000) Capability of Staining Fungi to Cause Structural Changes in New Zealand Radiata Pine: Toughness Testing and Enzyme Production. Maderas Ciencia y Technologia 2(2): 119-129.

36. Blanchette, R.A., Held, Benjamin W., Behrendt, C., Farrell, R.L., Navarrete, J. (2000) Development of a successful program for Biological Control of Blue Stain in Wood Products. Maderas Ciencia y Technologia 2(2): 130-129.

37. Burnes, T.A., Blanchette, R.A., Farrell, R.L. (2000). Bacterial biodegradation of extractives and patterns of bordered pit membrane attack in pine wood. *Applied and Environmental Microbiology*, 66 (12), p 5201-5205.

38. Blanchette, R.A., B.W. Held, R.L. Farrell and S. Duncan. 2000. Wood deterioration in the historic huts of Antarctica. *Phytopathology* 90(6):7.

39. Cooper, P., Downs, S., and Farrell, R. (2000) Validation of the Sapstain Danger Index. International Research Group on Wood Preservation Series Document IRG/WP/00-10333. IRG Secretariat SE-100 44 Stockholm Sweden.

40. Thwaites, J.M. and Farrell, R.L. (2000) Colonisation and Detection of New Zealand Sapstain Fungi. International Research Group on Wood Preservation Series Document IRG/WP 00 – 10329 IRG Secretariat SE-100 44 Stockholm Sweden.

41. Schirp, A., Kreber, B., Farrell, R L (1999) Evaluation of Decay in Radiata Pine, International Research Group on Wood Preservation Series Document IRG/WP 00 IRG Secretariat SE-100 44 Stockholm Sweden.

42. White-McDougall, W.J., Blanchette, R.A., Farrell, R.L. (1998). Biological control of the stain fungi on *Populus tremuloides* using selected Ophiostoma isolates. *Holzforschung,* 52 (3), p 234-240.

43. Rocheleau, M.J., Sithole, B.B., Allen, L.H., Iverson, S., Farrell, R., Noel, Y. (1998). Fungal Treatment of Aspen Chips for Wood Resin Reduction: A Laboratory Evaluation. *Journal of Pulp and Paper Science,* Vol 24. Number 2, p 37-42.

44. Farrell, R.L., Kay, S.J., Hadar, E., Hadar, Y., Blanchette, R.A., Harrington, T.C. (1998). Sapstain in New Zealand - the causes and a potential anti-sapstain solution, In “Biology and prevention of Sapstain”, Forest Products Society Publication No. 7273.

45. Farrell, R.L. (1998). Science, technology and end-users: optimising R&D for the commercial sector for society’s benefits. In *Leadership Priorities for New Zealand Science and Technology* sponsored by the Academy Council of The

Royal Society of New Zealand, 5-6 November 1998. Miscellaneous series 54, pp.127-131.

46. Farrell, R.L., Hata, K. and Wall, M.B. (1997). Solving Pitch Problems in Pulp and Paper Processes by the Use of Enzymes or Fungi. *Advances in Biochemical Engineering/Biotechnology,* Vol. 57: p 198-210.

47. Forde Kohler, L.J., Dinus, R.J., Malcolm, E.W., Rudie, A.W., Farrell, R.L. & Brush, T.S. (1997) Improving softwood mechanical pulp properties with *Ophiostoma piliferum*. *Tappi Journal* **80**(3):135-140.

48. Farrell, R.L. and Allison, R.A. (1997). Effect of Cartapip 97 pretreatment on the kraft pulping of radiata pine, Tappi Research and Development Proceedings, T*appi Press, Atlanta, GA, USA*. p 28-32

49. Farrell, Roberta. L., Duncan, Shona. M., Ram, Arvina. P. (1997). Strategies for Improving Protection of Logs and Lumber. PP 25-37. *FRI Bulletin No. 204.* p 25-31

50. Farrell, Roberta. L., Blanchette, R.A., Behrendt, C.J., White-McDougall, W.J. (1997). Strategies for Improving Protection of Logs and Lumber. pp 25-37. *FRI Bulletin No 204,* p81-87.

51. Farrell, R.L., Viikari, L. and Senior, D. (1996). Section IV: *The Technology of Chemical Pulp Bleaching*, Chapter 7: Enzyme Treatments of Pulp. p 365-377.

52. Zimmerman, W.C., Blanchette, R.A., Burnes, T.A., Farrell, R.L. (1995). Melanin and perithecial development in Ophiostoma piliferum. *Mycologia* 87: 857-863.

53. Behrendt, CJ, Blanchette, RA and Farrell, RL. (1995) Biological Control of Blue Stain Fungi in Wood: Investigation of Fungal Interactions in the Laboratory and Field. *Phytopathology* 85, 92-97.

54. Behrendt, C.J., R. A. Blanchette and R. L. Farrell. 1995. An integrated approach, using biological and chemical control, to prevent blue stain in pine logs. Can. J. Bot. 73:613-619.

