- 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.

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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 sev-
eral 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.

Chapter 8, called "Non-Einsteinian Theories of Gravitation", deals with topics of current interest for which Professor Stephani could find no room earlier. Possible tests of alternatives to Einstein's theory of gravitation, the PPN formalism and quantum gravity. This last chapter is not up to the standard of the others because the author seems to me to be very unenthusiastic about the subject matter. Section 30 on quantum gravity is very skeptical about the outcome of current research.

An excellent course of lectures could be created from this book for either an honours degree course or M.Sc. It has everything the potential research student ought to know!

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"MATHEMATICAL BYWAYS IN AYLING, BEELING AND CEILING"

By *Hugh ApSimon*

Published by *Oxford University Press*, 1984, xii + 97 pp.
Stg £5.95. ISBN 019-853-201-6

This is the first book of a new series called Recreations in Mathematics from O.U.P. The series is aimed at 'all lovers of mathematics' and will include not only new titles, but also translations and reprints of classics.

Mathematical Byways is a book of problems. The problems themselves are of a familiar type, many being concerned with integer-sided triangles and optimising strategies, but the for-

mat of the book is rather unusual. Each of the chapters is introduced by a specific problem featuring some aspect of rural life in the three villages of Ayling, Beeling and Ceiling. For example, in Chapter 1 we meet Farmer Able's pretty daughter and are asked to work out how far from the ground is her window-sill if a ladder of length 18 ft 5 ins will just reach it when there is a packing case with cross-section 5 ft x 5 ft directly below the window. Later problems involve, for example, the areas of sheep pens, strategies for sheepdog trials and the shortest possible road system which connects the three villages.

Each of these specific problems is followed directly by the statement of a more general problem, which is solved in detail. The solution to the original problem is then given and each chapter ends with remarks about the 'composer's problem' and possible 'extension problems'. In this way each of the eleven problems in the book is given a very thorough treatment which should certainly be accessible, as the author claims, to a 'properly taught sixteen year old".

In fact the author's solutions are in some ways almost too good! Many readers will not, I fear, try to solve the specific problems, but turn immediately to the general problems (which are sometimes easier to understand) and so proceed inevitably to their solutions. With a more conventional style of format this might have been avoided, and also many more problems of a similar standard could have been included, without reducing the depth of their treatment. Most of the extension problems given look decidedly difficult, though one at least can be settled by a short computer search.

To sum up, this is an interesting book, well illustrated and with only a few misprints, and I enjoyed the treatment of the problems given. However I couldn't help recalling how much more is to be found in the books of puzzles and games by Martin Gardner or, at a more advanced level, in Donald Newman's splendid 'Problem Seminar'.

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