

## COMMUNICATIONS OF THE DUBLIN INSTITUTE FOR

## ADVANCED STUDY, SERIES A (THEORETICAL PHYSICS)

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| 3.  | P.A.M. DIRAC, <i>Developments in quantum electrodynamics</i> , 1946                                     | 50p   |
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| 25. | J.H. RAWNSLEY, <i>The differential geometry of instantons</i> , 1976                                    | £1.50 |
| 26. | W. ISRAEL, <i>Differential forms in general relativity</i> , 2nd ed., 1979                              | £1.50 |

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## CONFERENCE REPORTS

## BAIL II

The second international conference on Boundary and Interior Layers-Computational and Asymptotic Methods, BAIL II, was held in Trinity College, Dublin, Ireland, from 16th to 18th June, 1982, under the auspices of the Numerical Analysis Group. The eightytwo participants came from eighteen countries and included for the first time strong delegations from the USSR and China.

The conference was cosponsored by the American Institute of Aeronautics and Astronautics, the American Meteorological Society, the Institute for Numerical Computation and Analysis and the Irish Mathematical Society.

The aim of this series of conferences is to bring together biologists, chemists, engineers, mathematicians, physicists and other scientists who encounter problems having solutions which exhibit boundary or interior layer behaviour. Both computational and asymptotic methods were discussed extensively at BAIL II, and the degree of difficulty of the problems to which these were applied showed a marked increase over that of the first conference in the series.

The eleven keynote speakers presented papers covering a wide variety of applications and several new computational and asymptotic methods. The areas of application included plasmas, hydrodynamic shocks, transonic airfoils, free surface problems, viscous flows and a variety of phenomena in meteorology. The new methods were concerned with turning point and parabolic problems having a singular perturbation and stiff and other special initial value problems.

In addition there were forty-four contributed papers. Many of these were concerned with boundary and interior layer problems arising in biology, chemistry, elasticity, fluid flow, heat transfer, meteorology and petroleum reservoir modelling. Others discussed various computational and asymptotic topics including uniform numerical methods for problems with a singular perturbation, multigrid methods, defect correction techniques, sparse matrices and eigenvalue problems.

When boundary or interior layers are encountered in practical problems it is often found that standard numerical techniques are inaccurate, too expensive or even divergent. This underlines the importance of devising robust numerical algorithms which take account of such layers. In

other cases the occurrence of layers may not have been recognised even though they may in fact be present. It is wise therefore to consider their presence as one possible cause for the degradation in performance of an otherwise well established numerical algorithm. That such is the case in a wide variety of situations is attested to by the many fascinating papers delivered at the first two conferences in this series.

In association with the BAIL II Conference an introductory short course was held on the same topic as the conference. This consisted of sixteen tutorial lectures on the various conference themes.

An exhibition of books and journals was also arranged. Eleven scientific and technical publishers exhibited fifty four books and sixteen journals.

For a representative collection of papers on the subject the reader may consult the three publications (4), (5) and (6) associated with the BAIL Conferences. The Proceedings of two earlier conferences on a similar topic are contained in (1) and (3). A comprehensive monograph on uniform numerical methods for problems with layers is (2), and an earlier monograph on complementary topics is (7).

It is proposed to hold the third conference in the series, BAIL III, from 20th to 22nd June, 1984.

#### BIBLIOGRAPHY

- (1) O.A. Exelsson, L.S. Frank, A. van der Sluis (eds.) "Analytical and Numerical Approaches to Asymptotic Problems in Analysis". North-Holland, Amsterdam (1981).
- (2) E.P. Doolan, J.J.H. Miller, W.H.A. Schilders "Uniform Numerical Methods for Problems with Initial and Boundary Layers". Boole Press, Dublin (1980).
- (3) P.W. Hemker, J.J.H. Miller (eds.) "Numerical Analysis of Singular Perturbation Problems". Academic Press, London (1979).
- (4) J.J.H. Miller (ed.) "Boundary and Interior Layers - Computational and Asymptotic Methods. Proceedings of the BAIL II Conference". Boole Press, Dublin (1980).
- (5) J.J.H. Miller (ed.) "Computational and Asymptotic Methods for Boundary and Interior Layers. Proceedings of the BAIL II Conference". Boole Press, Dublin (1982).
- (6) J.J.H. Miller (ed.) "An Introduction to Computational and Asymptotic Methods for Boundary and Interior Layers. Lecture Notes of a Short

Course held in association with the BAIL II Conference". Boole Press, Dublin (1982).

