low position of the planet in the sky, rendered systematic work impossible. We accordingly limit our reference to the discussion of the 1919–20 observations.

The work done may be divided into three parts:

(1) Micrometrical measures for determining the co-ordinates of individual spots.

(2) Micrometrical measures for determining the latitudes of the belts.

(3) Descriptive notes and drawings of the surface features.

M. Luplau Janssen is a firm believer in determining the longitudes as well as the latitudes of Jovian markings with the micrometer, but some eye-estimated transits across the central meridian were also recorded. Many of the older observers of the planet will recollect the discussions which took place several years ago as to the relative merits of the two methods of deriving longitudes. A comparison of M. Luplau Janssen's micrometric results with central meridian transits by other observers shows the accuracy attained to be of much the same order, but it seems to the reviewer that in a given time a considerably larger number of spots can be observed by the transit method, which is a matter of great importance. On the other hand, valuable results can, of course, often be obtained with the micrometer of an object which has already been observed by the transit method, or for some other reason cannot be observed at its central passage. Micrometer measures also have the advantage of furnishing values for the equatorial as well as the polar diameter of the planet, and from his series of observations in 1919–20, M. Luplau Janssen deduces the figures 37″·72 and 35″·54 respectively at mean distance, which gives for the oblateness of the disc the value $\frac{1}{19}$. The figures for the equatorial and polar diameters at present adopted in the physical ephemerides are 37″·87 and 35″·35.

In the discussion of the observations of individual spots, the conclusions drawn suffer from the, relatively speaking, small number of longitude determinations. In fact, the identifications in some cases seem to the reviewer to be entirely erroneous. A striking example is found in the case of some remarkable spots observed in the south tropical zone (the zone between M. Luplau Janssen's bands IV. and V.). On p. 66 of his report five observations are taken together as referring to one and the same object, but if we accept the conclusions arrived at in the twenty-second report of the Jupiter Section of the British Astronomical Association recently published, which are based on a very much larger number of observations, we find that they actually belong to four separate objects, and that what is, perhaps, the most interesting fact revealed during the apparition—namely, the abnormal drift in opposite directions of two pairs of spots—has been entirely missed. Similarly, when all the available material is considered it appears that mistakes in the adopted identifications are accountable for some of the large irregularities of motion attributed to certain other spots by M. Luplau Janssen.

A valuable part of the report is that which contains a summary of the micrometrical measures of the latitudes of the belts and a comparison with results obtained by other observers in previous years. As has been often remarked, the latitudes of the belts show considerable variations, and especially has this been the case in recent years with the north edge of the north equatorial belt (M. Luplau Janssen's band III.). M. Luplau Janssen considers that there is evidence in the measures of some of the belts of changes of a periodic nature which are related to the position of the planet in its orbit. It may be questioned whether the available evidence is sufficiently strong to warrant such a conclusion, but the matter is certainly worth careful investigation, and there can be no doubt that measures of the positions of the belts (as emphasised several years ago by the late Prof. G. W. Hough) should be regarded as an important part of the work on Jupiter. M. Luplau Janssen lays emphasis on the stability in position of the south equatorial belt (his band IV.); yet it is worth noting that it is this belt which in 1919 and again in the present year has faded to such an extent as to become invisible save for its north component. Overlying vapours may perhaps be accountable for the effect observed, but on the other hand, in 1920 the revival was attended by disturbances which seemed to indicate some deep-seated cause in the planet's interior.

At the end of the report are seven plates containing 41 drawings, 37 of which belong to the apparition of 1919–20. These drawings illustrate the remarkably rapid and amazingly complicated changes which were associated with the great revival of the south equatorial belt and the south tropical disturbance during that apparition.

Taken as a whole, the report contains a mass of valuable data which will be very welcome to all students of the planet.

The Problem of Secretion.

THE attention of those who are interested in the problem of secretion is directed to a series of three papers by Dr. Robert H. Bowen, of Columbia University, New York, which have appeared in the current volume of the *Quarterly Journal of Microscopical Science* (vol. 70, parts 1, 2, and 3), and especially to the very capable critique of the topography, structure, and function of the Golgi apparatus in glandular tissue which he has given in a fourth paper (part 3, October 1926). Believing that the older theories of secretion had broken down and that the field was clear for the thorough examination of the Golgi apparatus as a synthetic intermediary in the process of secretion, he has concentrated his attention on this subject and has made only brief references to the secretory possibilities of other components of the cell.

Dr. Bowen concludes that the Golgi apparatus is present from the beginning in all kinds of secretory cells, and, when large numbers of secretory granules are being produced, becomes greatly hypertrophied, establishing a volume in rough relation to that of the secretory products, the other elements of the cell diminishing more and more. The topography and behaviour of the Golgi apparatus are different in different kinds of glands, but can be divided roughly into three general types characteristic of cells which produce serous, mucous, and lipoidal secretions. The secretory granules make their first appearance only within the area delimited by the Golgi apparatus. In a few cases there are indications that the secretory granules arise in close connexion with the Golgi material, and in fact that there is a constant and intimate topographical association between them. Dr. Bowen concludes that the secretory granules are differentiated by the Golgi material, but that no direct transformation of one into the other occurs, such as has been claimed by some authors who have advocated the mitochondrial origin of secretions. Dr. Bowen suggests that the Golgi material is structurally homologous throughout the range of animal cells, and that the so-called idiosomic substance sometimes associated with it is to be looked upon as one phase

of a duplex system in which the relative development of lipoidal and idiosomic substances may undergo considerable variation.

