

ing *Leucandra cliarensis*, with dermal monaxon spicules visible to the naked eye and giving the sponge a characteristic silvery-white appearance; on the Turbellarians reported on by Mr. Southern (forty-five from the sea and five from fresh water); on the Polychætes tackled by the same energetic worker (249 species, sixteen new—by far the largest list as yet recorded from any limited area); on the new genus *Grania* discovered by Mr. Southern, the first Oligochæt found beyond low-water mark and occurring down as far as twenty-four fathoms; on the spiders recorded by Mr. Denis R. Pack-Beresford (108 species and ten Phalangids besides); on the fresh-water mites dealt with by Mr. Halbert (eighty species, four new)—but it is obvious that we must not continue. It is needless to pick and choose where all the workmanship is good. Some of the studies—notably on Marine Algæ, Phanerogams, Polychætes, and Foraminifera—are much more complete than others, and this, it should be noted, is in part due to the simple fact that some of the

tion of the rich micro-fauna of the "Polygordius ground"—a sub-littoral habitat with gravel, sand, and broken shells lying in about twenty-five fathoms of water. It abounds in the primitive Annelid *Polygordius*, and yielded six new genera and twenty-eight new species of small fry.

We should like to have been able to refer to the discussion of marine ecology by Mr. Southern, to the admirable introduction, narrative, and summary by Mr. Lloyd Praeger, and to the reports on history and archæology, place names and family names, Gaelic names for plants and animals, agriculture, climate, geology, tree-growth (rather a negative quantity), and non-flowering plants; for this model regional survey has been as comprehensive in its scope as it has been thorough in its treatment. The survey has been completed in six years, which means hard work and loyal co-operation. We heartily congratulate those who have contributed to an achievement to be proud of, and most of all the secretary and editor, Mr. Lloyd Praeger.



Photo.] [G. P. Farran.
FIG. 2.—Clare Island from E.N.E. Croaghmore in the centre. Lighthouse on extreme right. Harbour on extreme left. From "Clare Island Survey."

specialists were able to visit the island oftener than others. This readily intelligible inequality was, of course, to some extent counteracted by co-operation in collecting.

Looking into the novelties more analytically, we find fifteen new genera—one among Fungi, three among Mites, three among Chætopods, and eight among Nematodes. As to the last, it must be borne in mind that our knowledge of British free-living Nematodes has been of the scantiest, and we are not surprised that Mr. Southern should speak of one of the gatherings as furnishing "an apparently inexhaustible source of new and interesting species." It was among the Lower Invertebrates and Lower Cryptogams that the biggest hauls of new records and new species were obtained. Thus there were thirty-three water-bears recorded, all new to Ireland (for there had been no water-bear list before), eleven new to the British Isles, and five new to science. One of the most interesting results is the demonstra-

PROF. BARNARD'S ASTRO-
NOMICAL PHOTOGRAPHS.¹

THE name of Barnard is not only familiar to all astronomers, but also very generally to those who have from time to time perused illustrated astronomical books. The photographic recording of celestial objects has been carried by him to a very high state of perfection, and thereby not only has his own fame and that of the Lick Observatory been considerably enhanced, but our knowledge of the visible and invisible universe has been greatly extended. Unfortunately, it is an extremely difficult matter to reproduce, with complete accuracy, such photographs as are obtained by the combination of a telescope and a photographic plate, for not only do delicate lights and shades become relatively altered, but other errors may and do creep in during the process of reproduction. Further, the attempt to secure such high accuracy in reproduction increases very considerably the cost of publication. It will be gathered, therefore, that the extreme fineness and beauty of the original pictures cannot necessarily be judged by plates that have so far been published.

It is a great pleasure now to record the fact that, by a generous response for financial aid and with the assistance of considerable skill in reproduction, Prof. Barnard has been able to publish a selection of the photographs he took during the years 1892 to 1895. The volume contains 129 plates reproduced by the collotype process, and

¹ "Photographs of the Milky Way and of Comets, made with the Six-inch Willard Lens and Crocker Telescope during the Years 1892 to 1895." By E. E. Barnard, Astronomer in the Lick Observatory, University of California. Publications of the Lick Observatory, vol. xi., 1913.

while Prof. Barnard states that "the very great delay in the appearance of this volume of photographs can only be attributed to the writer's anxiety to secure the best possible reproductions of the original pictures," the excellence of the reproductions is the reward due to the delay in question.

