

Paul Barton RAINEY

CURRENT POSITION

2007- Professor of Evolutionary Genetics & James Cook Research Fellow, NZ Institute for Advanced Study, Massey University; External Scientific Member (Honorary Director), Max Planck Institute for Evolutionary Biology, Pollen; Visiting Professor & Co-Director, Hopkins Microbiology Course, Stanford University; Principal Investigator, Allan Wilson Centre for Molecular Ecology and Evolution.

EDUCATION

University

1986-89 Ph.D. University of Canterbury, New Zealand.
1984-86 M.Sc. (1st class hon). University of Canterbury, New Zealand.
1979-82 B.Sc. (Botany), University of Canterbury, New Zealand.

FELLOWSHIPS AND ACADEMIC AWARDS

2011- Member of the Max Planck Society
2010 James Cook Research Fellowship
2007 Elected Fellow of the Academy of the Royal Society of NZ (FRSNZ)
2007-09 Senior Adjunct Researcher, EAWAG, Switzerland
2006- Visiting Professor, Stanford University
1994-1999 Biotechnology and Biological Sciences Research Council Advanced Research Fellow, University of Oxford
1994-1997 BTP Fellowship in Microbiology and Molecular Genetics at Pembroke College
1988 William Georgetti Scholarship
1988 New Zealand Microbiological Society Ph.D. Prize
1986 University Grants Committee Scholarship

PREVIOUS POSITIONS

Oct 08-July 09 Director, Allan Wilson Centre for Molecular Ecology & Evolution.

2003-2007 Chair of Ecology and Evolution, School of Biological Sciences, University of Auckland (95% appointment from 2003 – 2005); Acting Deputy Director (Research) June 2005-Dec 2005.

2003-2005 International Professor of Biology (5% appointment), Department of Plant Sciences, University of Oxford (funded through the Division of Life and Environment Sciences); Senior Research Fellow, St Cross College; Visiting Professor, Wadham College.

1997-2003 Stipendary Lecturer, Wadham College, Oxford.

1997-2005 Fellow of St Cross College, Oxford

1996-2002 University Lecturer in Microbial Ecology and Population Genetics, Department of Plant Sciences, University of Oxford.

1994-1999 BBSRC Advanced Research Fellow, Department of Plant Sciences, University of Oxford.

1991-1994 Higher Scientific Officer, Molecular Microbial Ecology, Institute of Virology and Environmental Microbiology, Oxford: *Pseudomonas fluorescens* genome mapping, microbial population ecology, ecological divergence in *Pseudomonas*.

1989-1991 Post Doctoral Research Scientist, Microbial Physiology Group, Department of Plant Sciences, Cambridge University: Biochemistry and molecular genetics of tolaasin toxin production by *Pseudomonas tolaasii*. Visiting associate, Clare Hall, Cambridge.

GRADUATE SUPERVISION

Current (PhD only)

Yuriy Pichiguin (2010-) Marsden Fund. Mathematical models of major transitions

Yeserin Yildirim (2010-) Allan Wilson Centre PhD Scholarship. Genetics of sea slugs

Thomas Finn (2010-) Marsden Fund. Evolution under anaerobiosis

Sonal Shawamarani (2010-) Marsden Fund. Evolution under anaerobiosis

Andy Farr (2009-) NZIAS PhD Studentship. Reverse evolution

Yunhou Liu (2009-) Massey University Doctoral Scholarship. Catabolite repression.

Sylke Nestmann (2008-) NZIAS PhD Studentship. Genetics of adaptive evolution

Caroline Rose (2008-) Massey University Doctoral Scholarship. Evolution of multicellularity

Frederic Bertels (2008-) Allan Wilson Centre PhD Scholarship. Evolution of palindromic repeats

Completed (PhD / D. Phil. only)

Jenna Gallie (2006-2009). FRST Bright Futures Scholarship. Evolution of a mutable switch [currently post doc, Department of Biology, University of Washington]

McDonald (2005-2008). NERF. Molecular analysis of AWS [currently post doc SINICA, Taiwan]

Peter Meintjes (2005-2008). FRST Bright Futures Scholarship. Evolution of cooperation [currently scientific advisor for BioMatters]

Jacob Malone (2002-2005). D. Phil. BBSRC. Biochemistry of GGDEF domain proteins [currently post doc, Biocentrum, Basel]

Stefanie Gehrig (2002-2005). D. Phil. Gatsby Charitable Foundation. Genetics of adaptive evolution [currently commissioning editor, Oxford University Press]

Michael Brockhurst (2000-2003). D. Phil. Wellcome Trust. Evolution of virulence [currently faculty at University of Liverpool]

John Bohannon (1999-2002). D. Phil. Christopher Welch Scholarship. Spatial localisation of cellulose biosynthetic enzymes [currently free-lance writer for *Science*]

Patrick Goymer (1999-2002). D. Phil. BBSRC. Genetics of adaptive evolution [currently deputy biological sciences editor, *Nature*]

Eleni Bantinaki (1998-2002). D. Phil. BBSRC. Genetics of adaptive evolution [currently scientist, Oxford biotech company]

Micaela Gal (1999-2003). D. Phil. BTP Ltd. IVET development and application to the plant rhizosphere [currently PHLS, Cardiff]

Sophie Kahn (1995-1998). D. Phil. University of Oxford. Experimental evolution: genetics of adaptation.

