the weight of a single engine on the Metropolitan Railway. The maximum resistance at twenty miles an hour will be about 2,420 lbs., requiring to overcome it a pneumatic pressure of 2·6 ounces per square inch, and 162-horse-power, assuming the useful effect to be sixty per cent.

A VERY severe thunderstorm passed over London on the evening of July 5. Between eight and nine there came a very brilliant flash of lightning, followed by a deafening peal of thunder. Many people were stunned and in several cases were found quite insensible. Immediately after it was found at Kilburn that the telegraph wires, running from the top of the Queen's Arms to a house about 300 yards higher up the Edgeware Road, were struck by the lightning, and fell in red-hot fragments, varying in length from six inches to an inch, all along the road, a great deal of yellow smoke attending the fall of the wire. In one or two houses windows were broken, and a little girl who was passing through the street had her hair singed and her jacket burnt. The instruments at the office with which the destroyed wires were connected were much agitated, and the telegraph clerk, a young lady, was much stunned.

THE fourth edition of the "Lists of Elevations principally in that portion of the United States West of the Mississippi," edited by Mr. Henry Gannett, and published in connection with Mr. Hayden's Survey, must prove of great value to the geographer and meteorologist. The first edition, published in 1872, contained only thirty-one pages, the present edition contains 164 pages. It contains, among a variety of other matter, profiles of nearly all the railroads in the part of the United States above mentioned. The results given by these profiles have been made to accord, and the heights of several thousands of points on them have been determined with an approach to accuracy. This edition contains also the heights of many thousands of points determined approximately by means of the barometer. Elevations of many thousands of mountain-peaks are given, from which very correct ideas of the ruling heights of the principal ranges may be derived. It contains also tables of the slopes of the principal streams of the west, which are of value in studying the important question of irrigation. With these various lists of elevations there is given with this edition a map of the United States, in approximate contours of 1,000 feet of vertical intervals, which, in a measure, embodies all the results of this department. Toward the improvement and ultimate perfection of this map this work is to be mainly directed in future. To express still more clearly the facts brought out by the map, it is the intention of the Survey to make shortly a relief model of the United States, on the basis of this map.

WE have on several occasions referred to the association known as the Yorkshire Naturalists' Union, composed of a large number of local scientific societies in Yorkshire. This association publishes a useful monthly journal, *The Naturalist*, intended as a general field club record. We have received the twenty-fourth number of this journal, which, besides several papers on natural history, contains reports of several of the associated societies. From a report of the third meeting of the Union held recently at Wakefield, we notice that the Bradford Scientific Association was admitted to the Union, and that a testimonial, in the shape of a microscope, was presented to Mr. J. M. Barker, late secretary of the West Riding Consolidated Naturalists' Society.

THE additions to the Zoological Society's Gardens during the past week include four Common Kingfishers (*Alcedo ispida*) European, presented by Mr. J. Lyford; two Horned Lizards (*Phrynosoma cornutum*) from Texas, presented by Mr. W. A. Bowie; a Sun Bittern (*Eurypyga helias*), a Sacred Ibis (*Geronticus æthiopicus*), bred in the Gardens; eight speckled Terrapins (*Clemmys guttata*), three Red-vented Terrapins (*Clemmys rubriventris*), two American Box Tortoises (*Terrapene carinata*) from North America, purchased.

## THE INFLUENCE OF LIGHT UPON THE DEVELOPMENT OF BACTERIA[1]

WE have been engaged during the last few months on an investigation into the effect of light upon the development of bacteria in certain of those solutions in which they are usually produced.

We reserve the details for a paper which we hope to submit to the Royal Society in the course of their next session, but wish to state, in the meanwhile, that the first portion of our inquiry has led us to the following conclusions:—

1. That light is inimical to the development of bacteria.
2. That under favourable conditions it may prevent their development.
3. That under less favourable it may not prevent but only retard.
4. That for the full effect of light to be produced direct insolation is necessary.
5. That those conditions which tend to neutralise the action of light are the same which are known to favour processes of fermentation and putrefaction.
6. That the fitness of the solution to serve as a nidus is not destroyed by insolation.
7. That, so far as our investigation has yet gone, it would appear that the germs originally present in the solution are destroyed by direct insolation.

We are still pursuing the inquiry, and have devoted much time to investigating the influence of the refrangibility of the ray, but regret that at present we are not in a position to give any definite conclusions on this point.

We are endeavouring also to trace an analogy between facts which we have observed and certain vital and chemical processes, in which light is known to play a part, and are extending our observations to other phenomena of fermentation and to microscopic fungi.

That light is not essential for the development of bacteria has been long known, but that it is absolutely inimical to their production has not, so far as we are able to ascertain, been previously shown, and we are encouraged, therefore, to lay before the readers of NATURE this statement of our results.

