taken, however, and the comet was rediscovered by Horace P. Tuttle at the Harvard College Observatory, January 4, 1858.

Johannes Rahts, of Königsberg, made the most complete discussion of the orbit, combining the observations of 1858 and 1871–2, having regard also to the perturbations. His value of the period is 13.7 yrs. The comet was next seen in 1885, and was expected during the present year. An ephemeris was accordingly distributed from Kiel, and it was probably by means of this that a faint comet, supposed to be Tuttle's, was discovered March 5th, by Dr. Wolf, as already announced. This ephemeris, as corrected by Dr. Wolf's observation, is given below.

Ephemeris.

G. M. T.			R. A.			Dec.	
1899.	Mar.	5.5	1^h	16^m	39^s	$+31°$	$36'$
		9.5	1	31	31	+30	58
		13.5	1	46	31	+30	16
		17.5	2	1	35	+29	30

HARVARD COLLEGE OBSERVATORY,
March 8, 1899.

A NEW STAR IN SAGITTARIUS.

FROM an examination of the Draper Memorial photographs, Mrs. Fleming has discovered a new star in the constellation Sagittarius. Its position for 1900 is: R. A. $= 18^h 56.2^m$; Dec. $= -13° 18'$. It was too faint to be photographed on eighty plates taken between October 18, 1888, and October 27, 1897, although stars as faint as the fifteenth magnitude appear on some of them. It appears on eight photographs taken while it was bright. On March 8, 1898, it was of the fifth magnitude, and on April 29, 1898, of the eighth magnitude. A plate taken this morning, March 9, 1899, shows that the star is still visible, and is of the tenth magnitude. Two photographs show that its spectrum resembles those of other new stars. Fourteen bright lines are shown, six of them due to hydrogen. The entire number of new stars discovered since 1885 is six, of which five have been found by Mrs. Fleming.

E. C. PICKERING.

HARVARD COLLEGE OBSERVATORY,
March 9, 1899.

NOTES ON PHYSICS.

ELECTRIC WIRE WAVES.

THE theory of electric waves along wires has been worked out very completely by J. J. Thomson for the case of a wire surrounded by a cylindrical conducting shell. A further development of the theory, together with some interesting numerical results is given by A. Sommerfeld in *Wiedemann's Annalen*, 1899, No. 2. The author gives a rigorous solution of Maxwell's equations for electric waves transmitted along a straight wire of great length. This rigorous solution leads to an equation in Bessel's functions, the roots of which give the velocity of transmission and the damping coefficients. The author gives approximate solutions of this equation for wires of great conductivity, diameter of wire being rather small compared to the wave-length, and for wires of medium conductivity, diameter of wire being very small compared to wave-length. In these two cases the equation in Bessel's functions reduces to a logarithmic form for which the roots may be found without serious difficulty.

The author gives the following calculated results: Electric waves of 30 cm. wave-length travel along a copper wire of 4 mm. diameter at a velocity which is less than the velocity of light by one part in 30,000, and the amplitude falls to $\frac{1}{2.8}$ of its initial value at a distance of 1.5 kilometers.

Electric waves of 100 cm. normal wave-length (period $33 \cdot 10^{-10}$ second) travel at about three-quarters of the velocity of light along a platinum wire .004 mm. diameter, and their amplitude falls to $\frac{1}{2.8}$ of its initial value at a distance of only 17 cm.

The author also gives a diagram of the lines of electric force inside and outside of the wire, the lines of magnetic force being circles around the wire.

W. S. F.

A NEW INDICATOR FOR ELECTRIC WAVES.

A GALVANOMETER of medium sensitiveness is connected to a battery, a strip of silvered glass is included in the circuit and the coating of silver is scratched across so as to break the circuit. The strip is placed in moist air and the galvanometer shows a deflection. When the strip is exposed to electrical waves the galvanometer deflection is suddenly reduced to nearly zero; and when the waves cease the galvanometer deflection is quickly reëstablished. This effect is described by A. Neŭgschwender (*Wiedemann's Annalen*, 1899, No. 2), and the author finds that the film of moisture recovers its electrical conductivity so quickly after the cessation of the electrical waves that a telephone in circuit with the silvered strip gives the tone of the induction coil break even when the frequency of the break is very great. W. S. F.

THE ELECTRIC DISCHARGE IN RAREFIED GAS.

MATHIAS CANTOR (*Wiedemann's Annalen*, 1899, No. 2), has shown by means of the coherer (a mass of powdered metal forming a portion of an electric circuit), that the electric discharge produced through a vacuum tube by a large storage battery gives off electric waves. This discharge must, therefore, be either oscillatory or intermittent, contrary to the notion which has heretofore prevailed. W. S. F.

BRILLIANCY OF LIGHT SOURCES.

IN *Wiedemann's Annalen*, 1898, No. 13, Mr. P. Jenko gives a curiously roundabout method for the determination of the intrinsic brightness or brilliancy of light sources. Before entering into the details, however, it is necessary—such is the confusion of photometric terminology—to state a few definitions. The *brightness* of a source here signifies the total amount of light given out by that source and is ordinarily measured in candles. The *intensity of illumination* of a surface is the amount of light falling upon unit area of the surface and is usually measured in candles per square centimeter. Thus the intensity of the illumination of a surface distant one meter from a standard candle (assumed to give off light equally in all directions for the sake of brevity of statement) is $\frac{1}{126000}\frac{\text{candle}}{\text{cm}^2}$. This intensity of illumination is universally but irrationally called the *candle-meter*. The *brilliancy* of a light source is the amount of light given off from each unit area of its luminous surface. This, also, is to be expressed in candles per square centimeter. The candle per square centimeter is a convenient unit for expressing brilliancy of light sources, but is an inconveniently large unit for expressing ordinary intensities of illumination. Thus, easy reading requires about $\frac{1}{10000}$ candle per square centimeter.

