hand, and could have done with proper references. Recourse to the original documents would have saved Lord Acton, for example, from having to answer occasionally for the remarks of William Acton, and it would have been interesting to know when and where Havelock Ellis "suggested chastity devices for boys". Granted the size of the book, this may be too much to ask.

The really interesting emphasis in the book—interesting because it will still be unfamiliar to many psychiatrists and counsellors—is ethological: that bisexual potential in humans, and especially in males, though it is undoubtedly an overdetermined behaviour, is far more closely related phylogenetically to bonding behaviour and to dominance than to heterosexuality. It represents one more of the versatile uses to which sex in primates generally, and man in particular, has been put. Psychiatrists who have regarded it as a deviation have missed the fact that the potential for homosexual response is a functional and adaptive behaviour. Exclusive homosexuality is no doubt a problem for its possessor, and (in a culture which rejects it, particularly) associated with personality disorder, but in the generality it is not so much "latent" as a part of a built-in primate potential, a specific adaptation to bonding needs rather than heterosex gone wrong.

From the psychiatric point of view this is an important and unfamiliar, though not original, insight: it suggests that in predominant homosexuality one of the main overdeterminants is connected with dominance. In the light of primatology we need a new look at Adler. Not only is dominance subject to physical, including endocrine, influences, but the Freudian Oedipal conflict reflects a dominance situation between father and son of a special kind. Dr Karlen's acquaintance with depth psychology generally is unfortunately not sufficient for him to complete this line of thought—it would have been worth sacrificing some of the anecdote and all of the "case histories" to a proper consummation of the marriage between primatology and clinical psychodynamics, insofar as that is now possible. As it is, the book is well written, humane and instructive both to professionals and laymen, but it needs a rather steadier hand to complete a serviceable hypothesis.

ALEX COMFORT

Weather by Numbers

Numerical Weather Prediction. By George J. Haltiner. Pp. xvi+317. (Wiley: New York and London, October 1971.) £5.

ALTHOUGH research into numerical weather prediction started in the late 1940s and routine numerical predictions became available to weather forecasters in the late 1950s, texts devoted to expounding the principles and practice are not plentiful. The best so far is *Thompson's Numerical Weather Analysis and Prediction,* dated 1961, and indeed the only other worthwhile text in English since then is *Lectures on Numerical Short Range Weather Prediction,* published in 1969, a very uneven and bulky book which shows all the signs of multiple authorship. There is indeed, then, a welcome for a new book.

The aim of Professor Haltiner's book is stated clearly enough—"to assist students, faculty, and other scientists who presently must rely on highly condensed articles in technical journals"—so we must regard it as a pedagogic book and not one for the specialist. This creates an immediate problem which the specialist, choosing part of the field, avoids. The early research work was concerned with vorticity models; because on the synoptic scale of atmospheric motion the absolute vorticity about a vertical axis is almost conserved and for all practical purposes vorticity is spin, a fairly clear picture of the mechanism is available—one can "see" that columns of air which are stretched will have to spin more quickly and so on. Yet the present day developments are all concerned with dealing directly with the Navier–Stokes and energy equations and the picture is nothing like so clear. The teacher has to decide how much attention to give to the development of vorticity models and how much to the primitive equation models. The problem is heightened because the ancillary mathematics required to integrate the model equations is quite different, the first involving solutions of second order partial differential equations with elliptic boundary conditions and the second the more straightforward but subtle first order hyperbolic equations. Should the student have to learn and understand both?

Professor Haltiner has given about equal space to both, perhaps a good compromise. It allows him to develop the "classical" theory at a leisurely pace, dealing with the equations of motion, the various wave type solutions of the linearized equations, the scale analysis, filtering and the vorticity models with their barotropic and baroclinic instabilities. The author's clarity of exposition, known from his previous writings, is at its best here because the story is a connected one.

The second half of the book dealing with the primitive equation approach was bound to suffer in comparision with the first half. The problems are polarized into three areas, adequately representing the sub-grid scale physics of the model in terms of larger-scale fields, developing a suitable integration scheme and obtaining a good starting point for the integrations. Only the first of these is really meteorological in character while the latter two are decidedly in the field of numerical analysis. Moreover, no single solution to any of these problems has been found acceptable to everyone, which forces Professor Haltiner to pick and choose among the many solutions which have been advanced without any very clear reason for choice except familiarity. Nevertheless he has managed to include some illustrative material on nearly all the principal aspects such as radiative transfer, cumulus convection, finite difference schemes, objective analysis and so on, enough to start the student thinking without going into any great depth.

With no real competitor covering the same ground with this crisp approach, Professor Haltiner's book should be in great demand by students and teachers, for the subject matter is becoming a very important part of the meteorological teaching syllabus.

E. KNIGHTING

Rare Gases

The Inert Gases: Model System for Science. By B. L. Smith. Pp. xii+172. (Wykeham: London, June 1971.) £2.50.

IN these days of specialization where volumes may be written on topics, it is no mean feat to give a comprehensive survey of a small area in science in 172 pages. In his book on the rare gases Dr Smith carries out this operation most successfully. This well-laid-out book follows the rare gases from their discovery to their multifarious present day applications in the physical and—very surprisingly—biological sciences.

The theme of the book is how the rare gases are used as models in physics because of their simple physical properties. They are monatomic, extremely stable chemically, have spherically symmetric electron charge clouds, and interact with one another in a particularly simple fashion. Thus chapters are devoted to theories of the gaseous, liquid and crystalline phases with the rare gases as the physical counterparts of the theoretician's abstractions. The interplay between theory and experiment is constantly emphasized. A further chapter on critical phenomena gives an excellent account of present work on the liquid-vapour transition and the analogous ferro-magnetic transition, and a discussion of optical and dia-electric properties completes the study of the rare gases in physical theories. A small chapter on their chemistry points out that they may take part in chemical