senses: (1) for electrical energy, which is measured in *watts*; (2) for electric currents, which are measured in *amperes*; and (3) for electrical quantity, which is measured in *coulombs*.

Joé has discovered that the resistance of cobalt in a magnetic field is *increased* in the direction of lines of force, and *diminished* in directions at right angles to them.

STAR NAMES AMONGST THE ANCIENT CHINESE.

IN two recent numbers of the *Chinese Review* (vol. xvi. Nos. 5-6) the well-known scholar, Dr. Joseph Edkins, writes on the subject of star naming amongst the ancient Chinese. He says that there are two great periods of star naming in ancient China, the first being about B.C. 2300, and the second during the Chow dynasty from B.C. 1120 to B.C. 220. The real beginning of Chinese astronomy is, in Dr. Edkins's opinion, to be found in the period preceding B.C. 2300, about which date, by command of the Emperor Yan, the observation of the meridian stars was made. Amongst primitive Chinese observers our Scorpion was a dragon, Aquarius a serpent or tortoise, Taurus a tiger, and Leo a bird. These figures were, however, larger than our zodiacal signs; for instance, the chief portion of Virgo, Leo, and Cancer would form the Red Bird. At that remote period we find that Chinese astronomers divided the heavens into four large sections, and twenty-eight small groups or constellations. The former, the large ones, are all animals, and are arranged from east to west, while the constellations are arranged from west to east. There were seven eastern constellations forming the Green Dragon—which comprised the stars in Libra, Scorpio, and Sagittarius; seven southern constellations, the Red Bird, or *Feng-hwang*—comprising Cancer, Leo, and Virgo; seven western constellations, the White Tiger—made up of Aries, Taurus, and Gemini; and the seven northern constellations, the Dark Warriors—or the Serpent or Tortoise. Each group, whether large or small, had its Chinese name. The Red Bird or Pheasant is the constellation of summer or the south; the Dragon, of spring or the east; the Tiger, of autumn or the west; and the Serpent or Tortoise, of winter or the north. Since the Great Bear points to Spica Virginis, the Chinese astronomers made the group led by Spica the group of spring. Another reason for thus making Spica the gate of the year is, perhaps, to be found in the fact that the Babylonians, from whom the Chinese probably got their astronomy, for a long time regarded Scorpio as the first of the signs. This is, of course, a mere guess, for we cannot, after this lapse of time, tell how much of the astronomical knowledge of the Chinese is derived from external sources. On the probable Babylonish origin of some of the astronomical knowledge of the Chinese, Dr. Edkins says:—"The contests of the early Buddhists with the worshippers of fire show that the Persian religion was propagated in India during and after the sixth century before Christ, and the eagerness with which the Hindus adopted the Greek astronomy after Alexander's invasion of India, as well as our knowledge of the fondness of the Buddhists for astrology, make it probable that Babylonian ideas on the stars were familiarly known in ancient India, during the period when they became popular in China. The resemblance of the cosmogony of the laws of Manu to that of the Babylonians seems to support strongly the correctness of the statement that Babylonian astrology was accepted at the same time in ancient India and in ancient China." With regard to the names of the four zodiacal signs, they are, as we have seen, those of animals, and it is peculiar that they are all Chinese animals but the Dragon, and it is not known that any species of dragon ever existed in China. In the naming of the constellations a wider field is included. Thus, the following are found: parts of the body, as heart, stomach, lips; buildings, a house, a wall, a well, a tower; articles of daily use, a peck measure, a net, a carriage; animals, K'wei K'ien (a humped boar leading a cow to sacrifice); adjectives and numerical groups, &c. From these names it appears that the origin of the appellations was popular rather than Imperial. In B.C. 1144, Wen Wang began to write the treatise called "Yi King." The adoption by Wen Wang of red as the Court colour of the Chow dynasty, and the fact that his son introduced five colours into the sacrifices, show that the Babylonish doctrine of the five colours and the five planets was known in China at that time. There are, however, variations in the colours. Thus, Mars is red in both China and Babylon; Jupiter, orange in Babylon, blue or purple in China; Venus, yellow in Babylon, white in China; Mercury, blue in Babylon, black in China; Saturn, black