Bernhard Haubold (1994-1997). D. Phil. BBSRC. Population genetics of *Pseudomonas* [currently faculty member Max Planck Institute for Evolution, Ploen]

Postdoctoral Researchers (current)

Steve Ritchie (2010–) Allan Wilson Centre. Evolution of infectious disease

Eric Libby (2009-) NZIAS Postdoctoral Fellowship. Mathematical analysis: levels of selection

Katrin Hammerschmidt (2009-) Marsden Fund. Evolution of individuality

Monica Gerth (2008-) FRST Postdoctoral Fellowship. The HutD governor of gene expression

Gayle Ferguson (2008-) FRST Postdoctoral Fellowship. Evolution of a mutable switch

Xue-Xian Zhang (2003-) Massey University. Genetics of histidine regulation

Postdoctoral Researchers (alumni)

Jonathan Gauntlet (2008-2010) Marsden Fund. Signalling and transport [currently Ondek, Perth, Australia]

Christian Kost (2007-2009) Humboldt Fellow. Unravelling the effects of history in evolution [currently Max Planck Institute for Chemical Ecology, Jena]

Dominik Refardt (2005-2008) Swiss National Science. Evolution of virulence [currently ETH (Theoretical Biology)]

Bertus Beaumont (2004-2007) Marsden Fund. Reverse evolution [currently Faculty Kavli Institute for NanoScience, Delft University]

Darby Brown (2006-2007) Marsden Fund. Signalling and transport [currently teaching in Wisconsin]

Christina Moon (2002-2005) BBSRC. Spatial and temporal distribution of signals in the plant-root environment [currently scientist, AgResearch, Palmerston North, NZ]

Stephen Giddens (2002-2005) EU. *Pseudomonas* genomics [currently post doc, Plant Sciences, Oxford]

Robert Jackson (2001-2004) BBSRC. Type three secretion and translocation of effector proteins [currently faculty, University of Reading]

Christopher Knight (2001-2004) NERC. A proteomic perspective on adaptive evolution [currently post doc, UMIST]

Rees Kassen (1999-2004) NSERC. Evolution of diversity [currently faculty, University of Ottawa]

Xue-Xian Zhang (2000-2003) NERC. Molecular analysis of indigenous plasmids [currently, Senior Research Fellow, Massey University]

Angus Buckling (1999-2002) NERC. Evolution in temporally varying regimes [currently Royal Society URF & Lecturer, Zoology, Oxford]

Ruth Massey (1998-2000) EU. Rhizosphere biology [currently Departmental Lecturer, Zoology, Oxford]

Gail Preston (1997-2000) BBSRC. Type three secretion in plant-microbe interactions [currently Royal Society URF, Plant Sciences, Oxford]

Andrew Spiers (1997-2005) BBSRC / University of Oxford. *Pseudomonas* genetics [currently senior lecture, University of Abertay]

Michael Travisano (1997-1999) BBSRC. Adaptive radiation [currently faculty at University of Minnesota]

RESEARCH GRANTS

2010	James Cook Fellowship	Extending the Modern Synthesis	\$NZ 240k
2010	Marsden Fund (NZ)	Principles of genetic evolution	\$NZ 870k
2010	NIH (with SDSU)	Ecology of the CF lung	Funded
2010	Auckland Regional Council	Population genetics of sea slugs	\$NZ 180k
2009	TCPH (with four others)	Population genetics of <i>P. aeruginosa</i>	\$NZ 75k
2008	Marsden Fund (NZ)	Evolution of multicellularity	\$NZ 900k
2008	Paykel Trust	Small equipment grant	\$NZ 10k
2007	TEC (with eleven others)	Allan Wilson Centre	\$NZ 3,000k pa
2007	UARC (with two others)	Genetic structure of <i>Staphylococcus</i>	\$NZ 93k
2006	UARC (NZ)	Evolution of virulence	\$NZ 120k
2005	Marsden Fund (NZ)	Signalling and transport	\$NZ 730k
2004	UARC (NZ)	Vibrio population genetics	\$NZ 30k
2003	Marsden Fund (NZ)	Reverse evolution	\$NZ 630k
2003	NERF (NZ) (with six others)	Genomics of Acidovorax	\$NZ 6,000k
2002	EU	Genomics of Pseudomonas	£150k
2001	NERC	Adaptive evolution	£440k
2001	BBSRC	Novel bacterial polymers	£97k
2001	BBSRC	Rhizosphere gene expression	£200k
2001	BBSRC	<i>P. fluorescens</i> genome	£385k
2001	Sainsbury Foundation	Gatsby Studentship	£70k
2001	NZ Crop & Food	Fitness traits and plastic degradation	£60k
2000	BBSRC	Special Research Studentship	£70k
2000	BBSRC	Type III secretion	£200k
2000	Wellcome Trust	RNA phage evolution	£70k
1999	NERC	Plasmid encoded fitness traits	£200k
1999	NZ Crop & Food	Determinants of pathogenicity	£30k
1998	NERC	Niche specificity	£166k
1998	BBSRC	High res map	£91k
1998	EU	Determinants of fitness	£85k
1998	Sutcliffe Speakman	DNA Sequencer	£25k
1998	University of Oxford	DNA Sequencer	£25k
1997	BBSRC	Molecular basis of rhizosphere ecology	£150k
1997	Royal Society	<i>Pseudomonas</i> -plant signal exchange	£10 k
1997	BBSRC	Commonalities in colonization	£50 k
1995	Nipa Laboratories	<i>In vivo</i> expression technology	£50 k
1995	BBSRC	Population genetics	£70 k
1994	Royal Society Small Grant	Population genetics	£10 k
1994	BTP plc Contingency loci in <i>Pseudomonas</i>		£15 k
1994	University Pump-Priming	Population genetics	£10 k
1994	BBSRC	Determinants of ecological success	£250k

