subject-matter to any other mathematical journal in the United Kingdom.

MESSRS. DULAU AND CO. have just issued a catalogue (No. xv.) of works on geographical botany, containing more than four thousand titles, offered for sale by them.

THE Appendix of "Quain's Elements of Anatomy" (Longmans, Green, and Co.), which completes the tenth edition of the work, has now been published. The subject, "Superficial and Surgical Anatomy," is treated by Profs. G. D. Thane and R. J. Godlee.

WE learn from the current (and final) number of the *American Meteorological Journal*, that the New England Meteorological Society has been dissolved. It was formed in Boston, in June 1884, to promote the study of atmospheric phenomena in the New England States, and to establish systematic observation. It has done much useful work, especially relating to rainfall, thunderstorms and range of temperature, the results of which have from time to time been published in the above-named journal. The system of regular meteorological observations and the publication of a monthly bulletin were transferred to the New England Weather Service, in connection with the Washington Weather Bureau, several years ago.

THE Rebman Publishing Company have issued the first number of the *Archives of Clinical Skiagraphy*, by Mr. Sydney Rowland, being the commencement of a series of collotype illustrations, with descriptive text, illustrating applications of the new photography to medicine and surgery. In an introduction Mr. Rowland gives a brief account of Röntgen's discovery, and describes the great advantages obtained by the use of the form of Crookes' tube known as the focus tube, devised by Mr. Herbert Jackson. The excellent results obtained by British investigators working with X-rays are almost entirely due to the introduction of this form of tube. As to the constitution of fluorescent screens, Mr. Rowland agrees with the conclusion arrived at by Mr. Jackson after a systematic examination of numerous substances, viz. that the best salt to use is platinocyanide of potassium. The plates included in the present number of the *Archives* show the skeleton of a full-grown child, aged three months (exposure fourteen minutes), a needle embedded in a finger (exposure two minutes), knee-joint, from a case of multiple exostosis (exposure nine minutes), and hand of same case (exposure three minutes), wrist and forearm showing syphilitic disease of radius (exposure six minutes). The illustrations may be taken as an indication of how the Röntgen photography is able to supplement diagnosis in all cases of bony disease. It is really astonishing to think that, though Prof. Röntgen's discovery is but a few months old, it has already taken its place among the approved and accepted aids to diagnosis, and a publication has been started to deal with its developments in medicine and surgery.

THE additions to the Zoological Society's Gardens during the past week include a Rhesus Monkey (*Macacus rhesus*, ♂) from India, presented by Mr. E. Turnham; a Fennec Fox (*Canis cerdo*) from Egypt, presented by Mr. J. G. Mackie; a Mexican Skunk (*Mephitis macrura*) from Mexico, presented by Mr. Henry Heath Cochrane; a Brahminy Kite (*Haliastur indus*) from India, presented by Mr. A. Kemmis-Betty; an African Tantalus (*Tantalus ibis*), a Leopard Tortoise (*Testudo pardalis*) from East Africa, presented by Captain Dugmore; a Canary Finch (*Serinus canarius*) from Madeira, presented by Mr. H. B. Hewetson; a Great Wallaroo (*Macropus robustus*, ♀), a Gould's Monitor (*Varanus gouldi*), a Black and Yellow Cyclodus (*Cyclodus nigroluteus*) from Australia, a Yellow-headed Conure (*Conurus jendaya*), two Brazilian Tortoises (*Testudo tabulata*) from Brazil, five Meyer's Parrots (*Pæocephalus meyeri*), two Alario Sparrows (*Passer alario*) from South Africa, a Brown-throated Conure (*Conurus æruginosus*) from South America, deposited; a Chimpanzee (*Anthropopithecus troglodytes*, ♀) from West Africa, a Red-naped Fruit-Bat (*Pteropus funereus*), —— Bandicoot (*Perameles* ——) from Australia, two Spotted Tinamous (*Nothura maculosa*) from Buenos Ayres, purchased.

## OUR ASTRONOMICAL COLUMN.

THE PLANET MERCURY.—An unusually good opportunity of observing the planet Mercury with the naked eye, or with an opera-glass, will be afforded about the middle of the present month. The planet will be at its greatest eastern elongation on May 16, when it will be 22° from the sun, and will remain above the horizon for two hours and a quarter after sunset. At this time the apparent diameter of the planet will be 8″, and about 0·4 of the disc will be illuminated. On May 14, at 6 p.m., the planet will be in conjunction with the moon, Mercury being 2° 24′ to the south; at 9 p.m. on the same evening, the crescent of the two days' moon will be about 3° N.N.E. of the planet.