ARTHUR DOWNES; T. P. BLUNT

## UNIVERSITY AND EDUCATIONAL INTELLIGENCE

LONDON.—The following is the list of the new associates of the Royal School of Mines:—Associates in Mining and Metallurgy—C. W. Folkard, A. K. Huntington, E. W. Voelcker; Associates in Mining—E. H. Liveing, W. H. Merritt; Associates in Metallurgy—A. C. Copeland, J. F. Hogan, C. H. Lemann, W. Leyson, E. T. McCarthy; Associate in Geology—A. R. Sawyer. The Edward Forbes Medal and prize of books was awarded to A. Heilprin; the De la Beche Medal and prize of books to E. W. Voelcker; the Murchison Medal and prize of books to F. G. Mills.

## SCIENTIFIC SERIALS

*Journal de Physique*, June.—On the theory of electrometers, by M. Mascart.—On the dynamical theory of gases (continued), by M. Violle.—Process for measuring the index of refraction of liquids, by M. De Waha.—Application of the electric current to the study of the spheroidal state of liquids, by M. Hesehus.—Temperature and humidity of the air at different heights observed at Upsala during 1875, by M. Hamberg.—Proceedings of the Physical Society of St. Petersburg.

*Archives des Sciences Physiques et Naturelles*, June 15.—Study on the variations of transparence of the waters of Lake Leman, by M. Forel.—On the different modes of crystallisation of water, and the causes of the varied appearances of ice, by M. Pictet.—Researches on some niobiferous and tantaliferous minerals, by M. Delafontaine.

*Annalen der Physik und Chemie*, No. 4, 1877.—Johann Christian Poggendorff (memoir).—New experiments on the expansion of bodies by heat, by M. Glatzel.—On the objections of Clausius to Weber's law, by M. Zöllner.—On normal magnetisation, by M. Petruscheffsky.—On stratification of the electric light in Geissler tubes after insertion of a flame and some other resistances, by M. Holtz.—On the cohesion of salt solutions, by M.

Quincke.—On the excitation of electricity through gliding friction, by M. Riess.—On unipolar induction of a solenoid, by M. Zöllner.—Remarks on Prof. Neumann's paper on the number of electric materials, by M. Edlund.

No. 5.—On the reflection of heat rays from metals, by M. Knoblauch.—On the treatment of ponderomotive and electromotive forces occurring between linear currents and conductors, according to the fundamental laws of electrodynamics, by M. Clausius.—On the tensions of vapour in dissociation of salts containing water of crystallisation, by M. Pareau.—On the coefficients of temperature of heat conduction of air and hydrogen, by M. Winkelmann.—On the phenomena of motion of electrified mercury in glass vessels, by M. Herwig.—On divergences from Ohm's law in metallically conducting bodies, by M. Braun.—On the theory of unipolar induction and Plücker's experiments, by M. Riecke.—On heat conduction in sulphate of copper, by M. Pape.—Remarks on the polarisation of the rainbow, by M. Lommel.—On the history of the invention of the areometer, by M. Gerland.—On the significance of the rhombohedric and prismatic surfaces in quartz, by M. Baumhauer.

## SOCIETIES AND ACADEMIES

### LONDON

**Zoological Society**, June 19.—E. W. H. Holdsworth, F.Z.S., vice-president, in the chair.—The secretary read a letter addressed to him by Mr. J. M. Cornély, announcing that his female *Hydropetes inermis* had just produced three young ones.—Mr. J. E. Harting, F.Z.S., exhibited and made remarks on a variety of the common Snipe, intermediate between the usual form of that species and the so-called Sabine's Snipe.—Mr. B. Tegetmeier, F.Z.S., exhibited a specimen of a curiously malformed sternum of the Tawny Owl.—Mr. John Murray, Naturalist to the *Challenger* Expedition, exhibited and made remarks on a series of sharks' teeth, whales' ear-bones, and other specimens dredged up at great depths during the *Challenger* Expedition.—Mr. P. L. Sclater, F.R.S., read the first of a series of reports on the collection of birds made during the voyage of H.M.S. *Challenger*, containing general remarks on the collection, which was stated to consist of about 679 skins of terrestrial and 198 of oceanic birds, besides a considerable series of specimens in salt and in spirit, and a collection of eggs, principally of the oceanic species.—A communication was read from the Marquis of Tweeddale, F.R.S., containing a report on the collection of birds made during the voyage of H.M.S. *Challenger* in the Philippine Islands. Amongst them were examples of seven species new to science.—Mr. P. L. Sclater read a paper giving a description of the birds collected at the Admiralty Islands during the visit of the *Challenger* expedition to that place. Amongst these were examples of six species hitherto unknown to naturalists.—A communication was read from the Rev. O. P. Cambridge, C.M.Z.S., on some new species of Araneidea, with characters of two new genera and some remarks on the families *Podopthalmides* and *Dinopides*.—A note was read by Mr. J. H. Gurney on the breeding of the Polish swan in captivity, and on the stages of plumage of the young birds.—A communication was read from Mr. F. Moore, in which he gave a complete description of the Lepidopterous fauna of the Andaman and Nicobar Islands, so far as is yet known.—A communication was read from Mr. Herbert Druce, F.Z.S., containing a revision of the Lepidopterous genus *Paphia*, with descriptions of twenty-one new species.—A communication was read from Mr. E. J. Miers, F.Z.S., containing the description of a collection of Crustacea (*Decapoda* and *Isopoda*), chiefly from South America, with descriptions of new genera and species.—Mr. A. H. Garrod read a description of the brain of the Sumatran Rhinoceros (*Ceratorhinus sumatrensis*).—A paper by Mr. A. D. Bartlett, contained the description of a new Guinea Fowl, from Mombassa, in Eastern Africa, based on a specimen brought home by Mr. Gerald Waller, for which the name *Numida ellioti* was proposed.

