

# CURRICULUM VITAE

## Personal details

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## Academic qualifications

PhD, University of Adelaide, (1993); thesis entitled *Factorial Linear Model Analysis*.  
M.Agr.Sc., University of Adelaide, (1982); thesis entitled *Patterns in Correlation Matrices Arising from Wine-tasting and Other Experiments*.  
B.Sc.Agr., Sydney University (1972); majored in Biometry

## Employment record:

2009 – present *Adjunct Senior Lecturer in Statistics*, University of South Australia  
1989 – 2009 *Senior Lecturer in Statistics*, University of South Australia (formerly South Australian Institute of Technology)  
1988 – 1989 *Lecturer in Statistics*, South Australian Institute of Technology  
1978 – 1988 *Lecturer in Applied Statistics*, Roseworthy Agricultural College, South Australia  
1972 – 1978 *Biometrician*, Division of Horticultural Research, CSIRO, South Australia

## Membership of professional societies

1972 – present Biometric Society;  
Statistical Society of Australia  
1990 – present Institute of Mathematical Statistics

## Professional experience

### 1. Statistical Research

#### Design and linear model analysis of experiments

I have pioneered the development of a multitiered approach to experiments involving multiple randomizations, defining this class in Brien (1983). I have published papers and written a PhD thesis that describes a strategy for mixed model analysis that facilitates the analysis of complicated experiments, especially multitiered experiments (Brien, 1983, 1989, 1992a). Forms of multiple randomization that are employed in multitiered experiments and the formulation of randomization-based mixed models for such experiments are discussed by (Brien and Bailey, 2006). This has been expanded and extended to cover longitudinal experiments in Brien and Demétrio (2009). Brien and Payne (1999) outline the computation of their analyses of variance and this has been

implemented in the widely available statistical package Genstat (Brien and Payne, 2006). Brien and Demétrio (1998a and b) give a detailed study of the method's implications for the design and analysis of grazing trials. Current work includes: investigations into the structure of multitiered experiments and the conditions under which they are balanced (Brien and Bailey, 2009, 2010); the design of multiphase experiments that involve a laboratory/measurement phase subsequent to an initial phase (for example Brien, Harch and Correll, 2009). I maintain a web site at <http://chris.brien.name/multitier> that provides an introduction and an overview to the design and analysis of multitiered experiments.

### **The design of incubator and glasshouse experiments**

The design of experiments to study different species of native plant species, soils and soil-preparation treatments in incubator and greenhouse experiments has been investigated by T. T. Tran and C. J. Brien, in association with R. A. Bailey and J. Boland. This has resulted in the formulation of general methods for constructing quasi-Latin square designs and their extension to quasi-Latin rectangles, a new class of designs. Also, there has been the development of split plot designs in which both main plots and sub-plots employ two-dimensional designs and in which sub-plot treatments are latinized.

### **The analysis of structure in correlation matrices**

In association with A.T. James, W.N. Venables and O. Mayo, I have developed methods for analyzing correlation matrices for equal correlation patterns (Brien *et al.*, 1984 and 1988).

### **Design and analysis of sensory evaluation experiments**

I have formulated an approach to the design and analysis of wine sensory evaluation experiments that is appropriate given the variation in judges and that enables judge performance to be measured as part of each experiment. This work began as part of Master's thesis but has been taken further since then (Ewart and Brien, 1986; Brien, 1987; Brien *et al.*, 1987). It led to the work described under the previous two headings.

### **Research students**

I was the principal supervisor for Dr. T. T. Tran and, an associate supervisor for M. J. Goss, the latter from the School of Management. I am an associate supervisor of H. C. Lee from the School of Management.

## **2. Statistical Consulting**

My key areas of consulting are in the design of experiments and their analysis using modern statistical modelling techniques such as mixed modelling, generalized linear models (GLMs) and their combinations.

The lecturing positions that I have held since 1978 have involved the provision of a part-time statistical consulting service to students and staff. I have consulted in a wide range of areas including: agriculture, business and marketing, information technology, environmental sciences, oenology, pharmacy and physiotherapy. On occasion, I have also undertaken consulting for commercial companies. There have been a number of joint publications arising from this work.

My employment with the CSIRO Division of Horticultural Research was as a consulting biometrician and I was involved in the planning, analysis and interpretation of biological and chemical experiments.

