off capital, etc. One item of $60,000 consists of payments made to the general revenue fund of the city, which is in lieu of the amount which the city would receive in taxes, it is presumed, were the system operated by a private company. The balance goes into the reserve fund. There are 3400 persons employed, including 100 clerks. The general manager receives $6800; the chief engineer, $2400; the electrical engineer, $2000; and the mechanical engineer, who has charge of the powerstation, $1216. Point boys receive 28 cents per day; trace boys, from 40 to 52 cents per day; car cleaners, from 88 cents to $1 per day; drivers, conductors, and motormen, from $1 to $1.12 per day. These rates apply to Sundays and week days alike. The rolling stock consists of 384 horse cars, 132 electric cars (47 only of which are now running), 17 omnibuses, 39 lorries, and numerous carts, wagons, and vans. There are 4411 horses. Work is now progressing, with the object of changing the entire system to electric traction, which it is hoped to have completed within the next eighteen months. No underground conduits will be used, according to the present plans. Fares range from 1 cent for first half mile to 2 cents for a mile; the longest ride is 6 miles, costing 6 cents. No transfers are issued and tickets are not used. The committee of the town council having supervision of the tramways receives no compensation. For that matter, however, no member of the city government of Glasgow, inincluding lord provost, town councilors, and bailies (police judges), receives compensation. The city of Glasgow has a population of about 850,000, and spreads over an area of nearly 12,000 acres. There are no electric or other tramways extending out of Glasgow to other towns or cities. Within the city is an underground cable road which makes a circuit of about five miles, and is owned and operated by a private company. The rate of fares on this road is about the same as that prevailing on the surface roads.

SCIENTIFIC NOTES AND NEWS.

Dr. N. L. Britton, director-in-chief of the New York Botanical Garden, has been given leave of absence and is in attendance at the International Congress of Botany in Paris, in which assembly he represents the Garden, and is also an official delegate of the United States. He will visit many of the museums of France and England before he returns. The Board of Managers have designated Dr. D. T. MacDougal as acting director-in-chief of the New York Botanical Garden in Dr. Britton's absence.

Dr. B. T. Galloway, chief of the Division of Vegetable Pathology and Plant Physiology, has been placed in charge of the grounds of the U. S. Department of Agriculture.

Dr. Timbrell Bulstrode, one of the members of the Food Preservatives Committee, and Mr. Charles J. Huddart, the secretary, have, during the past month, visited Amsterdam, Hamburg and various places in Denmark for the purposes of studying the dairying industry and the methods of transport of dairy produce, with special reference to the milk and butter supplies in Holland, Germany and Denmark, and the butter export trade, in relation to the use or non-use of chemical preservatives.

The Duke of Abruzzi has been entertained by the Geographical Society of Christiania, the address of welcome being made by Professor Reusch. He has proceeded to Italy.

The Danish scientific expedition for the exploration of East Greenland, under Lieutenant Amdrup, has reached the shore. The Swedish Kolthoff expedition near Sabine Island found a mast with a Danish flag and a communication from Lieutenant Amdrup to Captain Sverdrup.

Thomas Davidson, well known as an author of philosophical and educational works and as a lecturer, died at Montreal on September 14th, aged sixty years. Mr. Davidson was born in Scotland, but has been living in the United States for the past twenty-five years.

Dr. Lewis Albert Sayre, one of the most eminent surgeons of New York City, died on September 21st in his 81st year. He was one of the founders of Bellevue Medical College and was professor there until the college was united with the New York University two years ago.

There will be a civil service examination on October 23rd and 24th for the position of assist-

ant in the Nautical Almanac office, with a salary of $1000 a year. The examination will be on the mathematical topics required for the computations. On October 23rd there will be an examination for the position of assistant physical geologist in the U. S. Geological Survey at a salary of $600 a year. The examination is chiefly on physics, but French and German are also included. On November 14th, there will be examinations for preparator in vertebrate paleontology and skilled laborer in the U. S. National Museum, with salaries of $900 and $720 respectively. The examinations will be on experience and practical questions regarding the mounting and care of vertebrate fossils. On October 23rd, 24th, and 25th, there will be held the examination we have already noted for the position of chemical geologist in the U. S. Geological Survey with a salary of $1400.

THE Grand Prize of the Paris Exposition has been awarded to the Division of Pomology of the Department of Agriculture, and four gold medals have been awarded to the United States in the horticultural group.