55. Yu, X, Minor, JL, Atalla, RH, Labbauf, MM and Farrell, RL. Effect of Hemicellulases on Unbleached Softwood Kraft Pulp. *Proceedings 1994 International Pulp Bleaching Conference,* 13-16 June 1994, Vancouver, British Columbia. p. 63-68.

56. Brush, TS, Farrell, RL, Ho, C. Biodegradation of Wood Extractives from Southern Yellow Pine by *Ophiostoma piliferum. Tappi Journal* 77, 155-159 (1994).

57. Farrell, R.L., Blanchette, R.A., Brush, T.S., Hadar, Y., Iverson, S., Krisa, K., Wendler, P.A., Zimmerman, W. (1993). Cartapip TM: a biopulping product for control of pitch and resin acid problems in pulp mills. *J. Biotechnol.* 30: 115-122.

58. Blanchette, RA, Farrell, RL, Behrendt, CJ, Burnes, TA, Wendler, PA, Brush, TS and Iverson, S. Biological Treatment of Pitch Control and Protection against Sapstain in Wood used for Pulp and Paper Products. 25-28 May 1993. *Proceedings 7th International Symposium on Wood and Pulping Chemistry,* Beijing, China. p. 591-595.

59. Gronberg, VV, Farrell, RL, and Skerker, PS. Biobleaching. *Proceedings XXV - Eucepa Conference*, 4-8 October 1993. Vienna, Austria, p. 167-174.

60. Blanchette, RA, Farrell, RL, Burnes, TA, Wendler, PA, Zimmerman, W, Brush, TS, Snyder, RA. Biological Control of Pitch in Pulp and Paper Production by *Ophiostoma piliferum. Tappi Journal* 75 (12), 102-106. (1992).

61. Farrell, R.L., "Chlorine-Free Bleaching with Cartazyme® HS Treatment", 1992, in *Progress in Biotechnology Vol. 7 Xylans and Xylanases*, Elsevier Science Publishers B.V, Amsterdam, Netherlands; New York, New York, USA. 315-324.

62. Hoffmann, G.C., Brush, T.S., Farrell, R.L., "A Biopulping Product for Control of Pitch and Resin Acid Problems in Pulp and Paper Production," *Naval Stores Review, 102*(3) 10-12 (1992).

63. Wendler, P.A., Brush, T.S., Iverson., S., Krisa, K., Zimmerman, W., and Farrell, R.L., "Biological Control of Pitch Problems in Paper Mills, *Kemia Kemi 19*, 262-264 (1992).

64. Farrell R.L., Blanchette, R.A., Brush, T.S., Gysin, B., Hadar, Y., Perollaz, J.J., Wendler, P.A., and Zimmerman.W., "Cartapip®" A Biopulping Product for Control of Pitch and Resin Acid problems in Pulp Mills" in *Biotechnology in the Pulp and Paper Industry*, Kyoto, Japan. Editor: M. Kuwahara and M. Shimada, Uni Publishers Co., ltd., Tokyo, Japan 1992, p. 27-32.

65. Skerker, P.S., Farrell, R.L. and Chang, H-M., "Chlorine free bleaching with Cartazyme® HS treatment," 1991, Proceedings of International Pulp Bleaching Conference 1991, Stockholm, Sweden, p. 93-95.

66. Kirk, T.K., Tien, M., Kersten, P., Kalyanaraman, B., Hammel, K., and Farrell, R.L., "Lignin Peroxidase from Fungi *Phanerochaete chrysosporium*," 1990, *Methods of Enzymology*, Vol. 188, p. 159-171, Academic Press, Inc. San Diego, California, USA.

67. Blanchette, R.A., Abad, A.R., Cease, K.R., Farrell, R.L., Skerker, P., Lovrien, R.E., "Cytochemical Aspects of wood Degradation by White and Brown Rot Basidiomycetes," *Biodeterioration and Biodegradation 8*, p. 533-535, Editor: H.W., Ross Moore, Elsevier, New York.

68. Blanchette, R.A., Abad, A.R., Cease, K.R., Farrell, R.L., Lovrien, R.E., and Leathers, T.D., "Enzyme Immunocytochemistry and Ultrastructural Localization of Cell Wall Components by Enzyme Gold Complexes," 1990 in *Biotechnology in the Pulp and Paper Industry,* Editors: Kirk, T.K. and Chang, H-M., Butterworth-Heinemann, Stoneham, MA, p. 69-81.

69. Skerker, P.S., Farrell, R.L., Dolphin, D., Cui,F., and Wijesekera, T., "Biomimetic Bleaching of Kraft Pulp," 1990, in *Biotechnology in the Pulp and Paper Industry,* Editors: Kirk, T.K. and Chang, H-M., Buttersworth-Heinemann, Stoneham, MA, p. 203-210..