in Babylon, yellow in China. The "Yi King" shows that the stars were divided into four groups from the earliest times, for the Dragon and the Tortoise lie at the root of all the divination of that work; and the Tiger and Red Bird are respectively assigned to the west and the south. Shortly after the date of "Yi King" we find the following points mentioned: the cycle of twelve years, dependent on a revolution of Jupiter; the twelve hours into which the horizon is divided by the pointing of the Bear; the cycle of ten days; the cycle of twenty-eight constellations; the four seasons; the sun, moon, and planets. Astrology was, of course, implicitly believed in; in fact, the end and aim of all ancient Chinese astronomy was astrology. The conjunction of the sun and moon controlled the good and bad luck of the Empire, and particular stars foretold the fortunes of the various portions of the Empire, for each province had its presiding star. During the Chow dynasty—that is, after B.C. 1120—many constellations are named. Thus the fifth Emperor ordered a group of stars in Cepheus to be called Tsau-fu, after his favourite charioteer. Wang-liang was also a charioteer about B.C. 470, and his name was given to a number of stars in Cassiopeia. The virtues of a duke of the Tsi kingdom who died in B.C. 488 were so great that a star was called after him. Unlike the old names, all of which seemed to denote a popular origin, those named during the Chow dynasty show their Imperial origin. Thus several stars in Leo were styled Wu-ti-tso—that is, "throne of the five emperors." During the second century before the Christian era, Chinese astronomers pointed out the five emperors. The chief ruler of Heaven is the ancient pole, the star Tai-yi, 22° from our present pole. The seven stars of the Great Bear are the Government—rulers of the sun, moon, and five planets. The palace of the heavenly emperor is bounded by the oval formed of the fifteen stars of Draco, amongst which is Tai-yi. At the back of the bear is the group Wen Ch'ang Kung, "the palace of literature brilliantly spread abroad," the favourite object of the adoration of the *literati*. The abode of the eastern emperor is in Scorpio. The group containing Antares is Ming-t'ang, the council-hall of the emperor, where he give laws to his subjects. The adjoining stars are the sons of the emperor. The palace of the emperor is Arcturus, and the two large stars in Centaur to the south of Sagittarius form the south gate of his dominions. In Cancer and Leo lies the residence of the southern emperor. One group is the palace of the sun, moon, and planets, and surrounding this group is a guard of twelve feudal barons who keep the throne of the five emperors. Between Procyon and Regulus, and between the ecliptic and equator, there is a group in Hydra called the willow-branch, which rules over planets, and forms the beak of the Red Bird. The constellations of the Seven Stars adjoin this, and form the neck of the Red Bird: its crop is the kitchen of the palace; Hydra forms the bird's wings; the constellation Yi is the imperial hotel where visitors at the palace are accommodated; the constellation Corvus finishes the shape of the Red Bird, and is the last in the zodiac. The seven western constellations—that is, those made up of Aries, Taurus, and Gemini—are "the lake of fulness," "the five reservoirs of heaven," "the home of the five emperors." Hyades is "the announcer of invasion on the border." Later on—that is, probably about the second century—the stars are grouped into three principal sections, the first section containing the circum-polar stars, the second stars in Leo and Virgo, the third twenty-two stars in Serpens, Hercules, and Ophiuchus, the latter being said to be feudal rulers paying homage to the Emperor. The whole history, in fact, of Chinese astronomy is full of this comparison of the state of the kingdoms on the earth with the heavenly bodies. Thus, under the Tsin dynasty, the pole star is the abode of the supreme ruler. "The circum-polar stars form his court. Their name as a whole is the 'purple subtle inclosure.' The stars selected to represent the emperors of the five colonies" (*i.e.* blue, red, yellow, white, and black) "were Denebola and four others in Leo. They are surrounded by twelve groups, which have received names of office and rank representing together the court of an earthly emperor. This inclosure is the court, especially, it is said, of the yellow emperor, whose essence is called Han-shu-nieu. The four remaining colours are near him. The blue emperor is Ling-wei-yang. The red or south emperor is Chi-piau-nu. The white emperor of the west is Pe-chan-kü, 'the white beckoning mason's rule.' The north or black emperor is

