The sine–cosine graphs, apart from inducing vertigo, do provide a convenient way of detecting specimens which although projected on the main canonical axes, in morphometric 'reality' lie some distance away. These chapters are heavy going and the writing style, with long and involved sentences, makes the reader's task more difficult.

The middle section is the longest and reviews multivariate morphometric studies on fossil hominid remains of the upper and lower limb girdles, several tali, humeral fragments, metacarpals and a toe bone. This is no place to take issue on technical details of the analyses and Oxnard fairly draws attention to the differences between the way he and other workers interpret the results of canonical analysis.

The last section is an attempt to synthesise the results followed by a discussion of their relevance, and it is here that the greatest controversy lies. It has recently become evident that locomotor assessments of early hominid fossils were bedevilled because modern human bipedalism was considered as the only bipedal arrangement possible: no close affinities to modern bones, no bipedalism. Now it is widely recognised that other models may have existed either as precursors of the modern human system or as parallel models which were destined for extinction. Therefore the 'uniqueness' of some of the fossils comes as no surprise.

Some of the analyses are claimed to show similarities between fossil hominid fragments and orang-utan bones, implying a close functional rather than a genetic relationship. Whereas the statistical implications of these results are exhaustively examined their conversion back into any biological reality is naive. Most of the fossils are fragmentary, and some form only part of functional units of which other parts are preserved. There is no examination of which variables underly the association with the orang-utan, nor is there any attempt at a functional anatomical or biomechanical explanation of why bones that do not look alike behave similarly in the analyses.

Morphometrics is only one of the methods available to hominid paleontologists in their attempts to analyse the functional implications of hominid fossils and unravel the phylogeny of early man. Such studies were at one time properly criticised for eschewing numerical data, but such data taken in isolation do not guarantee relevant results. The evidence presented in this book, based as it is on only a fraction of the available fossil evidence, is too narrow and conceptually limited to play more than a subsidiary role in the very necessary re-evaluation of our ideas about early hominid structure, function and phylogeny.

Oxnard has nonetheless performed a useful service; the controversy produced by this book may well stimulate the necessary, more balanced, research.

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Crystallography

Space Structures: Their Harmony and Counterpoint. By Arthur L. Loeb. Pp. xviii+169. (Addison-Wesley: Reading, Massachusetts and London, February 1976.) Cloth $19.50; paper $9.50.

THE structure of ordinary Euclidean space is not as simple as it seems. Just as the complexity of chemistry arises from the Pauli exclusion principle, forbidding two electrons to have the same set of quantum numbers, so much of the complex structure of space arises from what we might call the Democritean exclusion principle—no two atoms may have the same set of (x, y, z, t) space–time quantum numbers (otherwise knots would fall apart).

Arthur Loeb has produced a fascinating book, at about A-level standard, of interest to crystallographers and applied artists working in space. Indeed it is dedicated to all 'philomorphs'—a useful coinage for a spectrum recognisable as including the 'dome-folk' as well as the graph theorists, the cubists and the biomorphologists.

Much of the material is an exposition of the consequences of the Euler-Schläfli relationship (faces+vertices=edges+2), which is at the heart of the phase rule of chemistry and expresses surprisingly powerful constraints—seen at their best in Rhines' and Craig's analysis of grain growth in aluminium (*Metall. Trans.*, **5**, 413–425, 1974). Truncation, stellation and the division of space into Dirichelet domains are also discussed. It is all fairly familiar material, but well-presented without the obscurities with which graph theoreticians so often cloak their theorems, and is thus of wide popular interest.

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Mapping the insect brain

Atlas of an Insect Brain. By Nicholas J. Strausfeld. Pp. xii+214. (71 plates.) (Springer: Berlin and New York, 1976.) $118.10.

THE combination of Nick Strausfeld's scientific knowledge and literary and artistic abilities with a large format and high production standards has resulted in an admirable monograph about the neuroanatomy of the fly's brain, the text of which merits much discussion and suggests many experiments. There is also an abundance of photomicrographs and drawings, of high quality, illustrating those exquisite ramifications of nerve cells which are so beloved by anatomists, but which can cause the physiologist to despair sometimes of ever fully comprehending the workings of the nervous system.

Divided into seven chapters and two appendices, the book begins with a historical survey and proceeds to a description of the major cell types found in the fly's brain together with a classification of neurones based on the shapes of the processes of the nerve cells. The third chapter describes the primary compartments of the brain and the fourth, the coordinate system which gives the *Atlas* a stereotaxic frame of reference. The *Atlas* itself, composed of serial sections of the brain stained by reduced silver methods, forms chapter 6 and this is preceeded by a chapter which considers some quantitative aspects of brain structure. The final chapter shows the forms and dispositions of various neurones as revealed by variations of the Golgi impregnation technique. One appendix gives a multi-author and multi-lingual dictionary of the terminology of the fly's brain, whereas the other provides valuable information about the various histological techniques which can be applied to the insect nervous system.

The vast amount of anatomical information presented forms an excellent substratum on which to build future experiments and into which previous physiological and behavioural studies can be integrated. The neuroanatomy and possible function are related in a heuristically worthwhile manner. The book is marred only by the high incidence of uncorrected typographical errors.

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