In the introduction to the volume the author brings together some very interesting information, both instrumental and photographic, with regard to these pioneer days. Possibly for the first time a statement is made regarding the origin of the now famous 6-in. "Willard" lens, the lens so often coupled with Barnard's name in celestial photography. Willard, so far as the author could gather, was not a maker of lenses, but simply a photographic stock-dealer, whose name was stamped on lenses made by C. F. Usner in New York City. These large lenses were used for making portraits during the wet-plate period of photography, their large apertures being necessary to shorten the exposure during portrait sittings. Their application to astronomical work was first made by an amateur who used the above mentioned 6-in. "Willard" lens for photographing the solar corona during the eclipse in January 1, 1889, visible in Northern California. Some of the photographs taken were so excellent, and showed so well the great extent of the coronal streamers, that Prof. Holden, then director of the Lick Observatory, who was impressed with the excellent results obtained with it, purchased this lens for the observatory with funds provided by the Hon. C. F. Crocker.

Prof. Barnard came to use it in the following manner:—

I had been endeavouring to photograph the star clouds of the Milky Way with a small Voigtlander rectilinear lens attached to the 6-in. equatorial, but because of the slowness of the lens, had secured but feeble impressions of these clouds. The great light ratio of the old 6-in. lens suggested that it would perhaps serve my purpose. The results of some experiments which I made with it in photographing the Milky Way were very beautiful and intensely interesting. When the importance of the lens for such astronomical work became apparent, Prof. Holden placed it in the hands of Brashear, who figured it and greatly improved the definition of the star images.

Prof. Barnard gives the dimensions of the lens, and as these are of interest they may be mentioned here:—

Diam. of front lens	5.85 in.	=	148.6 mm.
" back "	6.73 "	"	171.0 "
Solar focus	42.59 in.	=	108.2 cm.
" "	70.2 "	"	178.3 "

The distance from the rear surface of the front lens to the surface of the back lens was 12.8 in. A diaphragm of 3.83 in. aperture was placed between the two sets of lenses at a distance of 5.54 in. from the front lens.

The early photographs of the Milky Way and comets were first made with the "Willard" lens in a wooden box camera strapped on to the 6½-in.

equatorial, the last-mentioned being used as a guiding telescope. Afterwards the lens, in its wooden box, was fixed on an equatorial mounting made by Brashear, the gift of the Hon. C. F. Crocker, and the telescope named after this donor.

The frontispiece shows the instrument with the 6-in. lens mounted, and also the Crocker dome which contains it.

It should be mentioned here that the new mounting was not equipped with a finder, so Prof. Barnard had to make use of the only telescope which was available for the purpose. This consisted of a small telescope, having only an aperture of 2.4 in., and there was no arrangement for the illumination of the cross threads, so desirable for very dark nights. Prof. Barnard had therefore to employ iron wires sufficiently coarse to be just visible in black relief on the dark sky. By racking out the eyepiece until the star was a little out of focus, he thus formed a disc, which he adjusted not only to be exactly behind the point of intersection of the wires, but of such a diameter that it was eclipsed by the wires with the exception of four small portions which peeped out of the four quadrants; for "following" purposes, these four positions were kept perfectly equal, the slightest inequality being detected and corrected at once. Anyone who has used this method knows how efficient it is, provided the star used for following is sufficiently bright; but, as Prof. Barnard points out, for "following" on a comet which has not a bright nucleus, "the following becomes a serious question, subject to considerable uncertainty, especially if the comet is faint." This drawback accounts, as he remarks, for the ragged condition of the trails of Brook's comet in his photographs. In spite, however, of the inefficiency of the following telescope, Prof. Barnard by his skill achieved wonderful results.

Turning now to the photographs, the page facing each plate is devoted to details of the photograph, such as date, exposure, scale, identification of stars, &c., and a brief description of the principal features. In cases where certain plates call for a more detailed description, further information is placed in the main text.

Thus, for instance, the region of the great nebula of ρ Ophiuchi is so treated. In the description of this plate Prof. Barnard says: "I do not think there is any other region of the heavens so extraordinary as this. . . . One hesitates at any attempt to describe it. Perhaps even more remarkable than the nebulosities are the vacant lanes that run eastward from the great nebula and those in the upper part of the plate." These lanes, as Prof. Barnard has previously published, suggest strong indications of light obscuration by interposing nebulous or other matter in space. This remarkable region is one of many which were discovered by him with the Willard lens. The nebula of ν Scorpii is pointed out as being of far greater interest in the direct evidence it gives of the obscuration of light in space.