SCIENTIFIC PUBLICATIONS

Published papers

- Bertels, F. and **Rainey, P. B.** (2011). Within genome evolution of REPINs: A new family of miniature mobile DNA in bacteria. *PLoS Genetics*, in press.
- Libby, E. and **Rainey, P. B.** (2011). Exclusion rules, population bottlenecks, and the evolution of stochastic switching. *Proceedings of the Royal Society (London) B*, 10.1098/rspb.2011.0146.
- Kidd, T. J., Ramsay, K. A., Grimwood, K., **Rainey, P. B.** & Bell, S. C. (2011). Comparison of pulsed-field gel electrophoresis and multi-locus sequence typing of *Pseudomonas aeruginosa* isolates in cystic fibrosis sputum. *Journal of Clinical Microbiology* **49**, 263-268.
- Best, N, Fraser, J. D., **Rainey, P. B.**, Roberts, S. A., Thomas, M. G. & Ritchie, S. R. (2011). Nasal carriage of *Staphylococcus aureus* in healthy Aucklanders. *The New Zealand Medical Journal* **124**, in press.
- Ritchie, S. R., Fraser, J. D., Libby, E., Morris, A. J., **Rainey, P. B.**, Thomas, M. G. (2011). Demographic variation in community-based MRSA skin and soft tissue infection in Auckland, New Zealand. *The New Zealand Medical Journal* **124**, in press.
- McDonald, M. J., Cooper, T. F., Beaumont, H. J. E. & **Rainey, P. B.** (2011). The distribution of fitness effects of new mutations in *Pseudomonas fluorescens*. *Biology Letters*. **7**, 98-100.
- Rainey, P. B.** and Kerr, B. (2010). Cheats as first propagules: A new hypothesis for the evolution of individuality during the transition from single cells to multicellularity. *BioEssays* **32**, 872-880.
- Zhang, X.-X., Liu, Y.-H. & **Rainey P. B.** (2010). CbrAB-dependent regulation of *pcnB*, a poly(A) polymerase gene involved in polyadenylation of RNA in *Pseudomonas fluorescens*. *Environmental Microbiology* **12**, 1674-1683.
- Refardt, D. & **Rainey, P. B.** (2010). Tuning a genetic switch: experimental evolution and natural variation of prophage induction. *Evolution*. **64**, 1086-1097.
- Knight, C. G., Zhang, X.-X., Gunn, A., Brenner, T., Jackson, R. W., Giddens, S. R., Sripardi, P., Zitzmann, N. & **Rainey, P. B.** (2010). Testing temperature induced proteomic changes in the plant associated bacterium *Pseudomonas fluorescens* SBW25. *Environmental Microbiology Reports* **2**, 396-402.
- Beaumont, H. J. E., Gallie, J., Kost, C., Ferguson, G. C. & **Rainey, P. B.** (2009). Experimental evolution of bet-hedging. *Nature* **462**, 90-93.
- McDonald, M. J., Gehrig, S. M., Meintjes, P. L., Zhang, X.-X. & **Rainey, P. B.** (2009). Adaptive divergence in experimental populations of *Pseudomonas fluorescens*. IV. Genetic constraints guide evolutionary trajectories in a parallel adaptive radiation. *Genetics* **183**, 1041-1053.
- Silby, M. W., Cerdeno-Tarranga, A. M., Vernikos, G., Giddens, S. R., Jackson, R. W., Preston, G. M., Zhang, X.-X., Moon, C. D., Gehrig, S. M., Godfrey, S. A. C., Knight, C. G., Malone, J. G., Robinson, Z., Spiers, A. J., Harris, S., Challis, G. L., Yaxley, A. M., Harris, D., Seeger, K., Murphy, L., Rutter, S., Squares, R., Quail, M. A., Saunders, E., Anderson, I., Mavromat, K., Brettin, T. S., Bentley, S., Hotherhall, J., Stephens, E., Thomas, C. M., Parkhill, J., Levy, S. B., Rainey, P. B. & Thomson, N. R. (2009). Genomic and genetic analyses of diversity and plant interactions of *Pseudomonas fluorescens*. *Genome Biology* **10**, R51.

- Zhang, X.-X. & **Rainey, P. B.** (2008). The regulation of copper homeostasis in *Pseudomonas fluorescens* SBW25. *Environmental Microbiology*, **10**, 3284-3294.
- Moon, C. D., Zhang, X.-X., Matthijs, S. Schäfer, M, Budzikiewicz, H. & **Rainey, P. B.** (2008). Pyoverdine-mediated iron acquisition in the plant growth-promoting bacterium, *Pseudomonas fluorescens* SBW25. *BMC Microbiology* **8**, 7.
- Zhang X.-X. & **Rainey, P. B.** (2008). Dual involvement of CbrAB and NtrBC in the regulation of histidine utilization in *Pseudomonas fluorescens* SBW25. *Genetics* **178**, 185-195.
- Zhang X.-X., Scott, K. Meffin, R. & **Rainey, P. B.** (2008). Genetic characterization of *psp* encoding the DING protein in *Pseudomonas fluorescens* SBW25. *BMC Microbiology* **7**, 114.
- Giddens, S. R., Jackson, R. W., Moon, C. D., Jacobs, M. A., Zhang, X.-X., Gehrig, S. M. & **Rainey, P. B.** (2007). Mutational activation of niche-specific genes provides insight into regulatory networks and bacterial function in a complex environment. *Proceedings of the National Academy of Sciences, USA* **104**, 18247-18252.
- Zhang X.-X. & **Rainey, P. B.** (2007). Construction and validation of a neutrally marked strain of *Pseudomonas fluorescens* SBW25. *Journal of Microbiological Methods* **71**, 78-81.
- Zhang X.-X. & **Rainey, P. B.** (2007). Genetic analysis of the histidine utilization (*hut*) genes in *Pseudomonas fluorescens* SBW25. *Genetics* **176**, 2165-2176.
- Tett, A., Spiers, A. J., Crossman, L. C., Aagar, D., Ciric, L., Dow, M., Fry, J., Harris, D., Lilley, A. K., Parkhill, J., Quail, M. A., Seeger, K., Squares, R., Snyder, L., Saunders, N., **Rainey, P. B.**, Thomas, C., Turner, S. L., Zhang, X.-X., Field, D. & Bailey, M. J. (2007). Sequence-based analysis of pQBR103, a representative of a unique, transfer proficient mega plasmid resident in the microbial community of sugar beet. *The ISME Journal* **1**, 331-340.
- Bantinaki, E., Kassen, R., Knight, C. G., Robinson, Z. & Spiers, & **Rainey, P. B.** (2007). Adaptive divergence in experimental populations of *Pseudomonas fluorescens*. III. Mutational origins of wrinkly spreader diversity. *Genetics* **176**, 441-453.
- Rainey, P. B.** (2007). Unity from conflict. *Nature* **446**, 616.
- Fukami, T, Beaumont, H. J. E. & Zhang, X.-X. **Rainey, P. B.** Immigration history controls diversification in experimental adaptive radiation. *Nature* **446**, 436-439.
- Malone, J. G., Williams, R., Christen, M., Jenal, U., Spiers, A. J. & **Rainey, P. B.** (2007). The structure-function relationship of WspR; a *Pseudomonas fluorescens* response regulator with a GGDEF output domain. *Microbiology* **153**, 980-994.
- Zhang, X.-X. & **Rainey, P. B.** (2007). Biological and ecological significance of a plant-inducible copper-transporting P1-type ATPase from *Pseudomonas fluorescens* SBW25. *Molecular Plant-Microbe Interactions* **20**, 581-588.
- Kirkelund Hansen, S., **Rainey, P. B.**, Haagenen, J. A. J & Molin, S. (2007). Evolution of species interactions in a biofilm community. *Nature* **445**, 533-536.
- Buckling, A., Brockhurst, M. A., Travisano, M. & **Rainey, P. B.** (2007). Experimental adaptation to high and low quality environments under different scales of temporal variation. *Journal of Evolutionary Biology*, **20**, 296-300.