THE Rothamsted Experimental Station established by Sir John Bennet Lawes was some time before his death made over to trustees who hold it for the British nation. In addition to the land and laboratory it has been provided with an endowment of £100,000.

AN elaborate exhibition has recently been held in the Botanical Museum and Conservatories of the Botanical Gardens at Berlin of the plants obtained in South and Central America by Dr. P. Preuss.

AS has already been stated the Nobel prizes will be awarded on the anniversary of the death of the founder, and it is expected that the first award will be made on December 10, 1901.

MAJOR A. ST. HILL GIBBONS has returned from Africa after an absence of two years and three months. We learn from the London *Times* that the expedition covered over 13,000 miles, in addition to travel by railway or steamship routes. The main object of Major Gibbons's journey was to complete the survey of the Barotse country and to determine the tribal distribution there. In this he was successful, and the whole country from the Kafukwe River on the east to the Kwito River on the west and the Zambesi-Congo watershed to 18° south latitude, or a total area of over 200,000 square miles, has been hydrographically and ethnographically surveyed. An interesting feature of Major Gibbons's work in this region was the discovery of the source of the Zambesi at a point nearly 100 miles distant from its supposed position. On the completion of his work in Barotseland Major Gibbons, in order to extend the scope of the expedition, separated from his companions and adopted the northern route, traveling by way of the chain of lakes to the Upper Nile. According to his charts considerable amendments to existing maps will be necessary, both with reference to the relative position, shape and extent of most of the Great Lakes, especially in the case of Lakes Kivu and Albert Edward, the latter of which is now found to be absolutely different in shape and size from the description given in existing maps. By the completion of this journey Major Gibbons has personally travelled a greater distance than any other explorer in Africa, probably not excluding Livingstone. He has never had occasion to use his rifle in anger, and he is proud of the fact that he has never killed a native nor lost one of his boys from death, either by disease or misadventure. He has brought home a large amount of valuable data on the general and political situation of the countries through which he has traveled and over 300 photographs, and his sporting collection includes a white rhinoceros from the Upper Nile.

THE report of the expeditions organized by the British Astronomical Association to observe the total Solar Eclipse of May 28, 1900, will be contained in a volume shortly to be issued from the office of *Knowledge*. The work will be edited by Mr. E. Walter Maunder, F.R.A.S., and will contain many fine photographs of the various stages of the Eclipse.

THE New York *Medical Record* states that a firm of manufacturing chemists in England having applied for a license to perform experiments upon living animals for the purpose of standardizing antitoxins, the Royal College of Physicians was requested to give an opinion as to the

advisability of granting the license. The reply of the College was that, while these experiments were absolutely necessary to the advance of pharmacology, the granting of such licenses to commercial firms was very undesirable. The standardization of antitoxins should be done in a government laboratory into which the question of money-making did not enter.

THE results of measurements of various rivers and the observations of height have been published by the U. S. Geological Survey in a series of Water-Supply Papers, Nos. 35 to 39, inclusive, arbitrary division into five parts being necessary by the requirements of law limiting these papers to 100 pages each. They are as follows:

No. 35 (Part I.) rivers flowing into the Atlantic Ocean from Maine to Virginia.

No. 36 (Part II.) rivers flowing into the Atlantic south of Virginia.

No. 37 (Part III.) rivers flowing from the eastern Rocky Mountain area.

No. 38 (Part IV.) rivers tributary to the Colorado, the interior basin, and Columbia River.

No. 39 (Part V.) California streams, and rating tables.

Application for these papers should be made to Members of Congress, by whom 4000 copies of the 5000 printed are distributed, or to the Director of the U. S. Geological Survey, Washington, D. C.

IN an article in *Nature* on latitude-variation, earth-magnetism and solar activity Dr. J. Halm summarizes his conclusions as follows: (1) The changes in the motion of the pole of rotation round the pole of figure are in an intimate connection with the variations of the earth-magnetic forces. (2) Inasmuch as the latter phenomena are in a close relation with the state of solar activity, the motion of the pole is also indirectly dependent on the dynamical changes taking place at the sun's surface. (3) The distance between the instantaneous and mean poles decreases with increasing intensity of earth-magnetic disturbance. (4) The length of the period of latitude-variation increases with increasing intensity of earth-magnetic disturbance. (5) In strict analogy with the phenomena of auroræ and of magnetic disturbance, the influence of the eleven-years' period of sun-spots, as well as of the 'great' period, is clearly exhibited in the phenomenon of latitude-variation; and the same deviations from the solar curve as are manifested by the auroræ are also evident in the motion of the pole. (6) The half yearly period of the earth-magnetic phenomena influences the motion of the pole of rotation in such a way that its path, instead of being circular, assumes the form of an ellipse, having the mean pole at its center. (7) The half-yearly period also explains the conspicuous fact of a rotation of the axes of the ellipse in a direction opposite to that of the motion of the pole.