## **3. Lecturing**

At the University of South Australia I have given a unit on Statistical Quality Control and another on Advanced Design and Analysis of experiments to students in the Honours Degree in Industrial and Applied Mathematics and a unit on linear models to Statistics

majors in the degree in Mathematics and Computer Studies. Since 2000 I have been delivering short course and external mode versions of the Design and Analysis of Experiments, Tests and Trials for professional development courses contracted by SEEC (now DASI) and for Engineering students. I have given introductory statistics subjects to students in several of the courses offered by the University: the degrees in Accounting, Business and Management, Health Sciences, Building Studies, Library Studies and Planning; the associate diplomas/certificates in Civil Engineering, Mechanical Engineering and Industrial Metallurgy. In particular, for the years 1994 to 2000 I was responsible for establishing and coordinating the subject Statistical Analysis in Business, a core subject in the Division of Business with 1400 students a year. I was an author of the textbook written for this subject. In 2006 I redeveloped this course to become Statistics for Business and, from 2007 to 2008, I coordinated this course.

At Roseworthy Agricultural College I was responsible for the development and teaching of the statistical and information technology service courses to agriculture, natural resource management, oenology and wine-marketing courses.

I am particularly interested in the development service statistics courses that emphasize the application of statistical methods and the use of computers. In the service teaching of Statistics in the School, I have established the use of assessable tutorial tests to promote student learning and feedback and exercises for lectures to attempt in lectures to break up the lecture and promote engagement. I have also been involved in promoting the use of PowerPoint presentations to appropriately deliver material in service courses. I maintain web sites containing information and resources for students.

#### **4. Administration**

From July 2002 to February 2003 I was Acting Head, School of Mathematics and Statistics. I undertook this role again for a month in February 2007 followed by supporting the new Head for several months.

In 2005 and from March 2003 to July 2003 I was Leader of the Applied Statistics Group within the School and a member of the School Executive Committee. From the beginning of 1997 until the beginning of 2000 I was the Administrative Head of the School of Mathematics and Statistics at the City West Campus and a member of the School Executive Committee. I also undertook these roles in 1993.

Since 2004 I have been Program Director of both the Bachelor and Masters of Quantitative Finance. In 1995 I was the Coordinator for the Bachelor of Applied Science (Honours) in Industrial and Applied Mathematics.

At Roseworthy Agricultural College, I was responsible for establishing, coordinating, planning and administering the computing facilities at the College during the period 1978–88.

- a) planning the substantial development of the College's computing facilities and the associated preparation of submissions,
- b) development of policies for use of the facilities,
- c) the monitoring of recurrent expenditure and usage of the central computer,
- d) involvement in the selection and acquisition of terminals, microcomputers, finance and word processing equipment, and
- e) membership of internal and external committees concerned with computing.

I was also Head of the Department of Applied Science for 1985–86. In this capacity my activities included: membership of the College's fund-allocating committee; administration of recurrent expenditure in the department; involvement in personnel matters such as promotion, work assignment and staff appointments; making submissions for funds and staff on behalf of the department; and overseeing teaching within the department.

## 5. Professional Activities

### Professional offices

- 2008 – 2011 Member, Organizing Committee, GenStat Conference 2011  
2008 – Associate Editor, Journal of Agricultural, Biological and Environmental Statistics  
2004 Member of Council, S.A. Branch, Statistical Society of Australia  
1995 – 2000 Consulting Biometrician, Australian Journal of Wine and Grape Research  
1986 – 1987 Immediate Past-President, S.A. Branch, Statistical Society of Australia  
1984 – 1986 President, S.A. Branch, Statistical Society of Australia  
1982 – 1984 Vice-President, S.A. Branch, Statistical Society of Australia  
1975 – 1981 Member of Council, S.A. Branch, Statistical Society of Australia  
1973 Secretary, S.A. Branch, Statistical Society of Australia  
1984 – 1986 S.A. representative, Australasian Regional Council, Biometric Society  
1976 – 1977 Secretary, Australasian Region, Biometric Society