- Brockhurst, M. A., Fenton, A., Roulston, B. & **Rainey, P. B.** (2006). The impact of phages on interspecific competition in experimental populations of bacteria. *BMC Ecology* **6**, 19 doi: 10.1186/1472-6785-6-19.
- Knight, C. G., Zitzmann, N, Prabhakar, S, Antrobus, R, Dwek, R, Hebestreit, H., & **Rainey, P. B.** (2006). Unravelling adaptive evolution: how a single point mutation affects the protein co-regulation network. *Nature Genetics* **38**, 1015-1022.
- Goymer, P., Kahn, S. G., Malone, J. G., Gehrig, S. M., Spiers, A. J. & **Rainey, P. B.** (2006). Adaptive divergence in experimental populations of *Pseudomonas fluorescens*. II. Role of the GGDEF regulator, WspR, in evolution and development of the wrinkly spreader phenotype. *Genetics*, **173**, 515-526.
- Zhang, X.-X., George, A., Bailey, M. J. & **Rainey, P. B.** (2006). The histidine uptake and degradation operon (*hut*) of *Pseudomonas fluorescens* SBW25 is active on plant surfaces, but is not required for colonisation of sugar beet seedlings. *Microbiology*, **152**, 1867-1875.
- Brockhurst, M. A., Buckling, A. & **Rainey, P. B.** (2006). Spatial heterogeneity and the stability of host-parasite coexistence. *Journal of Evolutionary Biology*, **19**, 374-379.
- Jackson, R. J., Preston G. M. & **Rainey, P. B.** (2005) Genetic characterisation of *Pseudomonas fluorescens* SBW25 *rsp* gene expression in the phytosphere and in vitro. *Journal of Bacteriology* **187**, 8477-8488.
- Arcus, V. L., **Rainey, P. B.** & Turner, S. J. (2005). The PIN-domain toxin-antitoxin array in mycobacteria. *Trends in Microbiology* **13**, 360-365.
- Spiers, A. J. & **Rainey, P. B.** (2005). The *Pseudomonas fluorescens* SBW25 wrinkly spreader A-L biofilm requires attachment factor, cellulose fibre and LPS interactions to maintain strength and integrity. *Microbiology* **151** 2829-2839.
- Cooper, T. F., Beaumont, H. J. E. & **Rainey, P. B.** (2005). Biofilm diversity as a test of the insurance hypothesis. *Microbiology* **151**, 2815-2816.
- Brockhurst, M. A., Buckling, A. & **Rainey, P. B.** (2005). The effect of a bacteriophage on diversification of the opportunistic bacterial pathogen *Pseudomonas aeruginosa*. *Proceedings of the Royal Society (London) B* **272**, 1385-1391.
- Rediers, H., **Rainey, P. B.**, Vanderleyden, J. & De Mot, R. (2005). Unravelling the secret lives of bacteria: IVET and DFI promoter traps as tools for exploring niche-specific gene expression. *Microbiology and Molecular Biology Reviews* **69**, 217-261.
- Zhang, X.-X., Lilley, A. K., Bailey, M. J. & **Rainey, P. B.** (2004). The indigenous *Pseudomonas* plasmid pQBR103 encodes plant-inducible genes including three putative helicases. *FEMS Microbiology Ecology*, **51**, 9-17.
- Kassen, R., Llewellyn, M. & **Rainey, P. B.** (2004). Ecological constraints in a model adaptive radiation, *Nature* **431**, 984-988.
- Zhang, X.-X., Lilley, A. K., Bailey, M. J. & **Rainey, P. B.** (2004). Functional and phylogenetic analysis of a plant-inducible oligoribonuclease (*orn*) gene from an indigenous *Pseudomonas* plasmid. *Microbiology* **150**, 2889-2898.