70. Cui, F., Dolphin, D., Wijesekera, T., Farrell, R.L., and Skerker, P.S., "Biomimetic Studies of Lignin Degradation and Bleaching," 1990, Biotechnology in the Pulp and Paper Industry, Editors: Kirk, T.K., and Chang, H-M., Buttersworth-Heinemann, Stoneham, MA. P. 481-491.

71. Ander, P., Mishra, C., Farrell, R.L., and K-E. Eriksson, "Redox Reactions in Lignin Degradation: Interactions Between Laccase, Different Peroxidases and Cellobiose: *Quinone Oxidoreductase*," *Journal of Biotechnology, 13*: 191-98 (1990).

72. Farrell, R.L., Murtach, K.B., Tien, M, Mozuch, M.D., and Kirk, T.K., "Physical and Enzymatic Properties of Lignin Peroxidase isoenzymes from *Phanerochaete chrysosporium*, " *Enzyme Microbial Technology,11* (6): 322-28 (1989).

73. Blanchette, R.A., Abad, A.R., Farrell, R.L., and Leathers, T.D., "Detection of Lignin peroxidase and Xylanase by Immunocytochemical labeling in Wood Decayed by Basidiomycetes," *Applied and Environmental Microbiology 55* (6): 1457-1465 (1989).

74. Farrell, R.L., Belew, M.E., Malone, T.E., and Sadownick, B.A., "Cloning of Ligninolytic Enzymes," *FEMS*, *43*: 349-364 (1988).

75. Sadownick, B. and Farrell, R.L., "Enzymatic Modification of Lignochemicals: Adhesive and Resin uses, *Biomass 15*: 77-92 (1988).

76. Kirk, T.K. and Farrell, R.L., "Enzymatic combustion": the microbial degradation of lignin", *Annual Reviews of Microbiology, 41*: 465-506 (1987).

77. Farrell, R.L., "A New Key Enzyme for Lignin Degradation" *Annals of New York Academy of Sciences, 501*: 150-158 (1987).

78. Maione, T., Javaharian, K., Belew, M., Gomez, L., and Farrell, R.L., "Activities of Recombinant Ligninase, Lignin Enzymic and Microbial Degradation," 1987, INRA, Paris, France, p. 177-183.

79. Dolphin, D., Nakan, T., Maione, R.E., Kirk, T.K., and Farrell, R.L., "Synthetic Model Ligninases," 1987. MAI, Paris, France, p.12.

80. Farrell, R.L., "Industrial Applications of the Lignin Transforming Enzymes," *Philosophical Transactions of the Royal Society 321*: 549-533 (1987).

81. Faison, B., Kirk, T.K., and Farrell, R.L., "Role of Veratryl Alcohol in Regulating Ligninase Activity in *Phanerochaete chrysosporium," Applied and Environmental Microbiology, 52*: 251-254 (1986).

82. Kirk, T.K., Croan,S., Tien, M., Murtach, K.E., and Farrell, R.L., "Production of Multiple Ligninases by *Phanerochaete chrysosporium*: Effect of Selected Growth Conditions and the Use of a Mutant Strain," *Enzyme and Microbial Technology, 8* (1): 27-32 (1986).

83. Farrell, R.L., "Biocatalysts Hold Promise of Better Pulp Quality," *TAPPI Journal, 67*: 32-33 (1984).

84. Farrell, R.L. and Ingram, V.M., "Globin Expression in RSV Transformed Quail Microblasts," 1983, *Process in Clinical and Biological Research,* Vol. 134, p. 263-266, Alan Liss Publishers, Editors: G. Stamatoyannopoulos and A.W. Neinhuis.C.

85. Farrell, R.L., and Ingram, V.M., "Cell Differentiation: Links to Cancer," 1983, *The MIT Report,* Vol. XI, p.1.

86. Farrell, R.L., and Chakrabarty, A.M., "Degradative Plasmids: Evolution and Molecular Relatedness," 1980, *Plasmids of Environmental, Medical and Commercial Importance,* Elsevier/North Holland Press.

87. Farrell, R.L., Gunsalus, I.C., Crawford, I.P., Johnston, J.B., and Ito, J., "Restriction Endonuclease Sites in Aromatic Metabolic Plasmids," *Biochem. Biophys. Res. Commun, 82* (2): 411-416 (1978).

88. Corey, J.Y. and Farrell, R.L., "Silipramine and Related Derivatives," *Journal of Organometallic Chemistry, 153*: 127-132 (1978).

89. Corey, J.Y., Dye, M.J., Farrell, R.L., and Mitchell, M.V., "Silicon Analogs of the Thioxanthenes," *Journal of Organometallic Chemistry,* 152: 137-142 (1978).

USA Issued PATENTS - 28

[Only USA Issued Patents are cited here. Most of those taken out elsewhere overlap the USA patents; there are more than 200 related international patents on which I am an Inventor.]

1. Farrell, R.L., Hadar, Y., Wendler, P.A., Zimmerman, W., United States Patent, Patent Number: 5,998,197, Fungi For Pitch Reduction and Their Preparation. Dec. 7, 1999.