Having established a probability in favour of the essential homology between secretory granules and the acrosome of the animal sperm, Dr. Bowen suggests that the relationship between the Golgi apparatus and the secretory granules is homologous to that existing between the Golgi apparatus and the acrosome, and that our more complete understanding of the latter phenomenon can be used as a basis for interpreting the much more obscure phenomena in the gland cell. He adds that the establishment of the views developed in his paper must depend finally upon further critical evidence from favourable material bearing upon the exact relation which exists between the individual secretory granule and the Golgi complex.

Dr. Bowen holds that no cytological evidence of the origin of secretory products from the nucleus receives any acceptance at the present time. The nucleus can be considered as the source of secretions only in the indirect sense that it may possibly exercise some control over the process as a whole, or may collaborate with other parts of the cell-system in preparing materials for the synthetic operations of the Golgi apparatus.

When a cell is divided into a nucleated and a non-nucleated portion, the latter is able to carry on synthetic activities for a brief period only; meanwhile the nucleated part regenerates and appears none the worse for the operation. Hence it was concluded that the nucleus is the centre of synthetic operations, and particularly of the formation of those intracellular enzymes upon which living activity is now supposed to depend. But it is at least equally possible that the nucleated piece alone continues capable of constructive metabolism because it possesses the complete cell-system, while in the non-nucleated piece the system is disrupted. Dr. Bowen remarks that if the Golgi apparatus could be eliminated, the cell would doubtless be fatally affected. While secretion is an activity in which the cell-system as a whole is probably involved, and over which the nucleus exercises some controlling influence, the actual synthetic centre for the differentiation of secretory granules is the Golgi apparatus. That this source of the visible secretory granules "is likewise the source of the invisible, intra-cellular enzymes . . . cannot at present be doubted, but our scanty knowledge of these things makes any hypothesis whatever almost pure speculation."

Forestry in Illinois and Great Britain.

IT is common knowledge that the drain upon the world's resources of coniferous timber is very heavy, and that in some countries the outlook is regarded with increasing disquietude. In the "Third Report on a Forest Survey of Illinois," by C. J. Telford, the position of the State is explained with great clarity, and the parallel to the state of affairs existing in Great Britain is depicted. The present forests of the United States contain an estimated total of 481,800 million cubic feet of standing timber, the annual cut is 25,000 million cubic feet and the annual growth 6039 million cubic feet. "The virgin forests," the report says, "will carry us another 25 years, after which we shall probably be wholly dependent upon growth from cut-over lands. By utilising the entire 470 million acres of forest lands at prevailing rates of growth these cut-over lands can supply us with an estimated annual yield of 14,000 million cubic feet—a little more than half our present requirements. The conviction that satisfactory substitutes for wood will be found is untenable when the enormous amount of wood required is appreciated. This drain of 25,000 million cubic feet of standing timber a year means that for every hundred pounds of coal, iron, cement, petroleum and copper consumed the forests supply 67 pounds of wood, and the crop lands supply 44 pounds of all forms of crops, including cereals, seeds, clover, hay, forage, cotton, potatoes, sugar, fruit, and nuts. It is obvious that a satisfactory substitution for a commodity representing by weight two-thirds of virtually all the minerals consumed, or one and a half times all crops raised in the United States, is impossible. A timber famine will be more disastrous to Illinois than to any other State. Its manufacturing establishments employ 11·6 per cent. more hands than agriculture, transportation, and mining combined, and thirty per cent. of all persons employed in manufacture are in industries dependent upon wood. In the single item of lumber, Illinois consumes one-thirtieth the total lumber-cut of the world."

The process of forest destruction is far advanced in Illinois. Virgin timber has practically disappeared, and the present drain on the cut-over forests and second growth stands, unchecked, will, it is held, result in an early disappearance of all forests in the State. There was an increase in unforested waste land of 250,000 acres in the ten years from 1910 to 1920, and Illinois now has a total of 1,577,663 acres in this class. The 3,021,650 acres now forested are on lands unsuited to ordinary farming, and if cleared will generally revert to waste land. The state of affairs thus briefly delineated is sufficiently alarming from the industrial outlook alone and renders the more interesting the following comparison with the position of Great Britain.

"There is a striking parallel between Illinois and Great Britain in the total wood consumption and in the total area forested. Each annually consumes approximately the same quantity of wood—560,720,000 cubic feet for Illinois and 600,000,000 cubic feet for Great Britain; each has about the same area forested —3,021,650 for Illinois and about 3,000,000 acres for Great Britain. But Great Britain, despite a population of 437·5 to the square mile as compared with 115·7 in Illinois, and the consequent pressure for land, has deliberately undertaken to replant 1,770,000 acres, and this planting is being done at the rate of 20,000 acres a year. Illinois has never planted 200 acres of publicly owned forests, her farm woodlands are decreasing at the rate of 4500 acres a year, and the unimproved and waste land on farms is increasing at the rate of 25,000 acres a year."

Bird Flight.

IN the *Transactions of the Royal Society of South Australia*, vol. i., 1926, an interesting contribution is made by Prof. F. Wood Jones on the flight of sea-birds. It has long been observed that many sea-birds spend protracted periods, sometimes soaring, sometimes gliding, and at any rate to the novice, apparently without a visible tremor of the wing. Their flight appears to be merely an ability to slide ahead with no other power than their own weight and a presumably instantaneous ability to readjust their planes and alter their cant and poise apparently largely by movements of the head.

As a result of close study and observation extending over many years, Hankin maintains that in the