

history and religion, as well as to matters of legal and medical interest. Among the new modes of investigation are the comparative methods, which have to a great extent taken the place of the older introspection; the experimental method, which commands most attention in the present day; and the pathological method, which, taking advantage of nature's own experiments, has thrown much light on the real character of the contents of some parts of our normal experience. Finally, the newer aims of psychology include the attempts to classify actual personalities with reference to standard equilibrated types, and to find a field for practical applications in pedagogy and in the treatment of criminals.

At the suggestion of Prof. A. A. Michelson, Mr. L. E. Gurney, of the University of Chicago, has investigated the viscosity of water at very low rates of shear in order to determine whether any change in its value occurs when the motion of the liquid is slight. The water was enclosed between concentric cylinders, the outer one of which was rotated at a measured rate about its axis, while the inner one was prevented from rotating by means of a couple of measured moment. For rates of shear varying from 5 radians down to 0.66 radian per second the author finds no evidence of an increase of viscosity as large as 1 per cent. (*Physical Review*, January).

In the *Physikalische Zeitschrift* for March 1 Dr. W. Lohmann describes his measurements of the Zeeman effect for the principal lines of helium. The helium tubes were placed in cylindrical holes bored through the pole pieces of the electromagnet in such a way that the electric current through them flowed parallel to the magnetic field. The separation of the outer from the middle lines of the triplets produced was observed by means of an echelon spectro-scope. Dr. Lohmann finds that the separation measured on the scale of reciprocal wave-lengths, i.e. the quantity $d\lambda/\lambda^2$, where $d\lambda$ is the observed change of the wave-length λ , is the same for the whole of the nine lines of helium observed, and is proportional to the strength of the magnetic field used. He considers this result points to an extremely simple form of helium atom.

PROF. AUGUSTO RIGHI announces the discovery of a new type of rays in the *Rendiconti dei Lincei* for February 2. It was Plücker who first observed that kathode rays, immersed in a strong magnetic field, trace out the magnetic lines of force. This is now held to mean that the projected electrons really describe high-pitched spirals about the lines of force, which nearly coincide with those lines when the field is very strong. Now Prof. Righi has found that these rays do not, as a rule, convey an electric charge. They are therefore not simple kathode rays. They are more probably sets of molecular magnets, constituted by electrons revolving about positive atoms in the planetary fashion. Such systems would possess considerable stability in a magnetic field of the same sign. They would not, of course, carry an electric charge, being themselves neutral combinations, but less close than ordinary chemical combinations. As the field gets weaker, the orbits would open out, and the system would be retarded, and might even return to the kathode. Prof. Righi has found evidences of such return. He proposes the term "magnetic rays" for the new radiation.

A WORK on "Stone: Quarrying and Preparation for the Market," by Mr. A. Greenwell and Mr. J. V. Elsdon, will shortly be published by the Chichester Press, Furnival Street, London, E.C.

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THE thirty-eighth annual report of the Wellington College Natural Science Society has been received. It deals with the society's work during 1907, and serves to show that the activity of the members is well maintained. A complete meteorological report for the year is included in addition to the proceedings of the society.

THE Royal Swedish Academy of Sciences is publishing a new edition of Swedenborg's scientific works in Swedish and the original Latin. The first volume has appeared, and two others are in the press. These three volumes include Swedenborg's contributions to geology, chemistry, physics, mechanics, and cosmology. Introductions are provided to the various volumes, that to the first by Prof. Alfred G. Nathorst, and those to the second and third by Prof. Svante Arrhenius, while those for forthcoming volumes on anatomy and physiology will be by Profs. Gustaf Retzius and S. E. Henschen respectively. The volumes are being edited by Mr. A. H. Stroh, of Philadelphia, and the price of each volume is 8s., payable in advance.