2. Blanchette, R.A., Farrell, Roberta L., Hadar, Yitzhak, Merritt, J.E., Snyder, R.A., Wendler, Philip A., Zimmerman, Wendy. United States Patent, Patent Number: 5,853,537, Process for treating pulpwoods and pulps with a Pitch Degrading Fungus of the Genus Ophiostoma. Dec. 29, 1998.

3. Blanchette, Robert A., Burnes, Todd A., Farrell, Roberta L. United States Patent, Patent Number: 5,711,945, Pitch Degradation with *Pseudomonas fluorescens*. Jan. 27, 1998.

4. Farrell, Roberta L., Gelep, Paul, Anilionis, Algis, Jaaherian, Kashayar, Maione, Theodore, Rusche, James, Sadownick, Bruce A, Jackson, Jennifer A. United States Patent, Patent Number: 5,616,473, Cloning and Expression of Ligninases. Apr. 1, 1997.

5. Farrell, Roberta L., Blanchette, R.A., Hadar, Yitzhak, Wendler, Philip A., Zimmerman, Wendy. United States Patent, Patent Number: 5,609,724, Fungi For Pitch Reduction and Their Preparation. Mar. 11, 1997.

6. Zimmerman, Wendy C., Farrell, Roberta L. United States Patent, Patent Number: 5,607,855, Fungi for Pitch Reduction and Their Preparation. Mar. 4, 1997.

7. Zimmerman, Wendy C., Farrell, Roberta L. United States Patent, Patent Number: 5,695,975, Mating Process For Preparing *Ophiostoma Piliferum* Fungi For Pitch Reduction. Dec. 9, 1997.

8. Blanchette, R.A., Farrell, R.L., Behrendt, C.J., Biological control for wood products and debarking. United States Patent Number: 5,518,921. Date of Patent: May 21, 1996.

9. Blanchette, R.A., Farrell, R.L., Iverson, S., Pitch degradation with white rot fungi. United States Patent Number: 5,476,790.

10. Blanchette, R.A., Farrell, R.L. Behrendt, C.J., Biological control for wood products. United States Patent Number: 5,532,164. Date of Patent: Jul, 2., 1996.

11. Blanchette, R.A., Brush, R.S., Farrell, R.L., Krisa, K.A., Mishra, C., White-rot fungus and uses thereof. United States Patent Number: 5,554,535. Date of Patent: Sep. 10, 1996.

12. Blanchette, R.A., Brush, T.S., Farrell, R.L., Krisa, K.A., Mishra, Process for treatment of waste stream using *Scytinostroma galactinum* fungus ATTCC 20966. United States Patent Number: 5,545,544. Date of patent: Aug. 13, 1996.

13. Blanchette, R.A., Brush, T.S., Farrell, R.L., Melanin compositions and uses thereof and resulting products. United States Patent Number: 5,538,752.

14. Farrell, R.L., Gelep, P., Anilionis, A., Javaherian, K., Maione, R.E., Rusche, J., Sadownick, B.A., Jackson, J.A., Cloning and expression of ligninases. United States Patent Number: 5,616,473. Date of Patent: Apr. 1, 1997.

15. Farrell, R.L., Use of RLDM TM 1-6 and other ligninolytic enzymes in the treatment of mechanical pulps. United States Patent Number: 4,687,745. Date of Patent: Aug. 18, 1987.

16. Farrell, R.L., Kirk, T.K., Tien, M., Novel enzymes which catalyze the degradation and modification of lignin. United States Patent Number: 4,687,741. Date of Patent: August 18, 1987

17. Farrell. R.L., Use of RLDM TM 1-6 and other ligninolytic enzymes in the bleaching of kraft pulp. United States Patent Number: 4,690,895. Date of Patent: Sep. 1., 1987.

18. Farrell, R.L., Use of RLDM TM 1-6 and other ligninolytic enzymes for the decolorization of E1 effluent. United States Patent Number: 4,692,413. Date of Patent: Sept. 8, 1987.

19. Dolphin, D.H., Nakano, T., Kirk, T.K., Wijesekera, T.P., Farrell, R.L., Maione, T.E., Porphyrins. United States Patent Number: 4,892,941. Date of Patent: Jan. 9, 1990.

20. Dolphin, D.H., Nakano, T., Kirk, T.K. Wijesekera, T.P., Farrell, R.L., Maione, T.E., Porphyrins and uses thereof. United States Patent Number: 5,077,394. Date of Patent: Dec. 31, 1991.

21. Blanchette, R.A., Brush, T.S., Farrell, R.L., Krisa, K.A., Mishra, C., White-rot fungus and uses thereof. United States patent Number: 5,427,945. Date of Patent: Jun. 27, 1995.

22. Blanchette, R.A., Farrell, R.L., Iverson, S., Pitch degradation with white rot fungus. United States Patent Number: 5,472,874. Date of Patent: Dec. 5, 1995.

