photographs of objects in their natural surroundings. The lantern slides sent by Messrs. Sanders and Crowhurst are from photographs of birds, nests, eggs and young and other living animals taken by Mr. Oliver G. Pike. To lecturers on natural history such true pictures of living creatures must be invaluable, and no better source of encouragement to study nature could be desired. By the side of such beautiful photographic pictures as are now available for projection upon a screen or for the illustration of books, the drawings which did duty in natural history instruction seem but a vain show. Messrs. Sanders and Crowhurst send us with their slides an ingenious arrangement for viewing lantern slides under a low magnifying power. The arrangement, though simple, is very effective, and a pleasant half hour can be passed by using it to look at lantern slides.

THE additions to the Zoological Society's Gardens during the past week include a Greater Vasa Parrot (*Coracopsis vasa*) from Madagascar, presented by Lady Amherst of Hackney; a Black-footed Penguin (*Spheniscus demersus*) from South Africa, presented by Lieut. F. J. Mosely; a Black-headed Gull (*Larus ridibundus*), European, presented by Miss M. Hall; a Bataleur Eagle (*Helotarsus ecaudatus*) from Lagos, presented by Mr. J. Peacock; two Yellow-cheeked Amazons (*Chrysotis autumnalis*) from Honduras, two Wall Creepers (*Tichodromus muraria*), European, deposited.

OUR ASTRONOMICAL COLUMN.

DISTURBANCE OF CORONA IN NEIGHBOURHOOD OF PROMINENCES.—Prof. C. D. Perrine, who had charge of the expedition to Sumatra organised by the staff of the Lick Observatory to observe the total eclipse of the sun on May 18, 1901, gives in his report a preliminary description of the results obtained in the *Astrophysical Journal*, vol. xiv. pp. 349-359. From a short examination of the photographs of the corona obtained with the forty-foot and Floyd telescopes (which are stated to show the details of the inner corona very perfectly in spite of the presence of clouds during the exposure), there is distinct evidence of disturbances in certain areas of the coronal structure. Especially noticeable is a conspicuous series of coronal hoods surrounding a prominence in position angle 115°, and also an unusual appearance in the north-east quadrant of the corona. This latter is near position angle 65°. Close to this point on the limb there is a small compact prominence, surrounding which the disturbed area has a form roughly resembling an inverted cone of large angle. The apex of this area is not visible, appearing to lie below the chromospheric layer showing at the limb. From the apparent position of the apex, a number of irregular streamers and masses of matter radiate as if propelled by some explosive force. A long thread-like prominence to the south of this point appears to originate from the same source. Above and around this region the corona is composed of broken irregular masses, very similar to those depicted on the photographs of the Orion and other nebulæ.

A NEW SOLAR THEORY.[1]

IT is a remarkable fact that in the numerous theories which have been propounded in explanation of the periodic changes of the solar phenomena no account has yet been taken of so important an element as the light- and heat-absorbing envelope surrounding the photosphere. The attention which this so-called solar atmosphere has hitherto received, on the part even of our most eminent investigators, in connection with the economy of radiant energy on our luminary, is utterly disproportionate to the importance of the subject. In spite of the fact, which was first accurately established by Langley's observations and was afterwards confirmed by others, that the sun, if deprived suddenly of this protecting screen, would radiate into space as much as double its present amount of energy, solar physicists failed to perceive that changes in the absorptive power of this envelope must entail consequences of the most far-reaching character with respect to the thermal conditions on and in the sun. That such changes—and these, too, of no inconsiderable magnitude—must inevitably occur is a conclusion which it is hardly possible to evade when it is remembered that the supreme control over the dispensation of solar energy depends entirely on a thin, shallow surface-layer, the matter of which is constantly tossed about by vehement eruptions and acted upon by a most complicated and powerful system of convection currents to and from the sun's centre.

The possibility of variations of the opacity of the solar atmosphere was, it is true, strongly urged, more than twenty years ago, by one of the greatest authorities on this question. Shortly after his well-known researches into the absorbing faculty of the solar envelope, Langley pointed out the decisive influence on the sun's radiation into space caused by changes in the transmissive power of its atmosphere. But his attention was at the time solely directed towards their probable effects on the temperature of our own planet. He found that an increase of absorption by as much as 25 per cent. would diminish the mean surface temperature of our globe by 100° F., whilst a like diminution in the solar envelope would produce a corresponding change in the opposite direction.

Now if the influence of a change in the absorptive power of the solar atmosphere is so enormous on a planet at a distance of almost a hundred millions of miles, of what inconceivable importance must it not be for the sun itself? Drawing the very natural inference that a *deficit* of outside radiation means a *surplus* of energies working upon the solar matter, and *vice versâ*, we are forcibly led to conclude that even slight changes of opacity, such as would elude our most refined observations, are bound to greatly influence the state of thermal equilibrium on our luminary.

Hence, if changes in the absorptive power of the sun's atmosphere exist, as cannot but be the case, the question presents itself: What happens with those energies which, by a condensation of the solar envelope, are prevented from escaping into space? No doubt they are preserved to the sun, but in what form? Do they raise the temperature of the solar mass, or augment its store of potential energy, or have they a share in the generation of those marvellous dynamical displays which we perceive in periodic succession on the solar surface? Questions such as these must tend to convince the investigator that a research into the causes of the variability of the forces which we see acting on the sun, if not identical with, is at least closely akin to, the investigation of the origin and the physical properties of the sun's atmosphere. I shall endeavour, in these columns, to demonstrate the possibility of such changes in the density of the solar envelope as would lead to alterations of the thermal conditions of the sun's mass, and shall make an attempt to answer the question as to how far these changes must be conducive to variations in the dynamical phenomena at the sun's surface.

There is perfect unanimity amongst astronomers as regards the nature of the force which by a continuous generation of heat compensates for the loss of energy into space. Helmholtz's theory, which attributes this heat-generation to the progressive contraction of the solar mass as a consequence of gravitation, may be regarded as one of the most probable hypotheses ever propounded in the history of physical science. But this theory does not yet enable us to form an idea of the evolution of a celestial body. It explains the existence of a heat-generating force within the star's bulk, but it gives no answer to the question as to whether the loss of energy by radiation is exactly compensated for by the generation of energy through contraction, or whether the conditions of contraction peculiar to the sun may not perhaps produce *more* or *less* heat than is required for compensation. It is, indeed, inconceivable that the conditions of contraction can remain the same throughout the lifetime of a star. The spectroscope has revealed the fact that the photospheres of different stars exhibit widely different stages as regards temperature. There are doubtless suns hotter than ours, and others considerably cooler. And we may confidently assume that the various conditions of temperature now recognised in the different types of star-spectra represent the phases which successively appear in the evolution of each of these bodies from its origin as a far-extended nebula down to its complete obscuration. In the life of each of these stars there will be a period when its temperature is on the ascent, and when, consequently,

[1] Abstract of a paper in *Astr. Nachr.* (No. 3723-24): "Ueber eine neue Theorie zur Erklärung der Periodicität der solaren Erscheinungen."