- Knight, C. G., Kassen, R., Hebestreit, H. & **Rainey, P. B.** (2004) Global analysis of predicted proteomes: functional adaptation and physical properties. *Proceedings of the National Academy of Sciences USA* **101**, 8390-8395.
- MacLean, C. Bell, G. & **Rainey, P. B.** (2004) The evolution of a pleiotropic fitness tradeoff in *Pseudomonas fluorescens*. *Proceedings of the National Academy of Sciences USA* **101**, 8072-8077.
- Silby, M. W. **Rainey, P. B.** & Levy, S. B. (2004). IVET experiments in *Pseudomonas fluorescens* reveal cryptic promoters at loci associated with recognizable overlapping genes. *Microbiology* **150**, 518-520.
- Kassen, R & **Rainey, P. B.** (2004). The ecology and genetics of microbial diversity. *Annual Review of Microbiology* **58**, 207-231
- Rainey, P. B.** & Cooper, T. F (2004). Evolution of bacterial diversity and the origins of modularity. *Research in Microbiology* (special issue on genome plasticity dedicated to the memory of Michel Blot) **155**, 370-375.
- Jessup, C. M., Kassen, R., Forde, S. E., Kerr, B., Buckling, A., **Rainey, P. B.** & Bohannon, B. J. M. (2004) Big questions, small worlds: Microbial model systems in ecology. *Trends in Ecology and Evolution* **19**, 189-197.
- Brockhurst, M. A., **Rainey, P. B.** & Buckling, A. (2004). The effect of spatial heterogeneity and parasites on the evolution of host diversity. *Proceedings of the Royal Society* **271**, 107-111.
- Rediers, H., Bonnacarrere, V., **Rainey, P. B.**, Hamonts, K., Vanderleyden, J. & De Mot, R. (2003). Development and application of a *dapB*-based IVET system to study colonization of rice by the endophytic nitrogen-fixing bacterium *Pseudomonas stutzeri* A15. *Applied and Environmental Microbiology* **69**, 6864-6874.
- Spiers, A. J., Bohannon, J., Gehrig, S. M. & **Rainey, P. B.** (2003). Biofilm formation at the air-liquid interface by the *Pseudomonas fluorescens* SBW25 wrinkly spreader requires an acetylated form of cellulose. *Molecular Microbiology*, **50**, 15-27.
- Gal, M., Preston, G. M., Massey, R. M., Spiers, A. J. & **Rainey, P. B.** (2003). Genes encoding a cellulosic polymer contribute toward the ecological success of *Pseudomonas fluorescens* SBW25 on plant surfaces. *Molecular Ecology*, **12**, 3109-3121.
- Brockhurst, M. A., Morgan, A. D., **Rainey, P. B.** & Buckling, A. (2003). Population mixing accelerates coevolution. *Ecology Letters* **6**, 975-979.
- Rainey, P. B.** & Rainey, K. (2003). Evolution of co-operation and conflict in experimental bacterial populations. *Nature* **425**, 72-74.
- Aldrige, P., Paul, R., Goymer, P. J., **Rainey, P. B.** & Jenal, U. (2003). Role of the GGDEF regulator PleD in polar development of *Caulobacter crescentus*. *Molecular Microbiology* **47**, 1695-1708.
- Buckling, A. & **Rainey, P. B.** (2002). The role of parasites on sympatric and allopatric diversification of hosts. *Nature* **420**, 496-499.
- Hodgson, D., **Rainey, P. B.** & Buckling A (2002). Mechanisms linking, productivity and invasibility in experimental bacterial communities. *Proceedings of the Royal Society (London) B* **269**, 2277-2283.

- D'Argenio, D. A., Calfee, M. W., **Rainey, P. B.** & Pesci, E. C. (2002) Autolysis and autoaggregation in *Pseudomonas aeruginosa* colony morphology mutants. *Journal of Bacteriology* **184**, 6481-6489.
- Buckling, A & **Rainey, P. B.** (2002). Antagonistic coevolution between a bacterium and a bacteriophage. *Proceedings of the Royal Society (London) B* **269**, 931-936.
- Spiers, A. J., Kahn, S. G., Bohannon, J., Travisano, M. & **Rainey, P. B.** (2002). Adaptive divergence in experimental populations of *Pseudomonas fluorescens*. 1. Genetic and phenotypic bases of wrinkly spreader fitness. *Genetics* **161**, 33-46.
- Preston, G. M. Bertrand, N. & **Rainey, P. B.** (2001). Type III (Hrp) secretion in plant growth-promoting *Pseudomonas fluorescens* SBW25. *Molecular Microbiology* **41**, 999-1014.
- Spiers, A. J., Field, D., Bailey, M. J. & **Rainey, P. B.** (2001). Notes on designing a partial genomic database: The PfSBW25 Encyclopaedia, a sequence database for *Pseudomonas fluorescens* SBW25. *Microbiology* **147**, 247-249.
- Buckling, A. Kassen, R. Bell, G. & **Rainey, P. B.** (2000). Diversity and disturbance in experimental microcosms. *Nature*, **408**, 961-964.
- Spiers, A. J., Buckling, A. & **Rainey, P. B.** (2000). The causes of *Pseudomonas* diversity. *Microbiology*, **146**, 2345-2350.
- Rainey, P. B.** & Preston, G. M. (2000). IVET strategies: valuable tools for biotechnology. *Current Opinion in Biotechnology* **11**, 440-444.
- Travisano, M. & **Rainey, P. B.** (2000). Studies of adaptive radiation using model microbial systems. *American Naturalist*, **156**, S35-S44.
- Kassen, R. Buckling, A. Bell, G. & **Rainey, P. B.** (2000) Diversity peaks at intermediate productivity in a laboratory microcosm. *Nature*, **406**, 508-512.
- Rainey, P. B.** & Moxon, E. R. (2000). When being hyper keeps you fit. *Science* **288**: 1186-1187.
- Rainey, P. B.**, Buckling, A., Kassen, R. & Travisano, M. (2000). The emergence and maintenance of diversity: Insights from experimental microbial populations. *Trends in Ecology and Evolution*, **15**, 243-247.
- Massey, R. M., **Rainey, P. B.**, Keane, O., Sheehan, B. & Dorman, C. J. (1999). Environmentally constrained mutation and adaptive evolution in *Salmonella*. *Current Biology* **9**, 1477-1480.
- Rainey, P. B.** (1999). Economics of mutation. *Current Biology* **9**, R371-R373.
- Rainey, P. B.** (1999). Adaptation of *Pseudomonas fluorescens* to the plant rhizosphere. *Environmental Microbiology* **1**, 243-258.
- Haubold, B., Travisano, M., **Rainey, P. B.** & Hudson, R. R. (1998). Testing linkage equilibrium in bacterial populations. *Genetics* **150**, 1342-1348.
- Preston, G. M., Haubold, B. & **Rainey, P. B.** (1998) Bacterial genomics and adaptation to life on plants: Implications for the evolution of pathogenicity and symbiosis. *Current Opinion in Microbiology* **1**, 589-597.

