

OUR ASTRONOMICAL COLUMN.

THE GREENWICH SECTION OF THE ASTROGRAPHIC CATALOGUE.—At the meeting of the Royal Astronomical Society held on March 11, the Astronomer Royal gave the chief particulars concerning the first part of the Greenwich section of the International Astrographic Catalogue, which is now quite ready for publication. The whole section comprises the region between declination $+64^\circ$ and $+90^\circ$, whilst the part soon to be published deals with the region $+64^\circ$ to $+72^\circ$ inclusive, and covers 1077 square degrees, containing 80,000 stars. From the results already obtained it is computed that the complete Greenwich contribution to the catalogue will include about 179,000 stars.

In his communication Mr. Christie stated that the number of stars per square degree increases with the declination until a maximum is reached at $+76^\circ$; this effect is probably due to the Milky Way. A discussion of the relative magnitudes of the stars obtained on the catalogue plates has shown that stars down to at least the eleventh magnitude appear on negatives which received six minutes' exposure (the *Observatory*, April).

THE COMPUTATION OF ELEMENTS FOR AN ANNULAR ECLIPSE.—A paper by Herr Zwack, secretary of the Philippine Weather Bureau, issued as a supplement to the *Bulletin* for August, 1903, explains the method used in computing the elements for an annular eclipse of the sun. The method of successive approximations is illustrated by a detailed explanation of the procedure employed in computing the elements for the annular eclipse of March 17, 1904, as seen at San Domingo (Batanes Islands) and Manila (Luzon).

RAPID CHANGES IN A SUN-SPOT.—In a communication No. 343 of the *Observatory*, Mr. Denning gives particulars of some rapid changes which he saw take place in a sun-spot on January 22. The spot was one of four in the north-west quadrant, and it had a triple umbra. Whilst Mr. Denning was observing, one of these umbræ became greatly modified, and two new small spots appeared. Mr. Denning suggests that much valuable information regarding the behaviour, the formation, and the cyclonic conditions of spots might yet be obtained by more persistent observations. Solar observations generally terminate when the positions and forms of the spots have been recorded, and from these records valuable knowledge as to the period and loci of sun-spots has been deduced, but for about the last forty years very little consistent work has been done in persistently noting the minute yet constant changes which take place in the disturbed regions about spots.

Mr. Denning further suggests that daily observations extending over several hours would probably produce results which would completely justify the outlay of the time necessary for making them.

PHOTOGRAPHIC OBSERVATIONS OF BORRELLY'S COMET (1903 c).—A paper by Mr. Sebastian Albrecht in No. 2, vol. xix., of the *Astrophysical Journal* describes thirty-one negatives of the comet 1903 c, taken at the Lick Observatory, between June 22 and August 18 inclusive, with the Crocker telescope and the Pierson camera respectively.

The negatives show two tails, one about 10° in length and generally straight, the other about $1^\circ.5$ in length and much curved. In addition to these, occasional streamers developed and were generally fairly persistent, narrow and straight, sometimes emanating from the main tail, sometimes from the coma. The modifications in the main tail which have been previously noted by the observers at the Nanterre and Yerkes Observatories are very prominently shown on the negatives secured at Lick on July 23, 24 and 26, three beautiful reproductions of which accompany Mr. Albrecht's communication. The negative of July 23 shows an entirely new tail, having a length of about 4° and an angular width of about $4^\circ.6$, issuing from the head and preceding the radius vector by about 6° . This feature is not shown on the negative secured on July 24.

The paper also contains a discussion of the various changes, together with several tables giving the dimensions and positions of the tails and streamers which are shown on the negatives.

THE EVOLUTION OF EMPIRE.

NO matter what may be the subject of investigation, the process of evolution always appears as a progressive movement from the simple to the complex, from homogeneity to heterogeneity. It is so in zoology when the simple self-contained cell by segmentation sets out on the upward path of organisation; it is so in sociology when the primitive homogeneous community through division of labour takes the first step in civilisation; it is so in art; it is so in letters; it is so in all the multifarious domains of human experience, and the evolution of empire forms no exception to the rule. In every case the method is the same. The course pursued is a zig-zag or spiral, which tends now towards difference and again towards agreement; there is a constant ringing of the changes between variation and integration, and the goal is ultimately reached under the simultaneous or alternate influence of the forces of separation and union.

In the cooperation of these apparently antagonistic factors towards a common end lies the paradox of all ages. It is the riddle of the sphinx which each succeeding generation must solve or succumb. Ancient philosophy made many good guesses at the truth. Herakleitos, 500 B.C., wrote, "Opposition unites; from what draws apart results the most beautiful harmony; all things take place by strife." Empedokles a few years later spoke of creation as the product of love and strife, "From these come all things that are or have been or shall be." Still later Plato, referring to the teaching of Empedokles, wrote, "Being is many and one and is controlled by hate and love; borne apart it is always borne together." The Persians personified the antithesis under the dualism of Ormuzd and Ahriman, the powers of light and darkness. So universal is this concerted antagonism that it seems to be inherent in the very essence of things, and is doubtless a manifestation of the polarity which pervades creation. Even in music, the most fugitive and intangible of arts, the process of evolution through difference and agreement is clearly marked. The simplest music is in unison—to this succeeds a differentiation into various parts, and these are ultimately blended in harmony. So that the sequence, here as elsewhere, is from unity, through difference, up to union, the reintegration being more complex and in a far higher plane of performance than the uniformity from which it was evolved.

It was left for Darwin to focus the vague surmises of his predecessors and to demonstrate the systematic operation of variation and integration in the production of new forms. Science since his day has been occupied in applying his theory to fresh fields of inquiry, and in no department has a richer harvest of results rewarded the investigator than in tracing the application of the laws of evolution in the development of communities.

Comte was of opinion that the most fruitful results would follow the process of sociological suggestion followed by zoological verification, and striking confirmation of the efficacy of this method is found in the fact that Darwin got the first hint of his discoveries from contemplating the dilemma of Malthus with regard to population. This sequence is most rational, for selection has arrived at a far greater degree of finality and excellence in living forms than in social organisms. In each case nature proceeds by continual invention and experiment and ruthless discarding of failures, but in zoology the problems are simpler, because the factors are more determinate than in sociology. The rigorous dynamics of blood pressure and the limitation of speed of nerve currents are fixed conditions which prescribe the economic size of the individual. These conditions have existed since the beginning of the world—the necessity of rapid reaction to stimulus and of vascular efficiency has caused the elimination of the unwieldy antediluvian monsters in favour of the marvellously agile and tensely arterialed modern carnivora.

In sociological problems the hand of nature is still that of the apprentice. New conditions as to communication and transport have rendered previous conclusions nugatory. The difference in speed of communication to-day as compared with 300 years ago is illustrated by the fact that the news of Queen Elizabeth's death did not reach some parts