- (7) W.L. Miranker "Numerical Methods for Stiff Equations and Singular Perturbation Problems". Reidel, Dordrecht (1980).

*J.J. H. Miller*

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#### APPLIED STATISTICS IN IRELAND

A Conference on the above theme was held in Galway on May 13-14, 1982, attended by a most representative group of statisticians from all over Ireland. The Conference was an ideal opportunity for statisticians to get together and discover what other statisticians were doing.

Contributors to the Conference included statisticians working in third level educational institutions, the Civil Service and private industry. Their brief was to present papers involving the application of statistical methods to real problems, and this resulted in a widely varied range of topics, from the treatment of wind power as a spatial time process to the identification of the authorship of a certain tract by means of multivariate techniques.

Two invited speakers gave special review presentations. Professor David Cox of Imperial College, London, gave a highly interesting and wide-ranging presentation on the role of Asymptotic Theory in statistical practice. Conference participants were privileged to hear a lecture by a man so clearly a master of all he surveyed. Colm O'Muircheartaigh, of the London School of Economics, gave a very stimulating and highly amusing talk on the impact of sample survey theory on sample survey practice; the insights provided into the historical development of sample survey theory were most illuminating.

The rest of the conference consisted of a series of presentations describing the application of statistical techniques to particular problems. Professor R.E. Blackith (TCD) described a computer model of the possible relations between radiation and cancer. He examined in particular the form of the dosage-response curve relating ionising radiation and cancer by treating the problem as one in biological assay. Professor M.A. Moran (UCC) and Dr. B. Murphy (RTC, Cork) compared the parametric and product kernel approaches to discriminant analysis. They showed that the

latter approach was superior when the variables are independent or moderately correlated but that its behaviour otherwise is less predictable.

Dr. S.T.C. Weatherup (N.I. Dept. of Agriculture) described various statistical tests which are used to determine if newly bred varieties of crops can be distinguished from existing varieties. He described both univariate and multivariate methods of discriminating between varieties, and the determination of characteristics of new variates likely to be accepted by the present system.

Drs. J. Haslett, E. McColl and A. Raftery (TCD) presented the initial analyses of a project concerned with mapping the statistical characteristics of the Irish wind power resource. Their analysis involved the removal of non-stationarities in time and space, and an attempt to model the remaining space-time correlations. Subsequently, such a model would be used to develop improved estimates of long-term average wind power at sites where small amounts of data are available and by interpolation between sites to estimate wind power for sites at which no data is available.

Professor S.F. McNamara, Dr. K.F. McNamara, J. Conroy and T. Dooley (U.C.G.) spoke on a related topic. They described the analysis of the data collected from the international energy agency's prototype wave energy absorber KAIMEI during its sea trials at Yura in the Sea of Japan over the period September to March 1979. In order to determine the effectiveness of the KAIMEI in converting wave energy into useable electric power, the theory of multiple frequency response functions was applied to the data. Statistical measures were used to indicate the reasons why the KAIMEI failed to capture a great proportion of the available wave energy.

And now for something completely different! A.R. Unwin, D. Berman and M. Sloan (TCD) discussed a statistical approach to a long-running dispute concerning the authorship of "The Memoirs of Gaudenzio Di Lucca". They used multivariate statistics to analyse authors' styles and the claims of two of the most serious candidates were assessed. They also discussed the relationships between the statistical evidence available. In answer to a question, they had to admit that they could not reject the null hypothesis that the memoirs were written by Myles Na Gopaleen!

