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Book Review

Recent Developments in Gravitation and Mathematical Physics
Edited by A. Macias, T. Matos, O. Obregón, H. Quevedo. 393p., World Scientific, 1996. £ 60.

This book records the proceedings of the First Mexican School on Gravitation and Mathematical Physics held in honour of Carlos Graef-Fernández in 1994. It seems that the Mexican interest in relativity accelerated when G. D. Birkhoff went there in 1943, and in collaboration with Graef-Fernández and others, responded to the criticism by H. Weyl of Birkhoff's relativity theory.

The plenary lectures of the school were given by MacCallum, Senovilla, Page and Jacobsen. MacCallum's article, the longest in the book, is about computer algebra and relativity. It starts with quite simple things, such as why it is difficult to teach computers that $\sin^2 x + \cos^2 x = 1$, and proceeds to a valuable account of the equivalence problem, that is, how to find out whether two different metrics represent the same spacetime. The problem was first considered by Christoffel who showed that it could be solved if one knew at most the first 20 derivatives of the Riemann tensor! Subsequent work has brought 20 down to 7. The highest derivative required in examples so far is 4.

Senovilla gives a clear and comprehensive summary of the work he and collaborators have done on cosmological models without singularities. Although the cognoscenti may say they are not disturbed by this work, many relativists were certainly surprised by the discovery of models, containing reasonable matter and with $\Lambda = 0$, without a big-bang. At the very least this draws attention to the small print in the singularity theorems, for example, about the existence of trapped surfaces. The article is followed by 117 references.

D. N. Page gives an account of the approach to quantum mechanics he has developed in recent years, called Sensible Quantum Mechanics. In this, he tells us, "nothing is probabilistic, except, in a certain frequency sense,

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conscious perceptions." These perceptions can be realised by awareness operators. Page's approach can be seen as a development of the philosophical idealism implicit in quantum mechanics.

The article with the intriguing title "Introduction to black hole microscopy" by Jacobsen turns out to be on the Hawking radiation, the Unruh effect and the relation between them.

The remaining articles, under the headings Invited Lectures and Contributions, cover a very wide field but all seem to have some connection with relativity or quantum mechanics. Two which specially appealed to me were an overview by A. Krasiński of his monumental collection of inhomogeneous cosmological models (for which he had to survey 700 papers), and a provocative article on inflation by Y. Ne'eman. Ne'eman believes that the great achievement of inflation is that it brings *creation* into the scope of science. From this point of view it is a descendent of the steady state theory, which was ahead of its time. The classical relativist might say that these theories introduce a negative pressure into the cosmological energy tensor, which allows the creation of matter; and that this effect has been known at least since Tolman's book of 1934. What inflation has done is to introduce some speculative physics to account for the negative pressure.

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