blacks mated *inter se* 316 blacks and 2 types, and finally, two families of the origin homozygous type × heterozygous type included 132 types, all of which results lead to the same conclusion.

With the results, those secured in the *T. bistortata* work were in perfect agreement—a rather unexpected fact, for, in the Boarmiinae, including the allied *T. crepuscularia*, the melanism, whether induced or natural, is always a Mendelian dominant.

As stated in the concluding remarks of the Royal Society paper (Harrison and Garrett), this work left undecided the question whether it was the metal or the acid radical which played the active part. To determine this, additional work was undertaken with a Saxon strain of *Selenia bilunaria*. This strain, after five inbred generations reared on food charged with manganese chloride, has just (Dec. 19, 1926) supplied three female insects, two types and one melanic, a further induction of melanism rendering it probable that it is to the metal that we have to look for the inciting agent.

No matter what the exact meaning of these experiments, they demonstrate, without any possibility of contradiction, that the germplasm can be influenced by external agencies; therefore, if not of direct Lamarckian import, they lend weighty support to Lamarckian views, for what is in more intimate contact, chemically or otherwise, with the germplasm than the soma?

Irrespective of this, they supply, what evolutionary theories all lack, an experimental demonstration of at least one cause of variation; in fact, they go beyond this, for they actually provide the principle, new in evolution, that food not normal to any given organism may so affect its germplasm as to give rise to heritable variations. This being granted, we see at once how a change in habitat can originate new forms and finally new species.

In no group of organisms would this be more potent than in plants, and thus, instead of an appeal to the sorting out of various genotypes as urged by Turesson [3] to account for the existence of localised genotypes in various plant species, we can conceive of their origin in the stations in which they now exist. So, too, in the variation of cultivated plants influences of the same order are at work.

Nor are animals in Nature exempt from its operations; local races of animals, under the workings of this principle, find a ready explanation, and so do the various forms into which wild animals break when domesticated. In no group of animals are its workings so beautifully illustrated than in the Insecta, particularly in the phytophagous groups.

Often enough, owing to the preference of plants to grow in definite associations, different species of plants grow intermingled. What then is more likely than the accidental transference of eggs or larvæ to the wrong foodplant? Is not the difference between species chemical? If larvæ so transferred react as in the experimental work, new [4] phytophagous races or species must arise, isolated by their attachment to a special foodplant, and induced to vary from the type from which they were derived by the influence, exerted chemically, of that foodplant. Of insects so related to one another, even in our own restricted fauna, we have many; for example, the moth *Cerura biscuspis* is purely an alder feeder, whilst its congener *C. furcula* takes sallow, the Aleurodid *Tetralicia vaccinii* feeds on bilberry, and *T. ericae* on *Erica tetralix*, the gall-gnat *Loewiola centaureae* parasitises *Centaurea nigra* and its relative *L. serratulae*, *Serratula tinctoria*, and so the list could be extended to all insect groups.

[3] Turesson, "The Plant Species in Relation to Habitat and Climate," *Hereditas*, vol. 6, 1925.

[4] As demonstrated by me in the case of the Gallmaking sawflies of the genus Pontania in a paper now in the press.

Electro-deposition of Rubber.

FROM recent announcements in the press it would appear that some considerable changes are likely to take place in the technology of rubber as the outcome of patented developments in the process of rubber electro-deposition. So promising have been the results obtained that the American rights in the various patents concerned have been transferred from their original owners, the Anode Rubber Co. of Great Britain, the B. F. Goodrich Rubber Co., and the Eastman Kodak Co., to a new company called the American Anode, Inc., for independent exploitation. The British rights, it is understood, have just been acquired by the Dunlop Rubber Co. and its associated concerns. It is perhaps too soon yet to estimate the commercial value of the whole process, for it can only be regarded as emerging from the experimental stage; but the fact that strong financial support is already forthcoming furnishes presumptive evidence of its value.

The possibility of rubber electro-deposition dates back to 1906, when Henri observed that in rubber latex, which is a colloidal suspension of rubber particles in a serum, the particles are negatively charged and migrate to the anode under the influence of a direct electric current. The observation found early practical application in Cockerill's process, patented in 1908, for removing rubber from latex by depositing it electrically upon a moving anode; but as this process led only to the production of crude rubber—in fact it was only intended for the coagulation of rubber from latex prior to shipment—its commercial scope was limited. The importance of the recent developments in this field arises from the discovery, made independently in 1922–23 by Klein in Hungary and by Sheppard and Eberlin in the United States, that all the ingredients essential to the production of finished rubber articles, namely, the sulphur required for vulcanisation purposes, many fillers and other compounding ingredients, as well as organic dyes and vulcanisation accelerators, can be admixed in a finely divided state with rubber latex or even with an artificial dispersion of rubber, and that the whole adsorption compound produced can be electrically precipitated as a homogeneous

layer on the anode which serves as a mould. It then only remains to vulcanise the deposit in the usual way, either after separation from the metallic surface or while still adhering thereto. Of course it may not be desirable to add the vulcanising agent to the bath, but to effect a cold vulcanisation after deposition. In fact, as may be gathered from the patent literature on the subject, the process is capable of many modifications.

