work meant that this award had a considerable impact on the international scientific community, particularly in France and Italy. As a result, a French-Italian colloquium on de Giorgi's work was held at the H. Poincaré Institute in November 1983.

De Giorgi's work was concentrated mainly on six areas: evolution problems, minimal surfaces, regularity of solution of second order partial differential equations, analytic solutions of partial differential equations with constant coefficients, Gamma-convergence theory and connected problems, and hyperbolic equations with discontinuous coefficients with respect to the time variable.

BOOK REVIEWS

"STATISTICAL METHODS IN RESEARCH AND PRODUCTION"   (4th Edn)

Edited by *Owen L. Davies* and *Peter L. Goldsmith*

Published by *Longman*, 1984,   xii + 478 pp.   £10.95 (paperback)

"In Japanese firms, Statistics is everywhere .....";
"... statistical charts at loading docks and throughout the factory floor";
"Last year Japanese Industry carried out over 1 million statistical experiments";
"Japan has an annual National Statistics Day";
"Train-schedules in Tokyo railway stations are stem and leaf displays";
"American industry is now investing in massive training and education programs in Statistics, Quality Control and Reliability Methods".

- from a presentation by Blanton Godfrey (Bell Labs) at the 1984 American Statistical Association meeting in Philadelphia.

Most people nowadays accept that Japanese consumer goods are of high quality, and much of this progress in quality has been attributed to the work of W. Edwards Deming, the American statistician who has been a consultant to Japanese industry since 1945. The statistical methods that have been of such value to Japanese industry are essentially developments of the basic methods presented so competently in this book.

The object of the book, stated in the opening lines of the introduction, is "to facilitate a better understanding and a wider use of statistical methods by staff engaged in Research and Production, particularly in the chemical industry". The book originated as a 'company book' written by a team of authors

within Imperical Chemical Industries, the first edition appearing in 1947. Revised and enlarged editions appeared in 1949 and 1957. The current edition (available in paper covers) is essentially the fourth edition published in 1972, but with corrections made and some references updated. This book is excellent, and should be available to every engineer working in production or research in industry. Because of its practical orientation, the book will continue to be used as a methods textbook by Statistics students.

The Chapter headings are:

1. Introduction;

2. Frequency Distributions;

3. Averages and Measures of Dispersion;

4. Statistical Inference;

5. Statistical Tests; Choosing the Number of Observations;

6. Analysis of Variance;

7. Linear Relationships between Two Variables;

8. Multiple and Curvilinear Regression;

9. Frequency Data and Contingency Tables;

10. Control Charts;

11. Sampling and Specifications;

12. Simulation.

I found many attractive features in the book:

* An excellent introduction to Significance testing (Sections 4.5 - 4.8) which covers the t-test, sign test, rank-sum test and F-test in just six pages, and still manages to find space for such sensible comments as: "... it is wrong to associate different levels of statistical significance with different levels of practical importance".

* A useful explanation of the conclusions to be drawn in Multiple Comparisons (pp. 150 - 153).

* A good discussion of the distinction between Functional and Regression Relationships (p. 181).

* A treatment of Pure Error and Lack of Fit when fitting a Regression with replicated observations (Section 7.32).

* A good introduction to Multiple Linear Regression (Chapter 8) which begins with a realistic example rather than a definition of the Regression model, and goes on to discuss Model Selection, Transformation of Variables, Analysis of Residuals, Curvilinear Regression and Nonlinear Estimation. Not surprisingly, this is the longest chapter, and in fact Chapters 6, 7 and 8 account for over one-third of the book.

* A chapter on Simulation, which although it is quite short, will by its inclusion in a Statistical Methods book underline the importance of Simulation.

* A useful collection of statistical tables together with examples illustrating their use.

* Excellent layout and print.

It is virtually impossible to find nothing to complain about in a book such as this, and my complaints are:

- The diagrammatic representation of confidence limits (Fig. 4.1) is not helpful.

- A rather skimpy coverage (half page) of Dummy Variables in Regression (p. 274).

- In claiming that the sum of ψ^2 variates is also ψ^2, the requirement of independence is not mentioned (p. 318).

- In updating the references, the opportunity of referring to the considerable advances in the Analysis of Frequency Data was not grasped.

- There is the occasional instance of awkward phrasing, such as the following on the construction of Control Charts: "It is also important to take measurements at those points in the process at which any action consequent on points falling outside the control limits would rectify the trouble in the shortest possible time" (p. 341).

However, these shortcomings are minor when measured against the overall excellence of the book.

Patrick D. Bourke,
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"GENERAL RELATIVITY"

By *Hans Stephani*

Published by *Cambridge University Press*, in paperback, 1985, £13.95 stg. ISBN 0 521 31534 4

This is a translation from the German of a book published in 1977 and republished with amendments and corrections in 1980. One of the two translators (John Stewart) adds comments in several places as footnotes. The bibliography has been brought up to date as far as 1980/81.

Professor Stephani's book is one of the clearest text-books on 'mainstream' general relativity I have seen in a very long time. It is beautifully balanced between the mathematics and the physics of the subject. Although there are only 298

pages of text and it may seem that vast areas of research of the last 30 years have been omitted, nevertheless the reader who wishes to pursue any topic further is given three tiers of references at the end of each section: (i) Text-books, (ii) Monographs and Collected Works, and (iii) Review and Research Articles. Because of this I found I could read the book at a very leisurely pace. Many familiar things struck me with the force they had when I first learned them.

The book is divided into 30 large sections which are grouped into 8 chapters.

After an introductory chapter on Newtonian Mechanics that includes Lagrange's equations and a study of relative acceler-ations, all expressed in tensor notation, there is a chapter on Riemannian and Semi-Riemannian Geometry. In this chapter "Foundations of Riemannian Geometry" there is a very compact treatment of tensor algebra which treats symmetries of ten-sors as well as tetrad and spinor components of tensors and then comes the Lie derivative, parallel transport, Fermi-Walker transport, curvature and integral conservation laws. This chapter ends with electrodynamics in geometrical optics, ther-modynamics and finally perfect fluids.

Chapters 3 and 4 study Einstein's field equations, the observational tests of the theory, the linearized theory of gravitation and gravitational waves. Einstein's quadruple formula for gravitational radiation is derived. Chapter 5, a mere 40 pages, gives all the techniques that are used to classify the exact solutions of Einstein's field equations. In view of all the research that has been done in this area it is a masterpiece of compression.

In chapters 6 and 7 on Blackholes, Gravitational Collapse and Cosmology, I was disappointed at the few pages given to the Hawking-Penrose singularity theorem, but the reader gets ample compensation in the very readable accounts of spherically symmetric stars and the Schwarzschild black hole.