Hie-kwang-ki, 'mark of combining light.' Besides this palace in Leo and Virgo, there is another, Tien-shi-yuen, 'inclosure of the heavenly market.' It is not far to the north-east of Scorpio. It is the serpent in our astronomy. Within the brilliant circle of the serpent is a star called 'court of the western heaven.' There is also a bright star, α Herculis, which is called 'emperor's throne.' The twenty-two stars in the Serpent are named after the States into which China was formerly divided."

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

CAMBRIDGE.—Among the numerous lectures on physics and chemistry this term, we note those of Prof. Liveing, on spectroscopic chemistry; Prof. Dewar, on physical chemistry; Mr. Pattison Muir, on chemical affinity; Mr. Robinson, on agricultural chemistry; Mr. Heycock, on chemical philosophy; Prof. Thomson, on electricity and magnetism, and on the kinetic theory of gases; Mr. Shaw, on thermodynamics and radiation; and Mr. Wilberforce, on dynamo electric machines (continuous current generators and motors). Prof. Stuart lectures on theory of structures.

Prof. Foster continues his elementary course of physiology; Dr. Lea his chemical physiology; and Mr. Langley his advanced histology and physiology.

In zoology, Prof. Newton lectures on the geographical distribution of Vertebrates. Mr. Sedgwick and Mr. Darwin conduct the large class of elementary biology. Mr. Gadow's course is on the morphology of the Amniota (recent and extinct). Mr. Sedgwick, Mr. Harmer, and Mr. Weldon continue their classes on the Invertebrata.

Mr. Darwin lectures on the physiology of plants (advanced), Mr. Gardiner has a general elementary course, Mr. Vaizey lectures on the morphology and classification of Cryptogams, and Dr. Hicks on elementary botany.

The lectures on geology are divided thus: Prof. Hughes, geology of a district to be visited at Easter; Mr. Marr, principles, and geology and scenery; Mr. Harker, petrology; Mr. Roberts, palæontology; Mr. Seward, palæobotany.

The principal mathematical lectures are the following: Prof. Stokes, semi-convergent series involving powers of a complex variable; Prof. Cayley, analytical geometry; Prof. Adams, lunar theory; Mr. Pendlebury, projective geometry; Mr. Glazebrook, hydrodynamics (waves and sound); Mr. Hobson, spherical and cylindrical harmonics; Mr. Larmor, geometrical optics and electro-magnetism; Mr. Forsyth, modern algebra (binary forms); Dr. Ferrers, elliptic functions; Dr. Besant, analysis; Mr. H. M. Taylor, higher plane curves; Mr. Webb, dynamics (elasticity and viscosity); Mr. Stearn, hydrodynamics (multiply-connected velocity-potentials and vortices); Mr. Herman, hydrodynamics (viscous and gravitating fluids).

An examination will be held at Gonville and Caius College on March 15 for one Shuttleworth Scholarship, value £60 per annum for three years. Candidates must be medical students of the University of not less than eight terms standing. In the case of candidates not already scholars of the College, the examiners may recommend at the same time for a foundation scholarship. Further particulars may be obtained from the tutors.

SCIENTIFIC SERIALS.