### Study leave and visits

- 1986–7: 3 months at the Statistics Department, Rothamsted Experiment Station and 3 months at the Mathematics Department, Imperial College of Science and Technology.  
1992–3: 4 months at the Center for Quality and Product Improvement, University of Madison, 6 weeks at the Statistics Department, Rothamsted Experiment Station and 10 days at the Escola Superior de Agricultura “Luiz de Queiroz” at ESALQ, Piracicaba to give a short course (Brien, 1992b).  
1996: 1 month at Queen Mary & Westfield College, London.  
2000 3 months at ESALQ of the Universidade de São Paulo at Piracicaba, São Paulo, including several brief visits to other Brazilian universities.  
2001 7 weeks at Queen Mary, University of London, and 6 weeks at the Statistics Department, IACR-Rothamsted.  
2003 3 weeks visiting ESALQ of the Universidade de São Paulo at Piracicaba, São Paulo and Universidade de Lavras, Lavras, Brazil.  
2004 3 weeks at Queen Mary, University of London.  
2006–7 4 months at Queen Mary, University of London, 4 weeks at ESALQ of the Universidade de São Paulo at Piracicaba, São Paulo and 6 weeks at Biomathematics and Bioinformatics Division, Rothamsted Research, UK.  
2008 Invited to participate in the four-week Design of Experiments programme at the Isaac Newton Institute, Cambridge, UK, a gathering of experts in the area.

### Selected publications and manuscripts

- Brien, C.J., Harch, B.D. and Correll, R.L. (2010) Multiphase experiments with at least one laboratory phase. I. Orthogonal designs. In preparation.  
Brien, C.J. and Bailey, R.A. (2010) Decomposition tables for multitiered experiments. II. Two-one randomizations. *Annals of Statistics*, **37**, ??–??.  
Brien, C. J. & Bailey, R. A. (2009) Decomposition tables for multitiered experiments. I. A chain of randomization. *Annals of Statistics*, **36**, 4184–4213.  
Brien, C. J. & Demétrio, C. G. B. (2009) Formulating mixed models for experiments, including longitudinal experiments. *Journal of Agricultural, Biological and Environmental Sciences*, **14**(3), 253–80.  
Brien, C.J. and Payne, R.W. (2006) AMTIER procedure. In R.W. Payne and P.W. Lane. (Eds) *Genstat Reference Manual Release 9, Part 3. Procedure Library PL 17*, 73–75. VSN International, Hemel Hempstead. <<http://www.genstat.co.uk>>

- Brien, C.J. and Bailey, R.A. (2006) Multiple randomizations (with discussion). *Journal of the Royal Statistical Society, Series B (Methodology)*, 68(4), 571–609.
- Brown, B.M., Brien, C.J. and Lu, Z. (2003) *Statistical Analysis in Business*. Sydney, Pearson Education Australia.
- Brien, C.J., Bailey, R.A., Correll, R.L., Harch, B.D., Payne, R.W. and Demétrio, C.G.B. (2003) Multitiered experiments web site. <<http://chris.brien.name/multitier/>>
- Brien, C.J. and Payne, R.P. (1999) Tiers, structure formulae and the analysis of complicated experiments. *The Statistician*, 48(1), 41-52.
- Brien, C.J., and Demétrio, C.G.B. (1998b) Using the randomisation in specifying the ANOVA model and table for properly and improperly replicated grazing trials. *Australian Journal of Experimental Agriculture*, 38(4), 325-34.
- Brien, C.J. and Demétrio, C.G.B. (1998a) Using the randomization in specifying the ANOVA model and table for grazing trials. <<http://chris.brien.name/multitier/grazall.ps>> April 1998.
- Brien, C.J. (1992b) *General method for determining the analysis of variance for experiments*. Escola Superior de Agricultura "Luis de Queiroz", Universidade de Sao Paulo, Piracicaba.
- Brien, C.J. (1992a). *Factorial Linear Model Analysis*. PhD thesis, University of Adelaide.
- Brien, C.J. (1989). A model comparison approach to linear models. *Utilitas Mathematica*, 36, 225–54.
- Brien, C.J., James, A.T., and Venables, W.N. (1988). An analysis of correlation matrices: variables cross-classified by two factors. *Biometrika*, 75, 469–76.
- Brien, C.J., May, P., and Mayo, O. (1987) Analysis of judge performance in wine-quality evaluations. *Journal of Food Science*, 52, 1273–9.
- Brien, C.J. (1987) Wine-quality scores - what do they tell us? In *Tasting Seminars Chardonnay and Pinot Noir* edited by T.H. Lee, 47-63. Australian Society of Viticulture and Oenology, Urrbrae.
- Ewart, A.J.E., and Brien, C.J. (1986) Sensory evaluation, an art or science? *Grapegrower and Winemaker*, 14th Annual Technical Issue, 45–6.
- Brien, C.J., Venables, W.N., James, A.T., and Mayo, O. (1984). An analysis of correlation matrices: equal correlations. *Biometrika*, 71, 545–53.
- Brien, C.J. (1983). Analysis of variance tables based on experimental structure. *Biometrics*, 39, 133–9.
- Brien, C.J. (1981). *Patterns in Correlation Matrices arising in Wine-tasting and Other Experiments*. unpublished M. Agr. Sc. thesis, Adelaide University.