- Rainey, P. B.** & Travisano, M. (1998) Adaptive radiation in a heterogeneous environment. *Nature* **394**, 69-72.
- Rainey, P. B.**, Heithoff, D. & Mahan, M. (1997). Single-step conjugative cloning of gene fusions involved in microbial-host interactions. *Molecular and General Genetics* **256**, 84-87.
- Appleby, B. M., Petty, S. J., Blakey, J. K., **Rainey, P. B.** & MacDonald, D. W. Does variation of sex ratio enhance reproductive success of offspring in tawny owls (*Strix aluco*)? *Proceedings of the Royal Society, London Series B* **264**, 1111-1116.
- Ebert, D., **Rainey, P. B.**, Embley, M. & Scholz, D. (1996). Development, life cycle, ultrastructure and phylogenetic position of *Pasteuria ramosa* Metchnikoff 1888:rediscovery of an obligate endoparasite of *Daphnia magna* Straus. *Philosophical Transactions of the Royal Society, London B* **351**, 1689-1701.
- Haubold, B. & **Rainey, P. B.** (1996). Genetic and ecotypic structure of a fluorescent *Pseudomonas* population. *Molecular Ecology* **5**, 747-761.
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- Invited papers, chapters, articles**
- Rainey, P. B.** (2012). Section Editor: Evolutionary / Population Genetics. In *Encyclopedia of Genetics* 2nd edition (Editors-in-Chief Maloy, S. & Hughes, K.) Elsevier, Oxford. (forthcoming).
- Rainey, P. B.** (2011). Advances in evolution by convergence. *New Zealand Science Teacher* **126**, 12-13.
- Rainey, P. B. & Kerr, B. (2011). Conflicts among levels of selection as fuel for the evolution of individuality. In *The Major Transitions Revisited: The Evolution of Individuality*. (eds Calcott, B. & Sterelny K.). The Vienna Series in Theoretical Biology, MIT Press, in press.
- Rainey, P. B.** (2011). Adaptive radiation, the evolution of diversity and the emergence of rules governing phenotypic evolution. In *Microbes and the Origin of Species*. (eds Kolter, R. & Maloy, S.). American Society for Microbiology Press, in press.
- Zhang, X.-X. & **Rainey, P. B.** (2010). Bet hedging in the underworld. *Genome Biology* **11**, 137

- Rainey, P. B.** (2010). The de novo evolution of cooperation: an unlikely event. In *Social Behaviour: Genes, Ecology and Evolution*. (eds Szekely, T., Moore, A. & Komdeur, J.), Cambridge University Press, pp 357-359.
- Rainey, P. B.** (2009). Arrhythmia in tempo and mode (News & Views). *Nature*, **461**, 1219-1221.
- Rainey, P. B.** (2007). Using molecules to connect organisms, populations and communities. *Proceedings of the Royal Society (London) B* **274**, 2221.
- De Weert, S., Kuiper, I., Eijkemans, K., Kamilova F. D., Preston, G. M., Mulders, I. H. M., **Rainey, P. B.**, Bloemberg, G. V., Tikhonovich, I., Kravchenko, L., Wifjes, A. H. M., Azarova, T. & Lugtenberg, B. J. J. (2007). The role of competitive root tip colonization in the biological control of tomato foot and root rot. In *Biological Control of Plant Diseases*. (eds Chincholkar, S. B. & Mukerji, K. G.) Hawthorn Press, pp. 103-122.
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- Rainey, P. B.**, Brockhurst, M., Buckling, A., Hodgson, D. & Kassen, R. (2005). The causes and consequences of microbial diversity. In *Biological Diversity and Function in Soils*. (eds Bardgett, R., Hopkins, D & Usher, M.). Cambridge University Press, pp. 83-99.
- Rainey, P. B.** (2005). Bacteria evolve and function within communities: observations from experimental *Pseudomonas* populations. In *The Influence of Cooperative Bacteria on Animal Host Biology*. (ed. McFail-Ngai, M., Henderson, B., Ruby, N). Cambridge University Press, pp. 83-102.
- Rainey, P. B.** (2004). Bacteria adapt – genetically, by natural selection – even in the lab! *Microbiology Today* 31, 160-162.
- Rainey, P. B.** (2003). Big questions in evolution. *New Scientist*. 14th June 2003 issue (article featured on front cover).
- Preston G, Spiers A, Zhang X-X, Jackson R, Gal M, Knight C, Gehrig S, Malone J, Moon C, Godfrey S, Robinson Z, Bertrand N, Field D and **Rainey P. B.** (2003). The secret life of *Pseudomonas fluorescens* SBW25. In *Pseudomonas syringae and related pathogens*. (eds Iacobellis N.S., Collmer A., Hutcheson S.W., Mansfield J.W., Morris C.E., Murillo J., Schaad N.W., Stead D.E., Surico G., and Ullrich M.S.) Kluwer Academic Publishers. Dordrecht, The Netherlands. pp 347-353.
- Rainey, P. B.** (2003). Mutation rate evolution and implications for *Pseudomonas aeruginosa* in cystic fibrosis. In *Antibiotic Resistance in Cystic Fibrosis – an Emerging Crisis?* (ed. Pitt, T.) Royal Society of Medicine Press. pp 23-28.
- Bailey, M. J., **Rainey, P. B.**, Zhang, X.-X., & Lilley, A. K. (2002). Population dynamics, gene transfer and gene expression in plasmids, the role of the horizontal gene pool in local adaptation at the plant surface. In *Phyllosphere Microbiology* (eds Lindow, S. E., Hecht-Poinar, E. I. & Elliot, V. J.) American Phytopathological Society Press. pp 173-192.
- Rainey, P. B.** (1999). A sense of science. *Time Higher Education Supplement*, February 99; and yearly reviews of biology texts for *THES* until 2005).
- Moxon, E. R, Lenski, R. E. & **Rainey, P. B.** (1998). *Perspectives in Biology and Medicine* 42, 154-155.
- Rainey, P. B.** (1997) Contributor of definitions and short articles for *Encyclopaedia of Ecology and Environmental Management*. Blackwell Science.