Instead of determining the brilliancy of a light source by dividing its measured brightness (candle power) by the measured area of its luminous surface, making due allowance, of course, for irregular distribution in so far as this is possible, Mr. Jenko illuminates a screen of known area by a light of measured brightness, distance being measured. The intensity of the illumination of this screen is then known. He then compares upon a photometer bar the light given off by this screen with the light given off by the source of which the brilliancy is to be determined. He then measures the luminous area of the source and calculates its brilliancy in terms of the brilliancy of the illuminated screen, using an obvious relation between brilliancies, brightnesses and distances along the photometer bar! W. S. F.

THE MAGNETIZATION OF IRON.

IN *Wied. Ann.*, Band 66, No. 13, pp. 859-953, Max Wien communicates the results of a most careful and elaborate investigation upon 'The Magnetization of Iron by Alternating Currents.' The first part of the paper contains a general *résumé* of the literature of the subject, with a useful set of references to the original articles. Following this comes a discussion of the magnetization of iron by alternating currents, in which it is shown that for a coil containing an iron core and having a purely sinusoidal E. M. F. applied to it, neither the induction nor the magnetizing force will be a simple sine function of the time, but will contain higher harmonics, on account of the varying permeability of the core, and that also the apparent resistance of such an electro-magnet is greater than the resistance of its windings, while its apparent is less than its true self inductance.

A full description of the experimental arrangements and necessary corrections for Foucault currents, upper harmonics, etc., is then given together with the values obtained for the induction and hysteresis for irons of various qualities, using magnetizing currents having frequencies of 128, 256 and 520 per second.

The paper concludes with a general discussion of the experimental data, which may be summarized as follows:

The permeability and induction are always smaller for an alternating field than for a steady one, the difference reaching a maximum for low values of the magnetizing force, while near saturation the difference is small. For low values of the magnetizing force the differences are the same for all frequencies. The softer and less subdivided the iron, and the higher the frequency, the greater the difference (amounting in one case for very soft iron to 40%).

In moderate and strong fields, for equal values of the induction, the hysteresis is greater for alternating magnetization, than the value obtained by the usual static methods, the increase being greater the nearer saturation is approached, the higher the frequency and the softer the iron. The opposite is true for weak fields.

The only explanation which can be given is that the magnetism of the iron is unable to keep up with a rapidly varying field and consequently the hysteresis loop is broader and lower than it would be if determined for slow changes of the field. A. St. C. D.

GENERAL.

H. Becquerel (Comptes Rendus, t. CXXVII., p. 899 and t. CXXVIII., p. 145) has been able to prove and study the existence of abnormal dispersion in sodium vapor. He finds that the effects of the D_1 and D_2 lines in causing abnormal dispersion are superposed and that for certain rays the refractive indices are less than unity.

On account of its importance in the theory of atmospheric electricity the question as to whether the vapor of an electrified liquid is itself electrified is of great interest. It cannot be said that the subject has not received attention, but the results obtained by different investigators are not in accord. Pellat (Comptes Rendus, t. CXXVIII., p. 169) has lately reinvestigated the subject and finds that the rate of loss of charge from an insulated, electrified, metal vessel is greater when it contains water than when empty. Applying this result to the phenomena of atmospheric electricity he comes to the conclusion that it can only explain a part of the observed facts and further knowledge will reveal some as yet unknown cause acting. A. St. C. D.

SCIENTIFIC NOTES AND NEWS.

Mr. Henry Gannett, Geographer of the Geological Survey, who was the political and statistical geographer of the last census, has been asked to take charge of the same work for the coming census. The Director of the Census, Mr. Merriam, has announced that all applications for positions will receive consideration, and that examinations will be held as rigid as those before the Civil Service Commission. The 300 Supervisors are to be appointed after consultation with Senators and Representatives of the separate States, but without regard to party affiliations.

The professors of geology in the University of California and in Stanford University have organized a geological club, to be called the 'Cordilleran Geological Club.' It is intended to include all the geologists of the Pacific and adjacent States, and its object is by occasional meetings to stimulate geological work. Whether it shall remain an independent organization or shall be affiliated with any other scientific body is left for future decision.

Professor Ray Lankester has been elected Foreign Correspondent of the Paris Academy of Sciences for the Section of Anatomy and Zoology. Twenty-seven votes were cast for Professor Lankester and eight for Professor Van Beneden, of Liège. M. Lortet, professor of medicine, of Lyons, has been elected National Correspondent for the same Section.

Lord Lister, London, and Professor Koch, Berlin, have been elected Foreign Associates of the Paris Academy of Medicine.

Professor Ray Lankester, London; Professor L. Cremona, Rome, and M. Alexander Karpinsky, St. Petersburg, have been elected Associates of the Belgian Academy of Sciences.

The address in medicine at the next Yale commencement exercises is to be delivered by Professor Charles Sedgwick Minot, of the Harvard Medical School. The title of the address has not yet been announced, but we are in-