**Entomological Society**, July 4.—Prof. Westwood, president, in the chair.—Mr. J. W. Douglas exhibited a living specimen of *Cerambyx Heros* and a young larva of the same insect, bred from a log of wood imported from Bosnia.—The president exhibited some cases composed of small semi-transparent quartz-like particles and constructed by the larva of a Trichopterous insect inhabiting Southern Europe. They had been described by Swainson in 1840 as a shell belonging to the genus *Thelidomus*.—The president also exhibited a plant-bug (*Capsidæ*) found on the leaf of an orchis which had become covered with blisters from the attack of the insect.—Mr. Jenner Weir exhibited a female specimen of a *Cicada* taken in his presence in the New Forest by Mr. Auld, who stated that he had heard it stridulating. Mr. Douglas, however, suggested that the sound had been produced by a male concealed near.—Mr. S. Stevens exhibited two living specimens of *Tillus unifasciatus* taken on a fence near Norwood.—Mr. J. P. Mansell Weale, who had just returned from South Africa, exhibited a fine collection of insects from that country and read a paper containing the results of his observations and experiments upon the breeding of *Papilio merope* and other insects.—The secretary read a letter from Dumfries stating that *Colias edusa* had made its appearance in that district in the month of June.—The president brought before the Society the recent accounts of the appearance of the Colorado beetle in Canada and in Europe.

**Physical Society**, June 23.—Prof. G. C. Foster, president, in the chair.—Prof. W. Grylls Adams exhibited a very complete form of optical bench, which, in addition to being provided with all the improvements introduced by Prof. Clifton, carries an arm which can be set at any angle to it and is provided with appliances for studying a beam of light or radiant heat when it deviates from the main axis of the instrument. At the base of a pillar firmly clamped in any position in the manner adopted by Prof. Clifton, is fixed a horizontal graduated circle, and a vernier, attached to a counterpoised arm, which rotates round the axis of this pillar, renders it possible to determine the angle made by the arm with the bench to one minute. At the upper extremity of the pillar is a steel pivot to which various appendages may be clamped, and immediately below this is a second graduated circle by which to determine the angular position of whatever is supported by the pillar. Mirrors, metallic surfaces, prisms, &c., may be placed on this pillar for the reflection, refraction, diffusion, or polarisation of heat and light. For radiant heat the rotating arm carries a line thermo-electric pile and a table on which absorbing media may be placed. Prof. Adams illustrated the use of the instrument by projecting on to a screen the interference bands obtained when a beam of light, after reflection from the two surfaces of a thick plate of glass, is again reflected from the two surfaces of a similar plate placed very nearly parallel to the first. A compensator consisting of two plates of glass of equal thickness is also added between the two thick plates, and an ingenious arrangement renders it possible to incline the glasses at any angle to one another, and to move them either independently or together. He also showed the effect produced in the positions of the bands when the rays from the two surfaces of the first plate traverse air of different densities before falling on the second. The adjustment of this latter was facilitated by fine screws supplemented by springs which rendered it possible to give a slight movement to the plate in any direction, by combining a motion of translation of the plate parallel to its reflecting faces with a motion of rotation about a vertical or horizontal axis.—Mr. F. D. Brown exhibited an apparatus he has arranged, in which to compare thermometers. From a brass hemispherical boiler rises a tube of the same metal two inches in diameter and about two feet long; the steam, after ascending through it, descends a metallic jacket surrounding it, whence it passes into a U-shaped condenser, and from this it is returned to the boiler. The upper end of the condenser is in connection with a large air-tight vessel forming the base of the apparatus, and in which any required degree of exhaustion can be maintained by the use of Lothar Meyer's form of pump. The thermometers are placed in tubes, which pass within the wide brass tube at its upper end, and by varying the nature of the liquid in the boiler, and the pressure to which it is subjected, the boiling point can be retained constant at any required temperature.—Dr. Guthrie and Mr. Akroyd communicated a paper on electrical selection. When a metal or other body is rubbed against some non-conducting substance like caoutchouc, electricity is developed, and the track of the metal may be readily made evident by sprinkling on the caoutchouc a mixture of red lead and sulphur. This sieving imparts negative electricity to the sulphur and positive to the red lead, hence that particular ingredient of the mixture is drawn to the metal track which possesses the opposite kind of electricity. Iron, for example, when rubbed against caoutchouc generates negative electricity, and, after sprinkling the powder, the iron track is revealed by the marked collection thereon of red-lead. A list of mixtures was given which may be used instead of the above, and it was shown that electrical selection may prove of use (1) in making an electrical