23. Zimmerman, W.C., Farrell, R.L., Mating process for preparing *Ophiostoma piliferum* fungi for pitch reduction. United States Patent Number: 5,695,975. Date of Patent: Dec. 9, 1997.

24. Blanchette, R.A., Burnes, T.D., Farrell, R.L., Pitch degradation with *Pseudomonas fluorescens*. United States Patent Number: 5,711,945. Date of Patent: Jan. 27, 1998.

25. Farrell, R.L., Hadar, Y., Wendler, P.A., Zimmerman, W., Composition containing strains of *Ophiostoma piliferum* and a method of using the composition to reduce the pitch content of pulpwood or pulp. United States Patent Number: 5,476,789. Date of Patent: Dec. 19, 1995.

26. Blanchette; Robert A., Brush; Theresa S., Farrell; Roberta L. , Krisa, Keith A., Mishra, Chittra, White-rot fungus and uses thereof United States Patent Number. 5,554,535. Date of Patent: September 10, 1996.

27. Blanchette; Robert A., Brush; Theresa S., Farrell; Roberta L., Krisa, Keith A., Mishra, Chittra, Process for treatment of waste stream using Scytinostroma galactinum fungus ATCC 20966 United States Patent No. 5,545,544. Date of Patent: August 13, 1996

28. Farrell, R.L., Daniel, R.M., Morgan, H.W., Iverson, S., Williams, D.P., Alkali-Tolerant Xylanases, US Patent No. 08/501,126.

Granted PCT Applications

29. Farrell, R.L., Molina, J.G., Gutierrez, J.E.D., PCT/NZ2004/00078 entitled "Isolation and Use of Decay Fungi". Filed 23 April 2004. Granted 24 October 2005.

Provisional Patents

New Zealand

1. Farrell, R.L. Fungi for Improvements of Wood and Pulp Appearance and Qualities, NZ Patent Application No. 505017.

2. Farrell, R.L. Fungi for Improvements of Wood and Pulp Appearance and Qualities, NZ Patent Application No. 505316

3. Farrell, R.L. Fungi for Improvements of Wood and Pulp Appearance and Qualities, NZ Patent Application No. 506630

4. Farrell, R.L., Lamar, R.T., White, R.B., Bioremediation, NZ Patent Application Ref. PS217333. Filed 31 January 2003.

5. Farrell, R.L., Lamar, R.T., White, R.B., Bioremediation, NZ Patent Application Ref. PS218582. Filed 3 February 2003.

6. Farrell, R.L., Molina, J.G., Gutierrez, J.E.D., Isolation and Use of White Rot Fungi, NZ Patent Application No. 525521, Filed 24 April 2003.

7. Farrell, R.L., Thwaites, J.M., Blanchette, R.A., Held, B.W., Biocontrol, NZ Patent Application No. 526508, Filed 13 June 2003.

Australia

8. Nevalainen, P.L. Bergquist, V.S.J. Te'o and R.L. Farrell (2002). Fungal host for expression and production of recombinant products. Australian provisional patent application 20002951432. Filed 16 September 2002.

9. Nevalainen, P.L. Bergquist, V.S.J. Te'o and R.L. Farrell (2004). PCT. #1405967 entitled “Fungal host for expression and production of recombinant products”. Filed 24 September 2004.

USA Filed Patent Application

10. Farrell, R.L., Fungi for Improvements of Wood and Pulp Appearance and Qualities, Patent Application filed on March 30, 2001. Ref. No. P420421

Significant other publications

1. Farrell, R.L. 2008. Priorities: yesterday, today and tomorrow. AWIS Issue 4 December 2008, p11.

2. Duncan, S.M., Farrell, R.L., Thwaites, J.M., Held, B.W., Arenz, B., Jurgens, J.J., and Blanchette, R.A. (2005) Biodiversity and Enzymatic Functioning of Terrestrial Fungi Isolated from the Antarctic Specially Protected Areas (ASPA) of the Ross Island containing Heroic Period Historic Huts. Proceedings SCAR Symposium, Brazil, July 2005.

3. Farrell, R. L., Krzywanski, R., Pikula, S. (2005). Albino Fungal Effects on TMP and Dissolving Pulp Mill Operations, Tappi China Paper 2005. Proceedings 18-21 September 2005, Beijing, China.

4. Farrell, R.L., Thwaites, J.M, Su, Y-C, Wang, E.I, Ho, C., Hata, K. 2005. Improved brightness and decreased pitch in biotech-treated Eucalyptus sp. International Colloquium on Eucalyptus pulp, Concepcion, 24-26 May 2005.

5. Richardson, J.D., Wong, K.K.Y., Farrell, R.L., Handcock, C.L. (2004). Pilot Plant Evaluation of the Biomechanical Pulping Potential of Six New Zealand and One North American Fungi. Ensis Contract Report Output No. 36582, July 2004.

