

quartz as a dosimeter and the relative simplicity of the calculation of the annual dose. Fleming is primarily interested in pottery and does not consider the natural extension of this technique to the heated stones of prehistoric hearths (flint, quartzites, sandstone etc.), a method still in its infancy when the book was written.

Also in Chapter 3 there is a résumé of the elegant method which uses a very sensitive thermoluminescence dosimeter (fluorine) to measure directly the annual dose deposited by β -radiation in pottery. This method is also applicable to the measurement of the γ -dose coming from the soil. Here the problem of radon (radium emanation) must be considered, the active deposit of which is responsible for about 50% of the γ -dose, which therefore depends on the movement of radon in the soil. Chapters 2 and 6 give a very complete analysis of this problem.

The pre-dose technique (Chapter 5), which also involves quartz inclusions, has a use limited to those ceramics which have received a relatively low archaeological dose and are thus relatively young (< 1000 years old). On the other hand this permits it to be used instead of carbon-14 techniques which are practically useless for any period more recent than the fourteenth century.

Despite the difficulties which are inherent in it and which concern in particular the contribution of α -radiation

to the annual dose, the fine-grain technique has been brought up to the level of a routine measurement at Oxford. It is the subject of a detailed exposition in Chapter 4 which begins with the art of making the deposits of fine grains on aluminium discs which forms the basis of the whole method.

The last third of the book and Appendix E constitute an anthology of dates and of applications of TL to the authentication of ceramic artworks and of those bronzes which contain kernels of baked clay. Results bearing on the neolithic ceramics of Central Europe and Africa, relative to the Nok culture among others, are examples showing the great importance of TL for the dating of sites which in the absence of organic remains are not datable by the carbon-14 method. When the two methods have been applied simultaneously, the ages they have yielded are in agreement.

In conclusion, the methodological exposition is as complete as can reasonably be wished, given the present state of TL dating. Moreover, the book is rich in examples. Novices will find encouragement here to face up to problems which are still insufficiently resolved and archaeologists (particularly those strong in maths!) will discover the lucid explanations of the technique they have lacked until now. □

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Large African wildlife

Brian Bertram

The Ecology and Conservation of Large African Mammals. By S.K. Eltringham. Pp.268. (Macmillan: London, 1980.) £15.

WE have waited a long time for this book — not only because Dr Eltringham has taken a long time writing it but also because there has been a conspicuous and lamentable absence of a book which spanned the wide and fascinating area of field studies of large African mammals. The author is thoroughly well qualified to fill the void. He was Director of the Nuffield Unit of Tropical Animal Ecology in Uganda, and has for years been Associate Editor of the *East African Wildlife Journal* (now the *African Journal of Ecology*). It is this journal which has published many of the results of the large mammal field studies conducted at the Nuffield Unit, the Serengeti Research Institute, the Tsavo Research Project and East African universities.

So Keith Eltringham knows his facts. What has he done with them that is new? Essentially he brings them together in one place, and he discusses in general terms not the various mammal species themselves but the differences between those species, the interactions among them, and human interaction with and influence upon them. The book thus complements the many excellent and detailed accounts, at both popular and scientific levels, of field studies of single species or groups. It is not a review of those accounts — rather it provides the background to them, plus a much needed dose of general knowledge, experience and common sense, which may be widely shared but is too rarely written down.

The book starts with a brief summary of the African regions, and a description of some of the techniques used in wildlife research, principally counting, marking and immobilizing methods. Each of the following six chapters takes a particular theme and considers the range of ways in which large African mammals behave in that respect. These themes are social structure and social behaviour, followed by territorial behaviour, then population ecology, reproduction, herbivore feeding and carnivore feeding. Three chapters on conservation, wildlife management, and Man and national parks complete the text. To my mind the last six chapters are much better than the four preceding ones. There is a valuable bibliography of over 400 references, maps of African national parks and reserves, and a useful list of scientific names of mammals each with its authority and date. There are 27 informative black and white photographs, about 20 tables and as many diagrams.

A range of lattice path problems

Michael Berry

Lattice Path Counting and Applications. By Sri Gopal Mohanty. Pp.185.(Academic: New York and London, 1980.) \$24, £13.60.

CONSIDER the unit square lattice whose points have integer coordinates x, y , and let a 'path' be a sequence of steps between neighbouring points. How many paths run from the origin to the point with coordinates mn , ($m \neq n$) without touching the line $x=y$? It is with such problems, and their applications, that this book is concerned.

In the general case, where the lattice has more than two dimensions, where the paths are subject to more complicated restrictions (such as not touching boundaries of general form), and where diagonal steps are permitted, the enumeration of paths is very difficult. In many cases, however, recently developed combinational techniques make it possible to obtain solutions in closed form.

It is remarkable what a wide range of problems can be put into correspondence with the enumeration of lattice paths. The classical example, due to Bertrand, is to calculate the probability that the victor in

an election had more votes than the loser at every stage of counting. Another case is random walks on a line, for example the probability distribution of times when the walk (starting from the origin) first passes a given point. Other problems considered in the book are the lengths of queues, the enumeration of Cayley trees and the convolution identities (of binomial type) that can be proved by considering combinations of lattice paths.

For all problems treated, the exact solutions are given, involving for the most part binomial coefficients. In many cases, however, what are required are asymptotic approximations (for example as the number of steps tends to infinity), which are simpler and might be derived directly; but no such results are given here.

This is not an easy book to read. The author's style is terse, and the non-experts for whom the book is presumably intended will have to work hard to follow the argument. Such phrases as "one can easily show that" or "a little reflection will show" are unhelpful, and an argument alleged to provide "pictorial insight" would have been clearer if accompanied by an illustration. However, the book is greatly improved by the provision of extensive lists of references and challenging problems at the end of each chapter. □

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