Professor M.A. Moran (UCC) and J. Langan (IIRS) gave a very practical illustration of the application of discriminant analysis to the identification of edible 'fats' on the basis of their fatty acid composition. A variety of models appropriate to the compositional nature of the data were

described and discriminant functions based on these models were applied to some real data. M.R. Stevenson (Gallagher Ltd.) spoke about the truncation of data and its relevance to a particular problem: animals (experimental units) are allocated at random to treatment-dose groups and the time to a predetermined response (i.e. death!) measured for each experimental unit. In general, most animals indicate response before termination of the experiment, but in a few cases, particularly in the low dose treatment groups, some animals fail to respond before termination.

Dr. A.E. Raftery (TCD) described a non-parametric approach to measuring social mobility. This measurement is usually based on a sample survey of employed males in which they are asked to give their occupation and that of their father. Dr. Raftery developed a non-parametric approach which facilitated the construction of social mobility indices; these indices could then be used to enable comparisons to be drawn between surveys carried out in different countries or at different times, or between birth cohorts within the same survey.

Dr. G. Kelly (UCC) discussed an application of the errors in variables model to the comparison of two different methods for measuring cardiac output. This model is particularly appropriate when comparing two measurement techniques where both are subject to error. An analysis of real data was presented.

Dr. D.J. Kilpatrick (N.I. Dept. of Agriculture) spoke about sampling methods using information on a concomitant variable. The problem considered was the estimation of the mean of a variable  $y$  when information was available on a related variable  $x$ . Alternative estimation methods used included stratification according to  $x$  value, the adjustment of the mean of  $y$  through a ratio or regression procedure and sampling with probability proportional to  $x$ . Applications to recent forest survey data were described.

Dr. D. McSherry (QUB) presented a paper on optimal efficiency, within the constraints of cultivar incompatibility, in trials with mixtures of different cultivars of a single crop. Trials were identified which, within such constraints, were optimally efficient.

Last, but (to coin a phrase) by no means least, Dr. M. Stuart (TCD) gave a very stimulating talk on the increasing use of statistics and probabilities in law cases in Ireland. In particular, he reviewed some technical issues arising in the probabilistic assessment of forensic evidence.

The relevance of the substance of this paper to the breathalyser laws was discussed in depth.

The Conference, which was organised by Dr. S.T.C. Weatherup (N.I. Dept. of Agriculture) and Dr. I.G. O Muircheartaigh (UCG), was the second in a series of what is hoped will be annual conferences run by a (so far) ad hoc grouping of statisticians working in Ireland.

*I. Ó Muircheartaigh*

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# CONFERENCE ANNOUNCEMENTS

## THIRD CONFERENCE ON APPLIED STATISTICS IN IRELAND

This conference will be held in the Slieve Donard Hotel, Newcastle, Co. Down, on 28th and 29th March, 1983. As was the case with previous conferences, the preference is for papers concerned with the application of statistical methods but other papers will be considered. There will be a special session devoted to statistical computing and another to the teaching of statistics. While these sessions will have some invited speakers, submitted papers concerned with these topics are as welcome as any others. The criteria for acceptance of a paper are that it can be delivered in a 20 minute presentation and that the organisers consider the subject matter appropriate to the conference. The organisers will make their decision on the basis of an abstract or brief synopsis of the proposed paper. Please send abstracts to, either:

Dr. S.T.C. Weatherup, Department of Agricultural Biometrics,  
Agricultural and Food Science Centre, Queen's University,  
Newforge Lane, Belfast BT9 5PX,  
Telephone Belfast: 661166, Extension 209

Professor D. Conniffe, The Economic and Social Research Institute,  
4 Burlington Road, Dublin 4: Telephone Dublin: 760115

The final date for receipt of abstracts is 10 January 1983 but the organisers urge potential contributors to write or telephone as soon as possible.

Even if you will not be submitting a paper please consider attending the conference. The conference is intended to be of interest to anyone who utilises statistical methods and not only to the professional statistician. The conference fee, which covers all meals and accommodation, is £48 sterling.

## BRITISH MATHEMATICAL COLLOQUIUM

The thirty-fifth B.M.C. will be held at the University of Aberdeen from 5th to 9th April, 1983. The programme is:  
Wednesday, 6th April

9.30 - 12.30 E.H. Brown, D.F. Holt, J. Toland;  
G.J.O. Jameson, W.S. Kendall, J.C. Wood