JUDGE TOWNSEND in the U. S. Circuit Court for the District of Connecticut has handed down a decision sustaining Mr. Tesla's patents for the rotating magnetic field, but the case will doubtless be appealed to the Supreme Court. The learned judge described the progress of electrical knowledge as follows: "The search lights shed by defendant's exhibits upon the history of this art only serve to illumine the inventive conception of Tesla. The Arago rotation taught the schoolboy fifty years ago to make a plaything which embodied the principle that a 'rotating field could be used to rotate an armature.' Baily dreamed of the application of the Arago theory by means of a confessedly impossible construction. Deprez worked out a problem which involved the development of the general theory in providing an indicator for a ship's compass. Siemens failed to disclose the 'suitable modification' whereby his electric light machine might be transferred into a motor, and Bradley is almost equally vague. Eminent electricians united in the view that by reason of reversals of direction and rapidity of alternations an alternating current motor was impracticable, and the future belonged to the commutated continuous current. It remained to the genius of Tesla to capture the unruly, unrestrained and hitherto opposing elements in the field of nature and art and to harness them to draw the machines of man. It was he who first showed how to transform the toy of Arago into an engine of power; the 'laboratory experiment' of Baily into a practically successful motor; the indicator into a driver; he first conceived the

idea that the very impediments of reversal in direction, the contradictions of alternations might be transformed into power producing rotations, a whirling field of force. What others looked upon as only invincible barriers, impassable currents and contradictory forces, he seized, and by harmonizing their directions utilized in practical motors in distant cities the power of Niagara."

PROFESSOR E. RAY LANKESTER communicates to *Nature* a letter from Captain Hind remarking that "It is a curious fact that a bird which is so valuable as Buphaga in clearing parasitic insects from cattle that we lately agreed to give it special protection at the International Conference on the Preservation of African Wild Animals, should now, by a sudden change of conditions induced by man, become a dangerous and noxious creature. This fact shows how difficult is the problem presented by the relations of civilized man to a fauna and flora new to his influence." The letter is as follows: "The common rhinoceros-bird (*Buphaga erythroepyncha*) here formerly fed on ticks and other parasites which infest game and domestic animals; occasionally, if an animal had a sore, the birds would probe the sore to such an extent that it sometimes killed the animal. Since the cattle plague destroyed the immense herds in Ukambani, and nearly all the sheep and goats were eaten during the late famine, the birds, deprived of their food, have become carnivorous and now any domestic animal not constantly watched is killed by them. Perfectly healthy animals have their ears eaten down to the bone, holes torn in their backs and in the femoral regions. Native boys amuse themselves sometimes by shooting the birds on the cattle with arrows, the points of which are passed through a piece of wood or ivory for about half an inch, so if the animal is struck instead of the bird no harm is done. The few thus killed do not seem in any way to affect the numbers of these pests. On my own animals, when a hole has been dug, I put in iodoform powder, and that particular wound is generally avoided by the birds afterwards; but if the birds attack it again, they become almost immediately comatose and can be destroyed. This remedy is expensive and not very effective. Is there any other drug you could suggest that would be less likely to be detected? Perhaps you know that I reported three years ago that these birds rendered isolation under the cattle plague regulations useless in some districts, as I proved beyond doubt they were the only means of communication between clean and infected herds under supervision, a mile or two apart. These birds I have never seen on the great herds of game on the open plains, but I have seen them on antelope and rhinoceros in the immediate neighborhood of Masai villages and herds of cattle; on the other hand, I have never seen the small egret on cattle, though often on rhinoceros and gnū."

