been confined to immunology. In the field of general and experimental pathology he has made important contributions to knowledge, and his researches on experimental anæmia produced by the injection of hæmolytic serum, and on the regenerative changes in the bone marrow in response to infection, are widely known.

DAVY MEDAL, AWARDED TO PROF. GILBERT NEWTON LEWIS.

Prof. Lewis, of the University of California, is justly regarded as one of the leaders of modern physical chemistry, mainly on account of his remarkable contributions to chemical thermodynamics. He has been responsible for the development of fresh and original methods in attacking the problem of chemical affinity. By the skilful utilisation of appropriate experimental measurements, Lewis and his collaborators have shown how the free energy of a great variety of elements and compounds can be ascertained, and how this quantity is related to the thermal and electro-chemical characteristics of chemical reactions in which these elements and compounds are involved. It is to Lewis that we owe the concepts of 'activity' and 'activity coefficient', and recent advances, more especially in our knowledge of the thermodynamic properties of solutions, are the direct outcome of the introduction and development of these ideas. Further, in the closely related field of electrode potentials, his work, both on the theoretical and practical sides, has been outstanding. Lewis has rendered great service to chemistry by his theoretical work on electron configuration, and the bearing of this on polarity, valency, and cognate matters. His conceptions in this field and his recognition of the fundamental importance of the electron duplet have greatly influenced the development of modern chemical theory.

HUGHES MEDAL, AWARDED TO PROF. HANS GEIGER.

Prof. Geiger, of the University of Tübingen, has made many important contributions to our knowledge of radioactivity. He was the first to examine in detail the scattering of $\alpha$-particles by matter. His classical investigation, in collaboration with E. Marsden, on the large angle scattering of $\alpha$-particles in their passage through matter, not only gave a definite experimental foundation to the nuclear theory of the atom, but also led to the suggestion that the properties of an atom are defined by its atomic or ordinal number—a suggestion strikingly verified by the investigations of Moseley. Among many notable researches in radioactivity, special reference may be made to his determination of the ranges of the $\alpha$-particles from all the radioactive elements with the greatest possible precision. From these measurements we are enabled to deduce the velocity of expulsion of the $\alpha$-particle from many radioactive bodies. He discovered with Nuttall a remarkable relation between the life of a radioactive element and the velocity of the $\alpha$-particle ejected from it. This relation, known as the Geiger-Nuttall law, has an intimate bearing on the new theories of the constitution of atomic nuclei. With Sir Ernest Rutherford, Geiger devised an electric method of counting $\alpha$-particles and determined the number of $\alpha$-particles emitted by a gram of radium. Later Geiger devised a point detector of great sensibility, which could be used for counting both $\alpha$-particles and $\beta$-particles. Within the last few years he has succeeded in making a new type of detector, by which the liberation of any electron throughout a comparatively large volume is detected. This beautiful device, which has been applied by Geiger himself and by others to the study of the penetrating radiation in the atmosphere, promises to provide a method of great power for extending our knowledge of this radiation.

## Forestry in Kenya Colony.[1]

THE Annual Report of the Forest Department in Kenya Colony (to Dec. 31, 1928) directs attention to a fact which is well known in forestry economics, that any serious set-back to the country as a whole, whether due to climate, invasions of pests, disease or other troubles, will at once react on the forest sales and revenue. During the year here reviewed, the rains were everywhere much below the average, and a very serious infestation of locusts affected all parts of the country. The inevitable consequences followed, as stated in the report: "These two factors brought about a considerable restriction in trade and development of the Colony, which seriously affected the sales of timber and the partial drought greatly handicapped the Department's planting schemes". A check came to the continuous rise in revenue shown since 1926, as also in the rate of planting. This check is, however, regarded as purely temporary.

In the 1926 report the Conservator alluded to the fact that, owing to a paucity of staff, it was impossible to judge of the Colony's forest position as they had no data upon which to compare the annual cut with the existing stock of mature timber in the forests. The reviewer of that report in NATURE fully agreed with its author that such a position of affairs was "the most unsatisfactory aspect of the forestry position". In spite of the still existing difficulties due to an inadequate staff, the past two years have witnessed a decided effort to deal with the large amount of work connected with surveys of the forests and also, it is understood, with that important matter of stock mapping, however roughly, the growing stock of the reserves which are subject to fellings.

To the public outside Kenya, the most interesting factor connected with the forestry of the Colony is the well-known so-called pencil cedar (*Juniperus procera*), in which the report shows there was a large export, namely, 39,551 cub. ft., as compared with 13,548 cub. ft. in the previous year.

"The outlook of this trade", says the Conservator, "appears to be bright, provided only carefully selected, accurately sawn, and thoroughly seasoned slats are shipped and the price is moderate. A process has been developed in England for rapid treatment of the slats which appears to be most successful in seasoning and at the same time slightly softening the wood. The process appears to be a valuable one, which should help the trade considerably. Provided, however, the slats are carefully selected and thoroughly air seasoned, *i.e.* scientifically stacked under properly regulated conditions of air and moisture for, say, twelve months, the wood appears to be entirely suitable for pencil manufacture without artificial treatment.

"It is said that the preparatory treatment of cedar substitutes has made such improvement recently that these substitutes now compare very favourably in quality with cedar. It is not believed that these woods can ever be given quite the unique properties of cedar, but there is no doubt that cedar slats will have to be very carefully produced and at a comparatively low price if they are to compete successfully."