It will be evident that the process which has been outlined eliminates many of the cumbersome mechanical methods at present associated with the rubber industry. The operating conditions can be precisely controlled, whilst by maintaining them constant the process can be made continuous or even automatic; moreover, being a cold process throughout, the original quality and structure of the starting material are retained in the product. Against these advantages must be set the fact that, since rubber is a non-conductor, it is possible to obtain only comparatively thin sheets of rubber product, though further investigation will doubtless remove this limitation. The oxygen liberated by electrolysis at the anode gives rise to a further difficulty, inasmuch as it leads to the formation of a spongy deposit; already, however, many proposals have been made for overcoming this defect, such as the use of porous moulds surrounding the anode or the addition of reducing agents to the bath. When the technique of the process has been perfected, a reduction in the cost of manufacture of sheet rubber goods and rubbered fabrics may be anticipated; not only that, but important developments may be expected in the direction of the coating of metal and other surfaces with rubber.

Obituary.

SIR JOHN SCOTT KELTIE.

SIR JOHN KELTIE seemed endowed with perpetual youth. He regulated his activities so nicely to his increasing age that, even when well advanced in his eighty-seventh year, he was able in one day to lunch at his club, attend a long committee meeting and the Council of the Royal Geographical Society, conduct a dinner of the Geographical Club, sit through a long evening meeting of the Society, seeing and hearing everything as clearly as when a boy, and, after returning home, sit up until midnight talking over the past and planning the future for a year or two ahead. He found life so full of interest and satisfaction that there seemed no reason why he should not live to celebrate the centenary of the Royal Geographical Society in 1930, and that of his own birth in 1940. He was happy in being spared the suffering of long illness and the dulling of his physical powers; he died of bronchitis on Wednesday, Jan. 12, at work almost to the last day.

Keltie was born in Dundee on Mar. 29, 1840, inheriting from his ancestors, who dwelt in Glendevon, a store of bodily health and mental fitness, but nothing more. Unaided and self-supporting, he made his way through several sessions, first at the University of St. Andrews and then at that of Edinburgh, though without taking a degree. The choice of a career seemed to lie between the dominie's desk and the preacher's pulpit, and he qualified himself for the latter in the United Presbyterian Church. But the narrow theology of the time repelled Keltie, and he used to tell how many years later he looked up the "Year-Book" of his old Church and found his name branded with the curt comment, "Lapsed into literature."

Keltie's literary work began in 1861 with Messrs. W. and R. Chambers in Edinburgh, who were then publishing the first edition of their famous "Encyclopædia," and at this period he produced many pieces of work in various fields, including a "History of the Highland Clans." He married in 1865, and soon found life in Edinburgh too narrow for his ambition. The southing instinct of his race brought him to London in 1871, when he joined the editorial staff of Messrs. Macmillan and Co., Ltd., and remained in association with that firm to the end of his life. He acted as sub-editor of NATURE from 1873 until 1885, and as editor of the "Statesman's Year-Book" from 1880 until his death, this being the last of his literary activities and that of which he was most proud. In 1873 he wrote an article on the island of Socotra and sent it at a venture to the *Times*, which accepted it, and thus began a lifelong association with that journal. It was probably this chance which turned his attention seriously to geography in time to share in all the stirring episodes of the opening up of Africa, the penetration of central Asia, and the polar expeditions of forty remarkable years. His work on NATURE similarly developed in him a wide knowledge of the literature of science and a keen though unspecialised interest in its advances.

Keltie joined the Royal Geographical Society as a fellow in 1883, and in the following year when the Society was roused, at the instance of Mr. D. W. Freshfield, to deal with educational aspects, he was appointed inspector of geographical education and commissioned to inquire into the methods of teaching in Great Britain and abroad. On this service Keltie travelled through the principal countries of Europe and brought home a very large collection of text-books, maps, and teaching appliances which he exhibited and lectured upon in London, Edinburgh, and other places. He produced a valuable report setting forth the deplorable state of geographical teaching in the British Isles as compared with France, Germany, and Italy. From this report sprung directly the revival in teaching geography which has culminated in the training and appointment of professors or readers in every British University and the institution of a geographical tripos at Cambridge. In 1894 the librarianship of the Royal Geographical Society became vacant and Keltie was appointed to the