6. Nevalainen, K.M.H., Wu, C., Te'o, J, Bergquist, P and Farrell, R. (2004). Development of Ophiostoma as a novel fungal expression host. 7th European Conference on Fungal Genetics, Copenhagen 17-20 April 2004. Poster Abstracts VIIIp-37, p. 205.

7. Su, Y-C., Wang, E.I., Farrell, R.L., Ho, C., Thwaites, J., Chang, H-M., (2004). Screening of Fungi for Removal of Wood Extractives". Proceedings 58th Appita Annual Conference and Exhibition, incorporating the Pan Pacific Conference, Canberra, Australia Vol 1, pp. 27-34.

8. Held B. W., R.A. Blanchette, R.L. Farrell, S. Duncan "Deterioration and conservation issues associated with Antarctica's historic huts ", Proceedings of the Symposium Art, Biology and Conservation, Metropolitan Museum of Art, June 13-15, New York, (2002).

9. Reay, S.D., Walsh, P.J., Thwaites, J.M., Farrell R.L. (2001). The black pine bark beetle Hylastes ater in New Zealand. New Zealand Tree Grower, November 2001, 32-33.

10. Wong, K.Y., Farrell, R.L., Richardson, J.D., Kreber, B. Current Status of Using Fungi to Reduce Energy Consumption of Mechanical Pulping. PAPRO Confidential Contract Report. Output No. 33037, December 2001.

11. Farrell, R. L. Invited speaker, Refereed Proceedings. Biocontrol with Classic Manipulated Fungi. New Zealand Biotechnology Association Conference 2001.

12. Farrell, R. L. Evaluation of Deterioration of Historic Huts on Ross Island. Invited speaker, Refereed Proceedings. Absolutely Positively Microbes. New Zealand Microbiological Society Conference 2001. Wellington, 19 November 2001.

13. Reay, S.D., Thwaites, J.M., Farrell, R.L. and Walsh, P.J. (2001). The role of the bark beetle, *Hylastes ater* (Coleoptera: Scolytidae), as a sapstain fungi vector to *Pinus radiata* seedlings: a crisis for the New Zealand forestry industry? Meeting of IUFRO Working Parties on bark beetle and reforestation pests. Velaine-en-Haye, France, 5-7 September, 2001.

14. Farrell, R.L. (2001) Identification of fungal infections in imported timber. MAF Policy Research Results Report 1999-2000 and 2000/2001, Operational Research Results, Ministry of Agriculture and Forestry, Wellington, p. 21 – 23.

15. Reay, S.D., Walsh, P.J., Ram, A. and Farrell, R.L. (2000) Insect factors affecting seedling establishment in second rotation Pinus radiata forests in New Zealand. Proceedings of the XXI IURFO World Congress 2000, 7-12 August, Kuala Lumpur.

16. Janson R., and Farrell, R.L. (2000).Identification of Fungal Infections in Imported Timber. New Zealand Ministry of Agriculture and Forestry Report MBS 304.

17. Schirp, A., Kreber, B., Farrell, R.L. (2000). Capability of staining fungi to cause structural changes in New Zealand Radiata Pine: Toughness testing and enzyme production. IX Chilean Conference on Forest Products Research and Developments, 18-24 October 2000, Concepcion, Chile.

18. Farrell, R. L., Mulcahy, J., Nobbs, R., Rose, T., Richardson, D., Ram, A., Thwaites, J., Haryati, T., Held, B., McNew, D., Blanchette, R.A., Harrington, T.C. (2000). Research in progress: resin degradation and brightness increase of radiata pine with fungal treatment in lab and mill trials. International Symposium on Environmentally Friendly and Emerging Technologies for a Sustainable Pulp and Paper Industry 25-29 April 2000, Taipei, Taiwan

19. Janson, R., Ram A, Duncan, S. and Farrell RL. (2000) Survey of Fungal Biodiversity on Wood Packaging Imported into New Zealand. Proceedings of the XXI IURFO World Congress 2000, 7-12 August. Kuala Lumpur.

20. Janson, R. and Farrell, R. (2000). Wood packaging imported into New Zealand: A threat to Biosecurity? Presented New Zealand Cellular and Molecular Mycology Conference, Bulls, NZ July 2000.

21. Janson, R. and Farrell, R. (2000). Fungal diversity in imported wood packaging: A Biosecurity threat? Presented New Zealand Cellular and Ecological Society Conference 2000, Hamilton, NZ Nov. 19-23 2000.

22. Lin, F. and Farrell, R. (2000). Melanisation in *Sphaeropsis sapinea.* Presented New Zealand Cellular and Molecular Mycology Conference, Bulls, NZ July 2000.

23. Cooper, P. and Farrell, R. (2000). Validation of the Sapstain Danger Index. Presented New Zealand Cellular and Molecular Mycology Conference, Bulls, NZ July 2000.

24. Kay, S. and Farrell, R.L. Assessment of Various Fungicide Treatments for The Prevention of Sapstain On *Pinus radiata* Timber. Hort Research Client Report No: 98/173. June 1998.