## Presentations

### †Invited Addresses

*Differences between experimental designs elucidated by experimental structure* presented at the CSIRO Division of Mathematics and Statistics Conference in 1979.

*Sensory evaluation - the scientific approach* presented at a meeting of the S.A. Branch of the Statistical Society of Australia in 1982.

*Design and analysis of wine sensory experiments* presented at the 6th Australian Statistical Conference in 1982.

*Experimental structure and its advantages* presented at the 7th Australian Statistical Conference in 1984.

*A model comparison approach to linear models* presented at the

- S.A. Branch of the Statistical Society of Australia being the 1986 Presidential Address ,
- Applied Statistics Department, University of Reading in 1986,
- Statistics Department, Rothamsted Experiment Station in 1986,
- Mathematics Department, Imperial College of Science and Technology in 1986,
- †joint Clemson University/University of Georgia annual seminar in 1987.

*Statistical analysis of wine sensory evaluation experiments* presented at the Mathematics Department, Imperial College of Science and Technology in 1986,

*The analysis of judge performance in wine sensory experiments* presented at the Food Research Institute, Reading in 1986

*The analysis of uni-dimensional wine scores* presented at the

- †Scottish Agricultural Statistical Service, Edinburgh in 1987,
- Department of Enology and Viticulture, University of California, Davis in 1987.

*Wine-quality scores - what do they tell us?* presented at the Tasting Seminars† held in Canberra in 1987 by the Australian Society of Viticulture and Oenology.

*General method for determining the analysis of variance for experiments*, a short course presented in the Departamento de Matemática e Estatística at Escola Superior de Agricultura Luis de Queiroz in Piracicaba, Brasil in 1992.

*Multitiered experiments and their analysis* presented at the

- S.A. Branch of the Statistical Society of Australia in Adelaide, South Australia, in 1982.
- Simpósio Nacional de Probabilidade e Estatística in Rio de Janeiro, Brasil in 1992†;
- Joint Statistical Meeting in Boston, USA in 1992;
- Department of Statistics, University of Wisconsin, Madison, Wisconsin, USA in 1992
- Department of Statistics, Iowa State University, Ames, Iowa. USA in 1992
- Biometrics Unit, Cornell University, Ithaca, New York, USA in 1992
- Department of Mathematical Sciences, Goldsmiths' College, University of London, England in 1993
- Institute of Mathematics and Statistics, The University of Kent, Canterbury, Kent, England in 1993
- Statistics Department, Rothamsted Experimental Station, Harpenden, England in 1993

*Determining the model for complex experiments* presented at a Quality and Statistics seminar in the home of G.E.P. Box, Madison in 1992.

*On complex industrial experiments and multitiered experiments* presented at the University of South Australia, Adelaide in 1993.

*ANOVA with multiple sources for some contrasts* presented at the Joint Statistical Meetings, Chicago in 1996.

*Multitiered experiments and their analysis* (revised version) presented in the Department of Mathematical Sciences, Queen Mary and Westfield College, London in 1996.

*Multitiered experiments and their analysis* (short version) presented at the Sydney International Statistical Congress, Sydney in 1996.

*Tiers, structure formulae and the analysis of complicated experiments* presented at Genstat96, Adelaide in 1996.

*Using the randomization in specifying the ANOVA model and table for grazing trials* presented at Biometrics97, Warrina Resort in 1997.

*Design and ANOVA for experiments involving a field trial and laboratory analyses* presented at Environmetrics98, Jupiter's Casino, Queensland in 1998.

*Multitiered experiments: their randomization and analysis* presented at

- the Universidade Federal do Rio de Janeiro in Rio de Janeiro in 2000;
- the Instituto de Ciências Matemáticas e de Computação (ICMC) of the Universidade Federal de São Carlos in São Carlos in 2000;
- Escola Superior de Agricultura "Luiz de Queiroz" (ESALQ) of the Universidade de São Paulo in Piracicaba in 2000
- the Universidade Federal de Lavras (UFLA) in Lavras in 2000.

*Using the randomization in specifying the ANOVA model and table* presented at

- the Universidade Estadual de Campinas (UNICAMP) in Campinas in 2000;
- the Universidade Federal de Minas Gerais in Belo Horizonte in 2000;
- the Universidade Federal de Lavras (UFLA) in Lavras in 2000.