THE work done at the Pasteur Institute in Paris, so far as regards the treatment of rabies, is set forth in the last issue of the *Annales de l'Institut*, which is abstracted in the London *Times*. It appears that 1614 persons were inoculated, of whom 1506 were French, 74 English and Indian, 15 Belgian, seven Swiss, four Greeks, three Spanish, two each Dutch and Turks, and one from Morocco. Of the 1614 under treatment, 188 were bitten on the head or face, 965 on the hands and 464 on other parts of the body; while the number of deaths, excluding six which occurred before the treatment was completed, did not exceed four. The full return of the treatment since Pasteur commenced it is as under:

Year.	No. of persons treated.	No. of deaths.	Rate of mortality. per cent.
1886	2671	25	.94
1887	1770	14	.79
1888	1622	9	.55
1889	1830	7	.38
1890	1540	5	.32
1891	1559	4	.25
1892	1790	4	.22
1893	1648	6	.36
1894	1387	7	.50
1895	1520	5	.33
1896	1308	4	.30
1897	1521	6	.39
1898	1465	3	.20
1899	1614	4	.25

It must be pointed out that since the Pasteur Institute was started in Paris several others have been opened in different European countries, so that it is not surprising to find that the

number of persons under treatment has never been so large as it was in the first year.

UNIVERSITY AND EDUCATIONAL NEWS.

Mr. A. C. Bartlett has given the University of Chicago $125,000 for a gymnasium as a memorial of his son who died on July 15th.

A collection of eight hundred Arabic manuscripts, made by Count Landberg and said to be worth $20,000, has been presented to Yale University by Mr. Morris K. Jesup of the American Museum of Natural History.

The trustees of the College of the City of New York are considering the lengthening of the course to seven years. They have asked that the appropriation made by the Board of Estimate and Apportionment last year be increased from $200,000 to $225,000. It is expected that the new buildings in 138th Street will be begun during the present autumn.

The new president of the University of Rochester, Rev. Rush Rhees, who was elected last June, has assumed control, and his formal installation will take place on October 11th. President Seth Low, of Columbia University, will deliver an address on 'The City and the University'; President Harper, of the University of Chicago, will speak on 'The College Officer and the College Student'; President Seelye, of Smith College, will speak on 'Limitations to the President's Power in the American College.'

The London *Educational Times* states that during the coming session evening science courses will be held in connection with the Technical Education Board at University College, King's College and Bedford College. At University College Professor J. A. Fleming, F.R.S., will give a course of ten lectures, followed by laboratory practice, in advanced electrical measurements. A course of lectures on the electric motor and its application to electric traction will be given by Professor C. A. Carus-Wilson, each lecture to be followed by an experimental demonstration or by a class for the practical working of numerical examples in connection with the subject. A course will be given by Professor E. Wilson at King's College on direct and alternating currents. In mechanical engineering, Professor T. Hudson Beare will give a course of ten lectures at University College, on the theory of steam engines and boilers, with laboratory work on the testing of steam engines and boilers. Professor Beare will also give a course of five lectures on the theory of gas and oil engines, combined with laboratory work.

David J. Brewer, Associate Justice of the United States Supreme Court, has accepted the position of lecturer on the responsibilities of citizenship at Yale University. The lectures will be delivered next February.

Professor Goss, who has for a number of years been professor of mechanical engineering and director of the mechanical laboratory in Purdue University, Lafayette, Ind., has been made dean of the Engineering Schools of the University.

Professor L. C. Glen, of South Carolina College, has been appointed professor of geology at Vanderbilt University.

J. R. Street, Ph.D. (Clark), has been appointed professor of pedagogy at Syracuse University.

Mr. Alexander Macphail, M.B., C.M., senior demonstrator of anatomy in Glasgow University, has been appointed professor of anatomy in St. Mungo's College, Glasgow.

The following promotions have been made in German universities: Dr. Wilhelm Authenrieth, of the University of Freiburg, has been appointed associate professor of pharmaceutical chemistry; Dr. R. Abegg, of the University of Breslau, associate professor of chemistry; Dr. A. Loewy, of the University of Berlin, professor of physiology; Dr. Osann, of the University at Basle, associate professor of geology and mineralogy; Dr. Paul Eisler and Dr. Vorländer, of the University at Halle, associate professors of anatomy and chemistry, respectively.

Dr. Joseph Anton Gmeiner has qualified as docent in mathematics in the University of Vienna; Dr. Max Schwarzmann, as docent in mineralogy at the University of Giessen; Dr. Joseph Boleslaw Grzybowski, as docent in paleontology at the University of Cracow and Dr. Steinbrück as docent in agriculture at the University at Halle.