25. Eden, D., Chittenden, C., Kreber, B., van der Waals, J., Wakeling, R. and Farrell, R.L., Harrington, T.C., "Variable tolerance of *Ophiostoma* spp, and *Diplodia pinea* to commercial antisapstain products. Paper prepared for the 29th Annual Meeting Maastricht, The Low Countries, 14-19 June 1998. IRG Secretariat, KTH, Sweden.

26. Kay, S.J., Farrell, R.L., Hadar, E., Hadar, Y., Blanchette, R.A., Harrington, T.C. (1997). Sapstain in New Zealand - the causes and a potential anti-sapstain solution. *Proceedings of the 11th Biennial Conference of the Australasian Plant Pathology Society*, pp.21.

27. Ah-Chee, A., Farrell, R. L., Stewart, A., Hill, R. A. (1998). Decay Potential of Basidiomycete Fungi from Pinus radiata. Proc. 51st N.Z. Plant Protection Conf. P 235-240.

28. Forde Kohler, L.J., Dinus, R., Malcolm, E., Rudie, A., Farrell, R. & Brush, T. (1995) Enhancing softwood mechanical pulp properties through chip treatment with *Ophiostoma piliferum*. Proceedings of the 6th Conference on Biotechnology in the Pulp and Paper Industry: Advances in Applied and Fundamental Research, Ed. E. Swebotnik and K. Messner, p.225-228.

29. Wall, M.B., Stafford, G., Noel, Y., Fritz, A., Iverson, S. Farrell, R.L. (1995) Treatment with *Ophiostoma piliferum* improves chemical pulping efficiency. Proceedings of the 6th Conference on Biotechnology in the Pulp and Paper Industry: Advances in Applied and Fundamental Research, Ed. E. Swebotnik and K. Messner, p.205-210.

30. Chang, H-m. and Farrell, R.L. (1995) The effect of xylanase treatment on the bleachability of softwood and hardwood kraft pulps. Proceedings of the 6th Conference on Biotechnology in the Pulp and Paper Industry: Advances in Applied and Fundamental Research, Ed. E. Swebotnik and K. Messner, p.75-80.

31. Biely, P., McKay, D.L. and Farrell, R.L. (1995) Catalytic properties of two major endo-ß-1,4-mannanases of *Penicillium kloeckeri*. Proceedings of the 6th Conference on Biotechnology in the Pulp and Paper Industry: Advances in Applied and Fundamental Research, Ed. E. Swebotnik and K. Messner, p.479-484.

32. Farrell, R.L., Biely, P., and McKay, D.L. (1995) Production of hemicellulase by the fungus *Penicillium kloeckeri*. Proceedings of the 6th Conference on Biotechnology in the Pulp and Paper Industry: Advances in Applied and Fundamental Research, Ed. E. Swebotnik and K. Messner, p.485-489.

33. Blanchette, RA, Behrendt, C and Farrell, RL. Biological Protection of Sapstain for the Forest Products Industry. Proceedings 1994 TAPPI Biological Sciences Symposium, 3-6 October 1994, Minneapolis, Minnesota.

34. Farrell, RL, Brush, T, Iverson, S, Krisa, K, Fritz, A, Blanchette, RA, "Cartapip": A Biobleaching Product for Control of Pitch and Resin Acid Problems in Pulp Mills. Proceedings 1994 TAPPI Biological Sciences Symposium, 3-6 October 1994, Minneapolis, Minnesota.

35. Farrell, R.L. “Status of Enzyme Bleaching R&D and Mill Work”, March, 1992, Proceedings of Non-Chlorine Bleaching Conference, Hilton head, South Carolina, Miller Freeman Co., San Francisco, California.

36. Farrell, R.L., Wendler, P.A., Hadar, Y., Blanchette, R.A., Brush, T.S., Ho, C., “Cartapip® A Biological Product for the Control of Pitch and Resin Acid Problems in Pulp Mills,” August 1991, The International Symposium on Applications of Biotechnology to Tree Culture, Protection and Utilization, Columbus, Ohio, USA.

37. Wendler, P.A., Brush, T.S., Farrell, R.L., “Biological Control of Pitch Problems in a Thermomechanical Pulp Mill,” April 1991, 6th Proceedings International Symposium on Wood and Pulping Chemistry, Melbourne, Australia, p. 501-508.

38. Farrell, R.L., Brush, T.S., Mishra, C., Skerker, P.S., and Blanchette, R.A., “New Bleach Sequences of Kraft Pulp Using White-Rot Fungi,” 1990, Proceedings of Cellucon ’90: Ellis Horwood Publishers, Birmingham, UK, Editor: R. Kennedy.

39. Farrell, R.L., “Kraft Pulp Bleaching with Ligninolytic Enzymes,” 1986, Proceedings Third Conference on Biotechnology in the Pulp and Paper Industry, STFI, Stockholm, Sweden, p.65.