American Journal of Science, January.—The history of a doctrine, by S. P. Langley. This is the address delivered last year to the American Association for the Advancement of Science, here published complete with the notes that have not hitherto appeared. Its object is to show the steady progress of scientific truth, as illustrated by the history of the undulatory and corpuscular theories of light from the time of Descartes, Boyle, and other precursors of Newton down to the present day, when the identity of radiant light and heat as forms of motion, or as different effects of radiant energy, has been finally established.—Description of the new mineral beryllonite, by Edward S. Dana and Horace L. Wells. This is a new phosphate of sodium and beryllium discovered in 1886 by Mr. Sumner Andrews near Stoneham, Maine, the same district that has already yielded fine specimens of phenacite, herderite, and other rare minerals. It occurs mostly as a crystal in a fragmentary state, of small size and seldom well formed, but remarkable for the number of planes they present, eight or more distinct planes being frequently presented in each zone on a single crystal. Twins are common, leading to many curious variations of form. The crystals are colourless, or slightly yellowish, and transparent, with specific gravity 2·845, and hardness 5·5.—The iron ores of the Penokee-Gogebic series of Michigan and Wisconsin, by C. R. Van Hise. The author's recent explorations of this region confirm Prof. Irving's conclusion that the original rock of the iron-bearing formation is a cherty iron carbonate from which the various phases of rock and the ore found in it have been produced by a complex series of alterations. The iron ore is a soft, red, somewhat hydrated hæmatite, more or less manganiferous, and mostly very friable.—A quartz-keratophyre from Pigeon Point and Irving's augite-syenites, by W. S. Bayley. The remarkable bright red rock of Pigeon Point, Minnesota, is here studied in its various phases, with the general result that the sections described by Irving as augite-syenites are partly identical with the typical red rock itself, and partly the same in all essentials as the formations which have been called its intermediate varieties. The space between the fresh olivine-gabbro and the typical quartz-keratophyre is occupied by a series of rocks exhibiting a gradual transition between the heavy dark basic rock and the light red keratophyre.—On the occurrence of hanksite in California, by Henry G. Hanks. This anhydrous sulphate of soda has hitherto been found in limited quantities amongst the various borax fields of California. But the author's researches tend to show that it exists in great abundance, and that it plays an important part in the metamorphoses that produce gay-lussite, thinolite, and perhaps borax.—Further papers on Mount Loa are contributed by James D. Dana and the Rev. E. P. Baker, bringing its history down to July 1888.—H. L. Wells and S. L. Penfield contribute notes on the new mineral sperrylite.

American Journal of Mathematics, vol. xi. No. 2 (Baltimore, January 1889).—The number opens with an instalment of a memoir entitled "Remarque au sujet du théorème d'Euclide sur l'infinité du nombre des nombres premiers," by J. Perott (pp. 99–138). A footnote supplies bibliographical information as to previous memoirs on the same subject.—Next, Prof. Cayley writes on "The Theory of Groups" (pp. 139–57), a subject he has pretty largely written upon before, and to which his attention has been recalled by the section, in Mr. Kempe's Philosophical Transactions memoir "On the Theory of Mathematical Form," entitled "Groups containing from One to Twelve Units." The paper is largely illustrated by what the author styles "colour groups."—Mr. A. E. H. Love discusses "Vortex Motion in certain Triangles" (pp. 158–71), by a method explained by Dr. Routh in a paper in vol. xii. of the London Mathematical Society's Proceedings.—Another hydrodynamical paper follows, by Mr. Basset, "On the Steady Motion of an Annular Mass of Rotating Liquid" (pp. 172–81), wherein he follows up previous work in the line of Poincaré's and Prof. G. H. Darwin's recent investigations of the figures of equilibrium of rotating masses of liquid. The case considered is for an approximately circular cross-section and for rotation under the influence of its own attraction about an axis through its centre of inertia, which is perpendicular to the plane of its central line.—A paper, by Sophus Lie, "Die begriffe Gruppe und invariante" (pp. 182–86), is reprinted from the *Berichte der k. Sächs Gesellschaft der Wissenschaften*, August 1887.—A short note, by E. Picard, "Sur les formes quadratiques binaires a indéterminées conjuguées et les fonctions fuchsiennes" (pp. 187–94), closes the number. The method employed is that used by Poincaré in his memoir on fuchsian functions (*Journal de Jordan*, 1887).

SOCIETIES AND ACADEMIES.

LONDON.

Royal Meteorological Society, January 16.—Dr. W. Marcet, F.R.S., President, in the chair.—The Report of the Council showed that a large amount of work had been done during the past year, and that considerable progress had been made in the investigation of one of the most interesting and hitherto neglected branches of meteorology, viz. thunderstorms. Forty-nine new Fellows were elected last year, the total number on the books now being 525.—After the Report had been