*Multiple randomizations in an experiment: what are some types?* presented at the 15<sup>th</sup> Australian Statistical Conference in Adelaide, Australia in 2000.

†*Design of two-phase experiments, especially those with field and laboratory phases and Using the randomization in specifying the ANOVA model and table for multitiered experiments* (short laboratory version) presented on 6<sup>th</sup> December 2000 at BiometricsSA, Adelaide, Australia.

†*Design of two-phase experiments, especially those with field and laboratory phases* presented at Queen Mary, University of London, London, UK and at the University of Sheffield, Sheffield, UK in 2001.

†*Design and ANOVA for experiments involving a field trial and laboratory analyses* presented at 196<sup>th</sup> Ordinary Meeting of the British Region of the Biometric Society in London, UK in 2001.

*Design and ANOVA for experiments involving a field trial and laboratory analyses* (expanded version) presented at Statistics Department, Rothamsted Experimental Station, Harpenden, England in 2001.

*Using the randomization in specifying the mixed models and ANOVA tables* presented at the University of Exeter, Exeter, UK in 2001.

*Design of experiments involving a field trial and laboratory analyses* presented at the Australasian Biometrics and NZ Statistical Association Joint Conference 2001, Christchurch, NZ.

*Multitiered experiments: their randomization and analysis* presented at School of Mathematics, University of South Australia, Mawson Lakes, SA in 2002.

*Randomization: the simple and the not so simple* presented at a meeting of the S.A. Branch of the Statistical Society of Australia in 2002.

*Multiphase experiments: design and analysis*, a six-hour workshop presented to the Victorian Department of Natural Resources and the Environment in 2002.

*Design and analysis of multiphase experiments*, a six-hour minicourse presented at the Departamento de Ciências Exatas in Escola Superior de Agricultura "Luiz de Queiroz" (ESALQ) of the Universidade de São Paulo, Piracicaba, Brazil in 2003.

†*Design, ANOVA and mixed models for experiments involving a field trial followed by laboratory analyses* presented at the joint 10<sup>th</sup> SEAGRO and 48<sup>th</sup> RBRAS meeting at the Universidade Federal de Lavras, Lavras, Brazil in 2003.

*Randomization-based mixed models*, a poster presented at the XXII<sup>nd</sup> International Biometrics Conference in parallel with Australian Statistical Conference 2004, Cairns, Australia in 2004.

*Pseudofactors in the design and analysis of multiphase experiments* presented at the Thredbo Conference of the Australasian Region of the International Biometric Society and Australasian GenStat Users Association Inc. in Thredbo Village, Australia, in 2005..

†*The design and analysis of experiments with a laboratory phase subsequent to an initial phase* presented at the Experimental Design One-day workshop held in honour of Professor Nye John's retirement at the University of Wollongong in 2005.

*Multiple randomizations* read jointly with Prof. R.A. Bailey at the Royal Statistical Society Research Section Ordinary Meeting in London in 2006. Also presented in the Statistics Seminar Series, School of Mathematics and Statistics, University of South Australia and at the National University of Ireland, Galway, Ireland in 2006.

*Design and analysis of experiments with a laboratory phase subsequent to an initial phase* presented at Departamento de Ciências Exatas in Escola Superior de Agricultura "Luiz de Queiroz" (ESALQ) of the Universidade de São Paulo, Piracicaba, Brazil, the Universidade Federal de Ceará in Fortaleza, Brazil, Bioinformatics Division, Rothamsted Research, Harpenden, UK and the School of Mathematical Sciences, Queen Mary, University of London, London, in 2006 and Glaxo-Smith Kline, Harlow, UK, in 2007. The latter was an invited webinar.

*Design and analysis of experiments with a laboratory phase following an initial phase* (short version) presented at DEMA 2006, Southampton, UK

†*Why all the tiers?* An invited workshop presented at Bioinformatics Division, Rothamsted Research, Harpenden, UK in 2007.

*Design and analysis of experiments with a laboratory phase subsequent to an initial phase* presented in the Statistics Seminar Series, School of Mathematics and Statistics, University of South Australia in 2007.

†*Tiers in gene expression microarray experiments*, an invited address at Designed Experiments: Methods & Applications 2008, Cambridge, UK in 2008.

*Tiers in gene expression microarray experiments*, presented at AustMS, University of South Australia, Adelaide, Australia in 2009.