40. Kirk, T.K., Croan, S., McDonagh, T., and Farrell, R.L., "Production of Ligninases by *Phanerochaete chrysosporium,*" Proceedings from Biotechnology in the Pulp and Paper Industry, STFI, Stockholm, Sweden, p.61.

In addition to the publications listed, the following reports have been made recently on the research projects in New Zealand led by Professor Farrell:

- 1996-2000: Thirty-six Confidential Client Reports published for the New Zealand Forestry Consortium; Two Parliamentary Reports for New Zealand Foundation for Research Science and Technology,
  1998-2001: Five Confidential Client Reports published for Kimberly Clark Australia,
- 2001: Two Confidential Client Reports published for Rayonier Forests, Two Confidential Reports for Carter Holt Harvey Forests; Two Contracted Reports for MAF Quarantine Service; One Confidential Research Report for HortResearch; One Parliamentary Report for New Zealand Foundation for Research Science and Technology.
- 2002: Two confidential Client Reports for Carter Holt Harvey Forests, one Confidential Literature Review for MAF Quarantine Service

PhD and MSc Students and Theses - Chief Supervision Professor Roberta L. Farrell

2009 Doctor of Philosophy – thesis submitted – Joel A Jurgens
"Fungal biodiversity in extreme environments and wood degradation potential"

Doctor of Philosophy – Dirk Stahlhut
"Decay fungi from New Zealand leaky buildings: isolation, identification and preservative resistance"

2008-

Doctor of Philosophy – Lisa Robson
"Comparative and Functional Analysis of Gene Expression in *Ophiostoma* Species"

Doctor of Philosophy – D. Scott Fraser
"Fate and effects of pulp mill effluent solids in the soil environment"

2007

Doctor of Philosophy – Shona M Duncan
"Fungal Diversity and Cellulytic Activity in the Historic Huts of Ross Island, Antarctica"

2006

Masters of Science Degree - Erina Hingston
"The Manipulation of Cell Wall Polysaccharide Gene Expression"

2004

Masters of Science Degree – Tuti Haryati

Masters of Science Degree - Lisa M Robson
"Microbial Abundance and Diversity Surrounding Mummified Seals in Miers Valley, Antarctica"

Masters of Science Degree - Sulee Kuy
"Bovine Milk Factors and Intestinal Integrity"

Masters of Science Degree - Sandra Jo Wilcocks
"Extracellular Protein Expression by *Ophiostoma* sp."

Masters of Science Degree Thesis of Jonni Hazeline Ripi
"Identification of Genes and Promoters Relevant to Pineapple Fruit Ripening"

2003

Doctor of Philosophy - Joanne Mare Thwaites
"Black and White: Investigations in the ecology, biology and biological control of sapstain fungi in New Zealand"

Masters of Science Degree - Ryuji Minasaki
"Microbial Diversity Relation to Human Activity in Historic Areas of Ross Dependency, Antarctica"

Masters of Science Degree - Matthew Bryant
"Hollow Giants Heart rot in kauri (Agathis australis (D.don) Lindl.) and decay fungi"

2002

Doctor of Philosophy - Anke Schirp
"Effect of New Zealand sapstaining fungi on radiata pine"

MPhil Degree - ZiDong Jiang
"Study to Evaluate the Feasibility of Using Fungal-Based Remediation for treatment of PCP/Dioxin/Furan Contaminated Soil"

Masters of Science Degree – Kim Watson
"Computer visualization and modelling to increase the investigative study of epidemiology of sapstain"

Masters of Science Degree - Donald Scott Fraser
"Potential of organic waste amendments in the biocontrol of Phytophthora root rot of avocado : a case study in ethics of sustainable agriculture"

2001

Masters of Science Degree - Yonghong Zhou
"Adenylate Kinase: Gene Expression, enzyme and antibody characterisation"

(cont.)

Masters of Science Degree – Edward J. S. Hearnshaw
"Enzymatic treatments for the forming of linerboard"

2000

Masters of Science Degree - Reena Narayan
"Genetic Modification of *Pinus radiata* with Ferulate 5-Hydroxylase and Cytochrome P-450 Reductase Genes from *Arabidopsis thaliana*"

Masters of Science Degree - Feng Lin
"Elucidation of Melanin Pathway Genes of N.Z. sapstain *Sphaeropus sapinea*"

Masters of Science Degree - Paula Cooper
“Validation of the Sapstain Danger Index”

1999
Masters of Science Degree – Phillippa Rhodes
“Characterisation of hydrocarbon degrading Antarctic Pseudomonas species”

Masters of Science Degree – Robert Alexander O’Neill
“Purification of an oxidase from Pseudomonas resinovorans”

Masters of Science Degree – Joanne Maree Thwaites
“Sapstain fungi: colonisation and competition on radiata pine”

Masters of Science Degree – Tripti Singh
“Sphaeropsis sapinea antibody development and wood microscopy analysis”