Plate 3, showing the region of the great nebula of Andromeda, gives an example of the difficulty

of accurately reproducing plates from the original negative. Prof. Barnard is in every case very careful to point out the defects in each reproduction, for sometimes some inequalities of illumination, looking like nebulosities, are really defects of reproduction, even in these plates after so much care has been taken. The nebulous region of 15 Monocerotis is a wonderful photograph, and the reproduction is described as "beautiful." It shows most distinctly the great nearly vacant region beginning near the nebula and running for two or three degrees to the west and then turning north for even a greater distance. The plate illustrating the small star cloud and black holes in Sagittarius is one of numerous other fine specimens of Prof. Barnard's skill, but of which space forbids one to more than mention. No less beautiful than the Milky Way photographs are those showing comets. Among the many illustrated, most instructive are the changes of the forms of Comet I. 1892 (Swift), Comet IV. 1893 (Brooks), and Comet II. 1894 (Gale), series of photographs of which are given. Plate 101 records an interesting picture displaying the trail of the first comet (Comet V. 1892) discovered by the aid of photography.

While Prof. Barnard has brought still more to perfection his collection of astronomical photographs by using lenses more effective than the old "Willard" lens, yet this record of pioneer work is one to be thoroughly proud of, and astronomical literature is greatly enriched by the permanent record contained in this fine volume.

WILLIAM J. S. LOCKYER.

CEREBRO-SPINAL FEVER.

CEREBRO-SPINAL fever is a disease which occurs sporadically, *i.e.*, as occasional isolated cases, or in epidemic form. The first authenticated epidemic seems to have been in Geneva in 1805. In 1806 it appeared in the United States, and continued to prevail there for ten years, and again in 1861 to 1864. During this period, and indeed throughout the first half of last century, it was observed in different towns of France and of Italy, in Algeria, Spain, Denmark, etc. In 1854 and for seven years afterwards it raged in Sweden, destroying more than 4000 persons in that country. In 1863 it broke out in Germany and spread from north-eastern Prussia to the south German towns. In 1846 it appeared in many of the workhouses in Ireland, and in 1866-68 a very fatal type of it prevailed in Dublin, and to some extent in other parts of the country. The disease never seems to have established itself in London, or indeed in England, but during the last ten years epidemics of some severity have prevailed in Belfast, Glasgow, and Edinburgh, and during the past year a number of cases have occurred in different parts of the country, particularly in connection with military camps.

Cerebro-spinal fever is also termed *epidemic*

meningitis, or *epidemic cerebro-spinal meningitis*, from the fact that the prominent lesion is inflammation of the membranes (meninges) of the brain and spinal-cord. Another name is *spotted fever*, owing to the occurrence of an eruption of hæmorrhagic spots, particularly on the abdomen, which, however, is often absent.

The incubation period varies, but is frequently not more than four or five days, and the onset of the disease is usually sudden and ushered in by headache and vomiting. Stiffness and pain in the neck and retraction of the head are frequent, and twitching of the limbs and muscular tremor are often observed. Mental enfeeblement, stupor, or insensibility may occur, fever is present with prostration and wasting, and weakness or paralysis of various groups of muscles may ensue.

Cases show considerable variation in severity and duration; some are acute, others chronic, some are mild, others severe, and others again very acute and fulminating, so that death may result within twenty-four hours of the onset.

The causative micro-organism is a micrococcus, the "meningococcus" (*Diplococcus intracellularis*), a small spherical microbe measuring about $1/25,000$ in. in diameter. It occurs in pairs in groups principally within the cells of the exudation which forms on the membranes; it may also sometimes be found in the blood by culture. The meningococcus, when treated by the Gram staining process, remains uncoloured; it is readily cultivated on media containing serum, and by its cultural reactions can be distinguished from other similar micro-organisms, and does not develop at a temperature below about 75° F. The examination of the cerebro-spinal fluid for the presence of the meningococcus is now practised for purpose of diagnosis of the disease. No drug exerts any specific action upon the disease, but an "anti-meningococcic serum" is unquestionably sometimes a valuable curative agent, though at other times it fails. This variation in effect probably depends upon the fact that varieties of the meningococcus exist, and unless the serum has been prepared with the variety for which it is to be employed it is likely to fail.

The disease is undoubtedly spread by contact and possibly in other ways. The meningococcus is sometimes found located at the back of the throat, and may so exist not only in persons who have had the disease, but also in those who are seemingly healthy and have not suffered from the disease; such individuals constitute "carriers" and are sources of infection, and attempts have of late been made to detect such carriers by bacteriological examination, so that they may be isolated. Of preventive measures little of value is known, but recently a trial has been made of vaccinating with killed cultures of the meningococcus, with what result remains to be seen. The presence of the meningococcus in the throat has suggested that the organism enters the body and central nervous system *viâ* the nasal passages.

R. T. H.