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Moxon, E. R. & **Rainey, P. B.** (1995). Pathogenic bacteria; the wisdom of their genes. In *Ecology of Pathogenic Bacteria: Molecular and Evolutionary Aspects*. Proceedings of the 1995 Royal Netherlands Academy of Arts and Sciences Symposium. pp 255-268.

Rainey, P. B. & Beckman, K. (1994). Plant Pathology. In *Encyclopaedia of Molecular Biology*. (ed. J. Kendrew) Blackwell Scientific Publications. pp 838-843.

Rainey, P. B. (1994) Contributor of definitions on bacterial genetics for *Encyclopaedia of Molecular Biology*. (ed. J. Kendrew). Blackwell Scientific Publications.

Rainey, P. B., Moxon, E. R. & Thompson, I. P. (1993) Intraclonal polymorphism in bacteria. *Advances in Microbial Ecology* Vol 13, pp. 263-300. Plenum Press.

Rainey, P. B., Brodey, C. L. & Johnstone, K. (1992). Biology of *Pseudomonas tolaasii*, cause of brown blotch disease of mushrooms. *Advances in Plant Pathology*. **8**, 95-117. Academic Press.

Patents

Rainey, P. B., Spiers A. J. & Bantinaki, E. (2001). Bacterial polysaccharides and biofilm development. US Patent 20040054165

**INVITED CONFERENCE PRESENTATIONS, PLENARY PRESENTATIONS AND LECTURES
(2003-2011)**

- 2011
- American Society for Microbiology Annual Meeting (New Orleans)
Adaptive evolution of groups
 - Kavli Symposium on Phenotypic Evolution (Aspen, Colorado)
Unravelling the rules of genetic evolution
 - University of Wisconsin
Adaptive radiation and the rules of genetic evolution
 - University of Chicago
Adaptive radiation and the rules of genetic evolution
 - KITP, University of California, Santa Barbara
Evolution of a genetic switch
 - EMBO Genome Evolution (Vienna, Austria)
Evolution of bet hedging
 - Lactic Acid Bacteria Symposium (Egmond aan Zee, Netherlands)
Exclusion rules, bottlenecks and the evolution of bet hedging
- 2010
- Lorne Genome Conference (Lorne, NSW, Australia)
Evolution of bet hedging
 - Skerman Lecture (University of Queensland)
Inevitability and evolution
 - Ecological Society of America (Pittsburgh)
Exclusion rules, bottlenecks and the evolution of bet hedging
 - Conceptual Issues in Evolutionary Medicine
Mutualisms and host parasite evolution
 - Danish Technical University (Copenhagen, Denmark)
Extending the modern synthesis
 - San Diego State University
The role of development in evolution
 - Uppsala University
Unravelling the genetics of CbrA and histidine uptake
 - Pauanui, NZ (New Directions in Evolutionary Medicine)
The ecological dimension of infectious disease
- 2009
- University of Oslo (Centre for Ecological & Evolutionary Synthesis)
Evolution of bet hedging
 - University of Oslo (Darwin Day Celebration)
Evolution of individuality
 - Uppsala University (Department of Medical Biochemistry & Microbiology)
Evolution of bet hedging
 - Danish Technical University (Darwin Celebration)
Evolution of individuality
 - Danish Technical University (Department of Microbiology)
Evolution of bet hedging
 - Massey University (public lecture)
Evolution of life's diversity
 - University of Sydney (Department of Microbiology / Biology)
Evolution of bet hedging
 - Telluride Science Research Conference on Cystic Fibrosis
Predicting phenotypic evolution
 - American Academy for Microbiology Colloquium on Evolution (Galapagos)
Colloquium participant
 - Queenstown Molecular Biology Meeting (main meeting)
Evolution of bet hedging
 - Queenstown Molecular Biology Meeting (developmental biology satellite)
Predicting phenotypic evolution
 - COMBIO (Christchurch)
Evolution of bet hedging

Analytical Genetics (Asilomar)
Why evolution follows a limited subset of pathways
University of Arizona (Department of Ecology & Evolution) (two talks)
Evolution of bet hedging
Evolution of individuality
Stanford University (Department of Biology)
Evolution of bet hedging
University of Washington (Department of Biology)
Evolution of bet hedging