[1] Colony and Protectorate of Kenya. Forest Department Annual Report, 1928. Pp. 32. (Nairobi: Forest Department, 1929.)

It is a relief to know that the Conservator is of opinion that there are very considerable quantities of pencil cedar in the Colony, but that the survey of these is still very incomplete. The existing sawmills with cedar concessions can supply any immediate demands, and it is hoped in the near future to have other areas ready for exploitation.

Mr. H. M. Gardner, who is now the permanent Conservator, and his officers may be congratulated on a report which shows real progress. He is evidently an optimist, for the following extract shows that he has been able to perceive some benefit to forestry in the Colony as a result of the past drought. He writes: "The one satisfactory result of the drought conditions prevailing during the year was the very great increase in the public interest in forestry. The preservation of the existing forests and the increase of tree planting both on public and private land have become matters of public discussion throughout the Colony, which can result in nothing but good."

## Physics in Fuel Problems.

DR. C. H. LANDER, Director of Fuel Research, delivered one of the public lectures on physics in industry which are arranged by the Institute of Physics, on Nov. 27, taking as his subject "Physics in Relation to the Utilisation of Fuel". Apart from the great development of physical instruments for the control of fuel-using appliances, physics enters into the study of most problems of preparation, treatment, and utilisation of fuel.

The microscope has been effectively enlisted in the examination of coal, both for the study of thin sections by transmitted light, whereby the more resistant plant remains are made visible for identification, and for the investigation of polished surfaces by reflected light. X-ray photography as developed by Kemp has proved very useful in revealing the distribution, nature, and amount of ash in coal, information giving a ready guidance as to the prospects of 'washing' a coal to improve its worth. Again, by means of the X-ray spectrometer, graphite has been identified in cokes of different types, and it has been found possible to correlate the size of the graphite crystals with the reactivity of the cokes as determined by a chemical method used at the Fuel Research Station.

All processes of coal cleaning depend on utilising differences between the physical properties of the coal and the impurity to effect a separation. Difference in density, size, shape, friction, resiliency, and surface tension to water have all been used for this purpose. These applications were illustrated by description of the principles of the different methods of wet and dry cleaning.

Dr. Lander referred to the influence of the manner in which heat is applied on the process of carbonisation in retorts, and then turned to the physical principles of the utilisation of fuel. In order to reduce the size of the combustion chamber of furnaces fired by pulverised fuel, it has been considered advisable to create turbulence in the fire gases. Dr. Lander questioned whether uncontrolled turbulence will prove so satisfactory a solution as to obtain stable stream-line motion of air, and to induce the particles of fuel to move across the stream line in a controlled manner; this might perhaps be attained by giving a vortical motion to the air admitted at the perimeter of the chamber while the products are withdrawn axially. The fuel would be admitted at any convenient point or points, and the particles would be compelled to cross the stream lines in a stable manner.

The physics of the fuel fired furnace is complicated by the fact that it involves transfer of heat from moving gases. Unfortunately, the complications are such as to prevent the treatment of the problem by 'models', as in aerodynamical research. In such furnaces, in addition to the flow of combustion gases, heat interchange by conduction, forced and natural convection, and radiation are occurring. So complex are the conditions that reliance has usually to be placed on empirical formulæ of limited application, but progress is being made to place these on a more fundamental basis. H. J. H.

## Undulant Fever in England and Wales.

UNDULANT fever was regarded thirty years ago as a sub-tropical disease almost confined to the Mediterranean coast-line and islands; hence the old name of Mediterranean or Malta fever applied to the disease. It has now been recognised in every continent, with the possible exception of Australia.

The causative micro-organism of undulant fever is a micrococcus (*M. melitensis*), first described by Bruce in 1886 (though some regard it as a bacillus), and is spread almost entirely by goats' milk. In 1897, Bang of Copenhagen described under the name *Bacillus abortus* a micro-organism causative of contagious abortion in cattle. Research during the last few years has directed attention to the close similarity between *M. melitensis* and *B. abortus*, and inasmuch as *B. abortus* is frequently present in cows' milk, the question has arisen whether this organism may not cause a form of undulant fever in man. As a result of close clinical and bacteriological study of cases of irregular fever occurring in Great Britain, on the Continent, and in America, it has been shown that man is occasionally infected with the contagious abortion organism with the production of a form of undulant fever.

An exhaustive report on the subject by Capt. Dalrymple-Champneys has been issued by the Ministry of Health ("Undulant Fever." *Reps. on Pub. Health and Med. Subjects*, No. 56. London: H.M. Stationery Office. 1*s*. 6*d*. net), and it is found that at least 14 authentic cases of undulant fever in man caused by the *abortus* variety of the organism have originated in England. Many cases have been described in Denmark, some in Germany, and a number in America (366 cases this year, according to a *Daily Science News Bull.* issued by Science Service, Washington, D.C.). Contagious abortion is also widespread among animals other than the cow, namely, the sheep, pig, goat, horse, and dog, the causative organisms being of the *abortus* type, but sometimes presenting minute differences, so that several varieties exist.

Dr. Forest Huddleson has published a valuable contribution on the differentiation of these varieties, or species as he prefers to call them (*Technical Bull.*, No. 100, 1929. Agricultural Experiment Station, Michigan State College). The organisms are placed in a genus *Brucella*, which is divided into three main species, namely, *Br. abortus* (Bang), *Br. suis* (Traum),