THE general report on the operations of the Survey of India administered under the Government of India during 1905-6 is now available. It has been prepared under the direction of Colonel F. B. Longe, R.E., Surveyor-General of India, and deals with the operations of the department for the survey year ending September 30, 1906. It appears that the total out-turn of detail topographical and forest surveys on all scales was 23,312 square miles, against 26,340 square miles of similar surveys during the previous year, and that no surveys on a smaller scale than 1 inch equal to the mile were carried out during the year. The total area triangulated or traversed for topographical or forest surveys was 27,134, against 19,265 square miles for the previous year. The total area of cadastral and special surveys was 2982 square miles, and the area traversed was 6464 square miles, as compared with 7305 square miles of survey and 6398 square miles of traversing in 1904-5. Among special observations during the year may be mentioned systematic vertical observations of the Himalayan peaks of Kedarnath, Srikanta, Jaunli, Bander Punch, and Nanda Devi from stations near Dehra Dun; if this series of observations can be continued over five or six years the varying effects of refraction and snow-fall will be deducible. Pendulum observations were carried across the plains of the Punjab from Simla to Quetta, and the results have proved that a zone of excessive density crosses the Punjab plains from north to south, underlying Montgomery, Ferozepore, and Mian Mir. The field work of the magnetic survey over different portions of the country has been continued and extended.

OUR ASTRONOMICAL COLUMN.

A POSSIBLY NEW SATELLITE TO JUPITER.—A note in No. 4237 of the *Astronomische Nachrichten* (p. 207, March 6) announces the discovery of a new minor planet, or, possibly, a satellite, near Jupiter. The object was discovered by Mr. P. Melotte on a plate taken by him with the 30-inch equatorial reflector on January 27, and is of the sixteenth magnitude; it has been observed at Greenwich on seven nights since that date, and Prof. Wölff photographed it at Heidelberg on March 3. Should this faint object prove to be a minor planet, its temporary designation will be 1908 CJ, and it will probably prove to be a unique object, as regards its orbit, of its class. But it seems likely—so far as can be judged from the few observations yet made—that it is, really, an eighth member of Jupiter's satellite system, and if this is so it is probably the faintest and most distant yet discovered.

OBSERVATIONS OF JUPITER DURING THE PRESENT OPPOSITION.—M. P. Vincart, of Antwerp, to whom we referred in our issue of January 16 (No. 1994, p. 259) as having made his own reflector, describes his more recent observations of Jupiter in No. 3 of the *Gazette Astronomique* (p. 27). On February 5 the shadow of the fourth satellite, projected on to the bay of the Red Spot, appeared elongated, and was encircled by a brilliant halo where it came in contact with the Red Spot. On February 13, despite prolonged attention, M. Vincart was unable to find the least trace of the regular markings recently described by Mr. Bolton.

M. Vincart states that with his instrument he is able to separate, clearly, the components of γ^2 Andromedæ, whilst with the naked eye he is able to count thirteen stars in the Pleiades and to see Jupiter's third satellite when at its elongations.

RECENT OBSERVATIONS OF VENUS.—The third number of the *Gazette Astronomique* (February 29, p. 21) contains an interesting description, by Mr. J. M. Harg, of Lisburn, Ireland, of his recent observations of Venus, made with refractors of 104 mm. and 123 mm. aperture, and using a magnifying power of 200. Four sets of markings were recognised from time to time during the period December 29 to January 20, and are illustrated by the drawings accompanying the note. The first, in longitude 180° , is a long oblique shadow; the second is in longitude 270° , and is an irregularly shaped marking showing numerous details in its outline; the third is a doubtfully permanent, double marking in longitude 0° ; and the fourth is of a curiously bent form in longitude 90° . Mr. Harg's observations indicate that the rotation period does not exceed 23h. 28m.

THE SYSTEM OF ζ URSAE MAJORIS (MIZAR).—Prof. Frost, in a brief note communicated to No. 4235 of the *Astronomische Nachrichten* (p. 171, February 29), confirms Dr. Ludendorff's observation of the variable radial velocity of the fainter component of ζ Ursæ Majoris, but states that the Yerkes spectrograms show a greater range of velocity, varying from -17 km. to $+10$ km. per second; the period of the variation cannot yet be stated.

The plates of Alcor, the naked-eye companion to Mizar, show that the radial velocity of this star also is variable, the changes in the spectrum being so rapid that it has been found necessary to take spectrograms in continuous succession for several hours; it seems probable that the period will be found to be exceedingly short. A qualitative examination of the spectra obtained shows that the 4481 Mg line and the hydrogen lines are sometimes double, sometimes single. The displacement of the 4481 line with respect to the Ti line of nearly the same wave-length also varies considerably.