COMET SWIFT 1896.—The following continued ephemeris for the new comet is from revised elements computed by Dr. Schorr for Berlin midnight:—

| | R.A. | Decl. | Brightness. |
|---|---|---|---|
| | h. m. s. | ° ′ | |
| May 8 ... | 2 12 41 ... | +62 58·1 | |
| 10 ... | 1 58 52 ... | 64 46·1 ... | 0·35 |
| 12 ... | 1 44 41 ... | 66 17·4 | |
| 14 ... | 1 30 19 ... | +67 33·9 ... | 0·26 |

The unit of brightness is that on April 16. The comet was easily visible in a three-inch telescope on April 30, when the computed brightness was 0·7.

NEW DIVISIONS OF SATURN'S RINGS.—In the current number of the *Comptes rendus*, M. Flammarion gives particulars of some very interesting observations of Saturn's rings which have been made at his observatory by M. Antoniadi during the last month. Between the Cassini division and the Crape ring, three new divisions of the ring have been noted. The darkest of these, which is easily visible when the air is transparent, nearly bisects the inner bright ring; the fainter divisions, one on each side, are only observed with difficulty. The inner bright ring is thus divided into four zones, gradually darkening towards the planet.

This is by no means the first time that divisions of this kind have been recognised. Herschel, De Vico, Bond, Hall, and others, have in turn observed or suspected them, but Cassini's division is the only one which seems to be certainly permanent. M. Flammarion concludes that the fainter divisions observed on the rings are variable, and possibly dependent upon the varying attractions of the eight satellites upon the meteoritic particles of which the rings are composed.

DETERMINATION OF THE GENERAL BRIGHTNESS OF THE CORONA.—In the current number (vol. vi. No. 6) of the *Journal* of the British Astronomical Association, Mr. Joseph Lunt suggests a method by which a numerical value could be obtained for the general photographic intensity of the light of the corona during a total solar eclipse.

The method consists in photographing a "sensitometer window," consisting of twenty-five numbered squares of graduated opacities (like a Warnerke's sensitometer, but with different values). The opacities are so adjusted that an exposure of ninety seconds to full moon-light, which approximates to the coronal light, should yield a negative showing the figure 12. The negative could be obtained either by direct contact with the "sensitometer window" (as in lantern-slide making), or by forming an image of the "window" on the plate by means of a lens. The plates could be standardised by exposure to any standard artificial light or to full moon-light, according to Mr. Maunders' suggestion, in order to reproduce the precise illumination of the sensitometer window given by the corona. The conditions of development of the negatives for comparison should be identical, and the plates used should all be of identical sensitiveness.

The apparatus required is very simple, consisting of a box of square section, about three feet long, closed at one end by a ½-plate dark slide, and at the other by the ½-plate sensitometer,

screened by a dew-cap. A diaphragm in the middle carries a lens to form an image of the sensitometer on the plate. A simpler way is to obtain the negative by direct contact, in which case the sensitometer should be screened from the general sky illumination of the horizon.

## OBSERVATIONS ON ISOLATED NERVE.

THE work which Dr. Waller has recently summed up in the Croonian Lecture, is an experimental study of the influence of reagents upon excitable—that is to say, living—protoplasm. The choice of nerve as the most convenient form of living matter in such an inquiry is justified by the consideration that nerve, as is now generally admitted, is practically inexhaustible. That nerve fibre, apart from its end organs, is peculiarly responsive to even slight changes of chemical condition; and, further, that with this tissue there is the advantage of a wide and regular range between minimal and maximal effects. A previous research had shown (*Brain*, 1895) that in nerve, contrary to what obtains in muscle, stimulus and response, cause and effect are proportional, the curve expressing their relation to one another being a straight line. Probably, however, the autographic records of these nerve experiments will afford the most convincing argument for the employment of nerve fibre as a test tissue.

The main principle upon which the inquiry is based is the proposition of Du Bois-Reymond and of Hermann, that disturbed protoplasm is electro-negative to the normal; that excited is electro-negative to resting protoplasm. The excised and still living nerve of the frog gives off to the galvanometer a current, called by Hermann "the current of inquiry," which current, on stimulation of the nerve, undergoes a reversal of direction, the "negative variation," or "current of action." Supposing the nerve to be set up so that the current of inquiry is manifested as a northward deflection of the galvanometer (the arrangement followed in these experiments), the negative variation will be south. It is the magnitude of this negative variation which is taken as the index to the magnitude of chemico-physical change aroused in the nerve under various chemical conditions. To a series of stimuli of uniform intensity and duration, given at regular intervals, the nerve responds by a series of uniform deflections or negative variations, which persist for an indefinite time in the absence of modifying agents. A short series of such normal deflections precedes, in these experiments, the application of a reagent, after which, the stimuli being continued, the effect of the drug appears as increase, diminution, or abolition of the negative variations, as the case may be. The galvanometer deflections are recorded on a slowly-moving photographic plate.