2008
International Society for Microbial Ecology (Cairns) (Plenary)
Evolution of interactions
Richard Moxon Festschrift (Oxford)
Evolution of bet-hedging
University of Valencia (Spain)
Reverse evolution
Centro Nacional de Biotecnología (CSIC), Madrid (Spain)
Evolution of bet-hedging
Society for General Microbiology, Biofilms (Dublin)
Evolution of biofilm communities
Radio NZ & Royal Society NZ Darwin Lecturer
Evolution of biological complexity (available as pod cast)
University of Otago
Evolution of bet-hedging
American Society for Microbiology, Beneficial Bacteria (San Diego)
Evolution of interactions
San Diego State University (two talks)
Evolution of individuality
Processes affecting diversification of Pseudomonas
Rockefeller Workshop on microbial complexity (Bellagio)
Evolution of bet-hedging
Max Planck Institute for Evolution (Ploen)
Evolution of individuality
New Zealand Microbiological Society (Christchurch) (two talks)
Evolution of bet-hedging
Evolutionary genetics of Pseudomonas

2007
American Society for Microbiology, Biofilms (Quebec)
Evolution of biofilm communities
Webster Centre for Infectious Disease (Otago)
Evolution of bet-hedging
Massey University (Palmerston North)
Evolution of bet-hedging
Australian Society for Evolution (Sydney)
Evolution of individuality
American Society for Microbiology, General Meeting (Toronto)
Evolution of cooperation and individuality
Society for the Study of Evolution (Education Symposium) (Christchurch)
Teaching evolutionary biology
Workshop on adaptive evolution (DTU, Copenhagen);
Evolution of bet-hedging
Prokaryogenomics; 3rd European Conference on Prokaryote Genomics (Tubegin)
The rhizosphere as seen through the eyes of bacteria
ETH Zurich (Microbiology)
Reverse evolution
ETH Zurich (Theoretical Biology)
Evolution of individuality
University of Queensland (two lectures)
Evolution of species interactions
The design and development of a new approach to teaching evolution

Jacques Monod Conference (evolution of virulence) (Roscoff)
Evolution of species interactions
Journée d'Ecologie de Toulouse (Toulouse)
Evolution of individuality
University of Montpellier (Montpellier)
Evolution of individuality
Society of Rationalists and Humanists (Auckland)
Evolution of individuality
Evolution vs. Creationism (a public debate, North Harbour Stadium)
The process of science and what evolution is
Cooperation Workshop (Philosophy Programme ANU, Canberra)
Evolution of individuality

2006 Okazaki Biology Conference (Okazaki, Japan)
Evolution of bet-hedging
Shizuoka University (Japan)
The origin and maintenance of diversity
Society for General Microbiology (two lectures) (University of Warwick)
The WspR di-guanylate cyclase
The evolution of phenotypic diversity
University of Auckland Medical School
Vibrio population genetics

2005 International Society for Molecular Biology and Evolution (Auckland)
Evolution of network structures
Imperial College (London)
Evolutionary genetics of cooperation and conflict
University College (London)
Evolutionary genetics of cooperation and conflict
University of Toronto (Toronto)
Evolutionary genetics of cooperation and conflict
University of Ottawa (Ottawa)
Evolutionary genetics of cooperation and conflict
University of Otago (Dunedin)
Seeing through the eyes of bacteria
Karolinska Institute (Stockholm – two lectures)
Genetics of phenotypic diversity
Evolution of regulatory networks
University of Queensland (Brisbane)
Evolutionary genetics of cooperation and conflict
Australian National University (Canberra)
Evolution of individuality
Dartmouth Medical College (New Hampshire)
Evolutionary genetics of cooperation and conflict
Tufts Medical School (Boston)
Evolutionary genetics of cooperation and conflict
Danish Technical University (Denmark)
Evolution in biofilm communities
Massey University (Albany)
Evolutionary genetics of cooperation and conflict

2004 EMBO workshop (Heidelberg)
Genetics of cellulose production
Institute Pasteur (Paris)
Evolutionary genetics of cooperation and conflict
University of Oxford (Oxford)
Evolutionary genetics of cooperation and conflict
University of Melbourne (Invitrogen Lecturer) (Melbourne)

Evolutionary genetics of cooperation and conflict
University of Auckland (Auckland)
Genetics of phenotypic diversity
International Society for Microbial Ecology (Cancun)
Evolution of cooperation and conflict
2nd Okazaki Biology Conference (Ishe Shima)
Evolutionary genetics of cooperation
Queenstown Molecular Biology Meeting (Queenstown)
Evolutionary genetics of cooperation
Australian Microbiological Society (Sydney)
Evolution of cooperation and conflict
Danish Technical University (Copenhagen)
Evolution of biofilm communities

2003

Dutch Academy for Microbiology (Amsterdam)
Evolution of diversity
British Ecological Society (Lancaster)
Evolutionary origins of diversity
Gordon Research Conference on Ecological and Evolutionary Functional
Genomics (New Hampshire)
Ecological genetics of plant-colonising bacteria
Gordon Research Conference on Microbial Population Biology (New Hampshire)
Genetics of phenotypic diversity
Rockefeller Workshop on the interaction between beneficial bacterial and
eukaryotes (Bellagio)
Evolution of modularity
Department of Biological Sciences, University of Pittsburgh (by special invitation
of the graduate students)
Evolution of cooperation and conflict
European Society for Evolutionary Biology Society (Leeds)
Genetics of phenotypic diversity
Society for General Microbiology (Edinburgh)
Evolution of microbial diversity
Massey University (Palmerston North)
Evolution of cooperation and conflict
New Zealand Microbiological Society (Auckland)
Evolution of microbial diversity

RECREATIONAL ACTIVITIES

I spend time each day playing the piano (mostly Bach); I am interested in wine, I read avidly, I garden and walk in the hills when I can. In 2006 I built a hut on a remote part of Great Barrier Island: I go there as often as I can.