research in the specific field treated." A more critical discussion of the chemical reactions from the viewpoint of modern theories of organic chemistry would have been desirable; moreover, the authors could have pointed out more of the unsolved problems in the field.

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The Determination of Adrenocortical Steroids and Their Metabolites. Proceedings of a conference held by the Society for Endocrinology, London, May 21, 1953. P. Eckstein and S. Zuckerman, Eds. Dennis Dobson, London, 1953. 91 pp. Illus. 12s 6d.

In his closing remarks as chairman, Professor G. F. Marrian states that ". . . many of us have come to realize that most of the methods which have been in general use [for the determination of the steroids] are unsatisfactory and [we] are doing something to devise better ones and . . . are prepared to discuss are difficulties frankly among ourselves." The current effort on both sides of the Atlantic to develop new methods and to standardize existing methods is manifest in the fact that two conferences on the subject were held almost simultaneously in May 1954 at the Medical Society of London and at the Worcester Foundation in Shrewsbury, Mass. The memoirs of the Society for Endocrinology, No. 2, will be particularly welcome to workers in this field, not only for spotlighting the valuable recent British contributions to the general problem of steroid analysis, but also for the candor of the discussions in which the reader will recognize with familiarity many of the bothersome trivia of technique which seem to show no geographic discrimination in whom they plague.

The volume consists of 10 brief papers and relevant discussions on various aspects of corticosteriod determination in blood and urine. Problems associated with the estimation of "formaldehydogenic substances" and the stability of such substances in urine are discussed in two brief papers from Marrian's group. Among the novel and promising tools referred to in several of the papers are the sensitive arsenomolybdate color reaction of V. Schwarz; the ingenious bismuthate procedure of J. K. Norymberski for oxidizing the C_{21}-17-hydroxycorticosteroids to 17-ketosteroids as conjugates, directly in urine or in urine extracts; and the extraction of urinary conjugates by ethanol-ether mixtures by A. E. Kellie and coworkers. The evaluation of the combination of the last two techniques as a routine analytic procedure suggests a new tool with many future applications. Several papers deal with the evaluation of dehydroepiandrosterone in urine, and the nature of the corticosteroid fraction of normal and pathological urine (before and after ACTH), but only one paper deals with the problem of estimating the corticosteroids of peripheral blood.

Not the least noteworthy is the paper by S. A. Simpson and J. F. Tait on the isolation of a "weighable" amount (less than 1 mg) of electrocortin, the highly active sodium-retaining factor of adrenal tissue, its purification, and details of the evidence accumulated for the α-ketol and α,β-unsaturated ketone functions of the substance.

This excellently printed small book constitutes a good digest of many new advances in the field of the corticosteroids and their analysis. The procedures and technical details outlined by the various authors will serve to stimulate those already engaged in steroid analysis. As a guide to some recent and valuable literature, this book is highly recommended.

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The Physics of the Stratosphere. R. M. Goody. Cambridge Univ. Press, New York, 1954. 187 pp. Illus. $5.

According to Goody, *The Physics of the Stratosphere* was written for the physicist interested in learning something of a field other than his own. Writing in an easy and lucid style, he has been successful in presenting the principal problems before the stratosphericist and in pointing out the difficulties that beset their solution. Unlike the laboratory experimenter, the upper air physicist is unable to perform controlled experiments in which different parameters are varied at will. He is forced, therefore, into the role simply of observer and must attempt to interpret his observations without knowing for sure what parameters actually underlie the observed phenomena. This is repeatedly illustrated in Goody's book, as a wide variety of methods for determining the temperatures, composition, motions, and radiations in the stratosphere are reviewed. The principal criticism I have is that the most recent results from rocket experiments are not always included. Nevertheless, the book will be of interest, not only to the reader for whom it was written, but also to the geophysicist himself, as a handy, clear, objective and accurate summary of important techniques and results in stratospheric research.

The book opens with an introductory chapter, in which a brief historical review of the discovery of the stratosphere is given. It is pointed out that upper air nomenclature may be based on a variety of atmospheric features, such as temperature structure, dynamical factors, chemical composition of the air, and ionization. A uniform nomenclature has not been settled upon, and some terms have different meanings to different users. To some, the stratosphere lies between the tropopause and 20- or 30-km altitude. Goody uses the term to denote the region between the tropopause and the bottom of the ionosphere at about 80 km. It is with this region that the book is mainly concerned. The introductory chapter concludes with a brief review of upper air research vehicles: balloons, aircraft, and rockets.