The nerve, it should be said, is enclosed in a moist chamber, and rests on two pairs of electrodes, those leading off to the galvanometer, and a pair of wires from an induction coil by which the stimulations are sent in; these consist of weak tetanising currents of 8 secs. duration, given at minute intervals. Where gases are used, they are simply driven through the nerve chamber by pressure; where drugs in solution are employed, the nerve is removed from the electrodes and bathed in the solution for one minute.

Such is, briefly, the method employed. Of the results hitherto obtained, those which relate to the action of anæsthetics upon living matter will have a wide interest from their bearing upon a great practical issue. There is, of course, no question of the crude application of laboratory experience to therapeutics; yet a test so delicate and regular in its working, cannot but have its value in any estimate of the relative advantages and perils of various anæsthetic agents.

The comparative action of carbon dioxide, of ether, and of chloroform has been studied at length. All these in small quantity produce primary augmentation, and a pretty experiment consists in simply blowing through the nerve chamber, when the characteristic rise is produced by the carbon dioxide contained in the expired air. In larger quantity carbon dioxide gives abolition or diminution (Figs. 5 and 6); several minutes may elapse during which there is no response to the regularly repeated stimuli, but the abolition is not permanent, the deflections reappear, attain to, and for a time surpass their normal size. Ether vapour produces a more prolonged anæsthesia, followed by complete recovery of excitability (Fig. 1). Chloroform vapour gives a still more prolonged and often final abolition, recovery, where it takes place, being much less complete than in the case of ether (Fig. 2). Carbon dioxide added to chloroform counteracts the toxic effect and renders it more perfectly anæsthetic—that is to say, there is complete abolition followed by complete recovery.

Of the many other gases tried, oxygen (Fig. 3), carbon monoxide, and nitrous oxide (Fig. 4) give little or no effect, anæsthesia by the last is probably a carbon dioxide effect.

Passing by many groups of chemical substances of which the action has been tested, we may note merely that the study of the comparative action of haloid salts brings out with much clearness the analytical value of the method.

In regard to the acids, a fundamental question to be determined was as to whether their action upon living protoplasm was in proportion to acidity or to avidity. The answer obtained is to

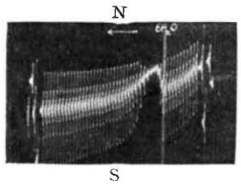

FIG. 1.

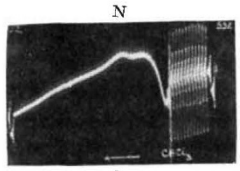

FIG. 2.

the effect that acidity is the chief determining factor. Three acids of widely different avidities, viz. nitric, sulphuric and acetic, have approximately equal effects at the same acid strength. Yet acids have also their specific action, a comparison of, for instance, lactic and oxalic acids of equal strength shows the former to be far more powerful than the latter.

But the most interesting result of these experiments, from the purely physiological point of view, is the demonstration of the evolution of carbon dioxide in the nerve itself. As the chief terminal product of protoplasmic activity carbon dioxide had received a large share of attention, and its influence had been recognised as giving the clue to a curious puzzle with regard to the nerves. In the earlier experiments, when a frog was killed, one sciatic nerve was removed for use, while the other was

FIG. 3. FIG. 4.

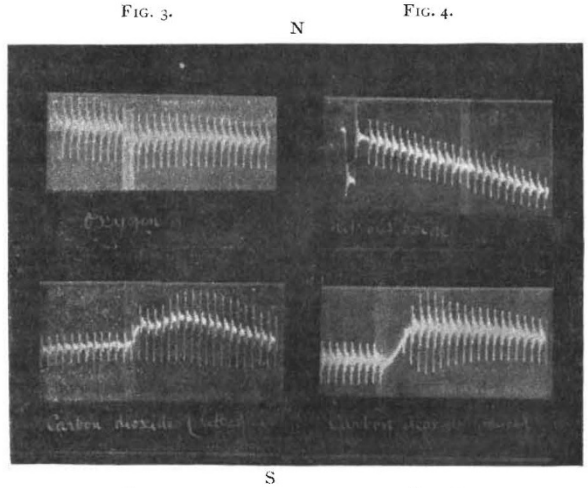

FIG. 5. FIG. 6.

The light band across the plates marks the passage of the gas through the nerve chamber.

left in the body until required. It was noticed that the second nerve was usually more excitable than the first, and when, as sometimes happened, a nerve had been left in the body all night, the negative variation was often a very large, though a declining one. To recognise that this augmentation was due to carbon dioxide given off by the surrounding tissues, was to have a fresh example of the delicacy of nerve as an indicator of the presence of the gas; and the question suggested itself: Supposing carbon dioxide to be evolved during nerve activity, *i.e.* prolonged tetanisation, ought not its presence to be marked by the now familiar augmentation of the negative variation? To test this, recourse was had to a very simple experiment; but before making it, a forecast of its probable course was drawn upon a