MARS AS THE ABODE OF LIFE.—The title of Prof. Lowell's article in the March number of the *Century Magazine* is "The Sun Dominant," and in it the author discusses the analogies between areographical and terrestrial conditions. The evolution of the conditions of habitability on the earth is described, and it is shown that the same kind of evolution is probably taking place on Mars. From the fact that the same species of animals, often the same individuals, are able to sustain life under the vastly different conditions of temperature and atmospheric pressure exhibited at various altitudes in the Andes and similar mountain ranges, it is argued that the variations of temperature and the constant lowness of the pressure on Mars should prove no bar to the possibility of living creatures existing there. The presence of water—demonstrated, since the article was written, by Mr. Slipher's spectrograms—and of vegetation are also discussed, and the article concludes with a discussion of the mode in which the presence of organic life is manifested.

THE VARIABLE STAR β , 1907, AURIGÆ.—A telegram from Prof. Hartwig, published in No. 4238 of the *Astronomische Nachrichten* (p. 223, March 9), states that the variable star β , 1907, Aurigæ, which he has found to be of the U-Geminorum type, was of the ninth magnitude on March 6, having increased four magnitudes in one day, whilst within eight days it was less than the fourteenth magnitude.

THE CARNEGIE INSTITUTION.

THE "Year-book" for 1907 of the Carnegie Institution of Washington is now available. It contains the minutes of the last meeting of the board of trustees, the reports of the president, Prof. R. S. Woodward, and the executive committee of the institution, and the reports on investigations and projects. The volume, of 230 pages, serves excellently to indicate the admirable work in science which is being done by means of the grants made by the institution. The subjoined summary of the reports shows the position of the institution and some of the directions in which progress was made during the past year.

At the meeting of the board of trustees in December last a letter from Mr. Andrew Carnegie was read announcing his intention to add 400,000. to the endowment of the institution. The financial statement for the year ending October 31, 1907, shows that the assets of the institution, including real estate and equipments, amounted to nearly two and a quarter millions sterling, the endowment being 2,000,000. At this meeting of trustees the following general appropriations were made for the present year:—publication fund, 10,000.; administration, 10,000.; grants for departments and large projects, 75,988.; and for previously implied grants, new minor grants, and research assistants, 10,000.

The report of the president for the financial year 1906-7 shows that the amounts available during that year were:—for large grants, 109,538.; for minor grants, 15,226.; for research assistants, 5080.; and for publication, 16,400. The aggregate receipts from interest on endowment, interest on deposits in banks, sales of publications, and miscellaneous items, amounted to 578,274.

From the income of the institution during the last six years there has been spent, for large projects, 240,462.; for minor and special projects, 138,530.; and for publication, 28,117. The gross sums allotted to large projects since the organisation of the institution amounted to 271,237., and for minor projects and research assistants to 156,936.

The report of the president also summarises the work of the various departments of the institution. The department of botanical research is engaged on a series of problems the elucidation of which cannot fail to be of the greatest interest and value, whether applied to the restricted field of botany or to the broader domain of biology. By means of observation, experiment, and measurement it is proposed to determine, as nearly as may be, the conditions of development, growth, distribution, migration, and variation of desert plants. Thus, in addition to systematic studies of the forms and distribution of these plants, there must be carried on studies of the factors of temperature, rainfall, evaporation, soil moisture, and anatomical and physiological adaptability. The location of the desert laboratory in a country affording a wide range of plant-forms, as well as a wide range of conditions in altitude, temperature, soil-moisture and soil-composition, presents unequalled opportunities for such studies. Along with these lines of work, the anatomical, physical, and physiological researches of the department staff have already resulted in noteworthy contributions to biological science.

The work of the department of experimental evolution is progressing favourably along lines explained in preceding reports, the principal problems under investigation being those of heredity in plants and animals.

The completion and occupancy of the geophysical laboratory mark a noteworthy advance in the progress of the novel and difficult experimental work carried on in this department of research.

The experiments and investigations of Mr. Luther Burbank in horticulture, and the work of preparing a scientific account of his methods and achievements, are progressing as favourably as the available division of time and labour will permit.

During the season under review, as hitherto, the department of marine biology has extended its laboratory and collecting facilities to specialists in zoological research, eleven such guests having availed themselves of the opportunities afforded at Dry Tortugas and in the adjacent