The second chapter takes up the problem of determining startospheric temperatures. Balloon observations of the lower stratosphere are summarized, and the relationships between the troposphere, the tropopause, and the lower stratosphere are discussed. The author quite properly emphasizes that in balloon temperature observations there are always the difficult problems of insuring that the thermal element comes into conductive equilibrium with the air rather than into radiative equilibrium with its surroundings, and of shielding the thermal element from solar radiation during daytime flights. Next Goody

reviews sound propagation studies, in which sound waves emanating from explosions on the earth's surface and refracted back to the earth from the stratosphere are used to determine winds and temperatures in the region from about 30 to 60 km. He summarizes the results so obtained. He fails, however, to note that this technique has also been employed in a more direct fashion by ejecting grenades from flying rockets and exploding them in the stratosphere itself. The study of visual and photographic meteors as an approach to upper stratospheric temperatures is discussed, and results are given. Goody points to the pioneering work of Lindemann and Dobson in this connection, and quite properly chooses to present in detail the more recent and more precise theory of F. L. Whipple and coworkers. Then there appears a review of rocket experiments. Unfortunately, the rocket results presented are long out of date; much better data have been available in the literature for some time. The chapter on temperature is concluded with a survey of numerous observations that tend to confirm the temperature picture obtained from sound, meteor, and rocket studies. The confirmatory evidence is found in observations of noctilucent clouds, theory of atmospheric oscillations, measurement of scale heights and electron collision frequencies by ionospheric sounding techniques, study of the auroral and night airglow spectra, and scattering of light from vertically directed high-power searchlight beams.

Chapter III deals with the composition of the stratosphere. Along with the major constituents, water vapor, carbon dioxide, the rare gases, nitrous oxide, and methane are discussed. Balloon, spectroscopic, and rocket techniques are described, and results are listed. In connection with the rocket measurements, Goody describes the taking of samples that appear to show diffusive separation in the stratosphere between 60 and 70 km. Specifically, it was found that the ratios of both helium and neon to nitrogen in the samples increased, while the ratio of argon content to nitrogen decreased with altitude. Because the increase in the light gases and the decreases in the heavier argon are in keeping with what one would expect if diffusive separation did occur, Goody comments that there is little doubt that the observations are reliable. More recently, however, many have come to believe that the observed separation could and did occur in the somewhat lengthy intake tube into the sample bottles, raising considerable doubt about the early interpretations of the data.

To the important subject of stratospheric ozone, the author devotes his longest chapter, providing an excellent and much needed summary of the subject. In Chapter IV, he points out the importance of ozone in the heat and radiation balance of the atmosphere and describes various ground-based, balloon-borne, and rocket methods for its study. The principal means for the determination of atmospheric ozone content is found in the absorption of solar radiation by the gas, and Goody gives a number of approaches that use this means, together with results. He describes methods for the determination of the temperature of the zone layer based on a study of the ozone itself. He presents numerous results, including summaries of world-wide observations on the total ozone content as a function of season. The apparent connection between total ozone and weather is pointed out, particularly the high correlation between ozone amount and potential temperature in the stratosphere. Finally, Goody presents a photochemical theory of the formation of the ozone layer, basing his discussion on the calculations of Craig. These calculations, however, rested on the assumed existence of photochemical equilibrium, which is probably not a valid assumption below 40 km. At the same time, he ignored the effect of the reaction

$$O + O + M \rightarrow O_2 + M,$$

which the theoretical results of Bates and Nicolet, and also of F. S. Johnson and coworkers, have shown to be not negligible above 50 km. It would have been better, I feel, to have quoted Johnson's calculations, which include the effect of recombination of oxygen atoms.

Chapter V gives a brief treatment of winds and turbulence in the stratosphere. For the lower stratosphere, the variation of wind speeds and directions with season and with altitude are discussed. The existence of a "jet stream" near the tropopause is pointed out. In the upper stratosphere, the observation of visual meteor trains and radio meteor trails is described. There is a brief reference to rocket smoke puff studies.

In Chapter VI, Goody closes with the fascinating, difficult, and important subject of radiation. He discusses the solar constant and presents a rocket determination of the solar energy spectrum in the near ultraviolet. He goes on to discuss various wavelength bands in which atmospheric absorption may be expected. The integral equations needed to solve the problem of the radiation balance in the atmosphere are set up, and the formidable obstacles in the way of any numerical solution are listed. Some theoretical results obtained by introducing simplifying assumptions are given, as for example Gowan's calculations on the temperature structure of the ozonosphere. I feel that Johnson's calculations on the diurnal variation of temperature in the ozone layer might well have been included, inasmuch as they are based on rocket measurement of the solar radiation actually absorbed at the various levels treated. Johnson's results show considerably smaller diurnal variation than do Gowan's figures.

In summary, *The Physics of the Stratosphere* is an easily readable, illuminating discussion of upper air physics. The subject matter is well organized and ably handled, giving the reader a clear insight into some of the major problems and difficulties of stratospheric research; and, except in the case of rocket upper air studies, the book provides the reader with a good picture of the current status of the field. Many of the criticisms I have made are plainly matters of judgment, and in this the author must of course have the final say. In physical appearance, the book is quite pleasing, and the publishers are to be congratulated on having done an artistic job. Finally, there are some minor errors that are pointed out simply for the convenience of the reader and the publishers. (Some proper names have been misspelled: p. 31, Atanasoff; p. 49, Ratcliffe; p. 65, Camp Ripley; p. 118, Deming.) I recommend the book both to workers in upper air physics and to those others who have, or think they might be induced to have, an interest in the upper atmosphere.

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