Obituary

DR. F. A. DIXEY, F.R.S.

FREDERICK AUGUSTUS DIXEY commenced his scientific career as a medical man and took the degree of B.M., B.Ch., Oxon, in 1884, followed by the D.M. in 1891. He was for a while demonstrator in physiology at University College, London, and also at Oxford from 1883; and a histological preparation made by him was used for an illustration still reproduced in Quain's "Anatomy". But it was as an entomologist that Dixey will be remembered: his first entomological publication was on the phylogenetic significance of wing markings in certain Nymphalid butterflies, and until his death on January 16, in his eightieth year, he was associated with the study of evolutionary entomology at Oxford, so intimately bound up with the name of Poulton.

Dixey was a true Darwinian and supporter of the current theory of mimicry as produced by natural selection. He especially studied the Pierinæ, or 'white' butterflies, on which he became an acknowledged expert, and made two subjects particularly his own. Fritz Müller in 1878 had shown that two distasteful species might benefit by resembling each other: "they may even have gone to meet each other" he wrote; but Müller did not develop this theory. Dixey approached the subject independently through practical study of specimens and, in an important contribution on the phylogeny of the Pierinæ following on the lines of his first paper, he introduced in 1894 the term 'reciprocal mimicry' to express the production of a superficial likeness between distasteful forms of widely removed affinities by the apparent interchange of characters peculiar to each. This term was superseded by 'diaposematism' to bring it into conformity with others used by Poulton. The theory of Müller and its important extension by Dixey were controverted by G. A. K. Marshall on statistical grounds; but R. A. Fisher in 1930 stated that Marshall's arguments were untenable.

"The Relation of Mimetic Patterns to the Original Form", followed by "Mimetic Attraction" (1896-97) showed the successive steps through which a complicated mimetic pattern could be evolved in simple and easy stages from a form presenting merely the ordinary aspect of its own genus, and that the process of gradual assimilation, starting from one given point, may take several divergent paths at the same time. In other words, the members of a single group may assume several different mimetic developments, each one corresponding to a distinct model, but all derived by easy stages from the same original form.

A characteristic of natural selection is the production of one effect by different means, and in a study of mimetic butterflies of New Guinea, Dixey showed how a certain type of coloration was produced by spot and stripe markings the position of which, different in absolute detail, resulted in a uniform appearance relatively to the whole exposed surface of the wings.

Dixey was convinced of the importance of studying geographical distribution in its relation to mimicry,

and made this the subject of his presidential address to Section D (Zoology) of the British Association in 1919. Coincidence, sometimes invoked to explain mimicry, can produce resemblance, and, in the guise of *advocatus diaboli*, he demonstrated examples from different parts of the world bearing similar patterns. But such resemblances are crude, and lack the perfection of detail of typical mimicry, and thus coincidence fails to explain the latter.

Seasonal forms of butterflies and the possible direct influence of climate were the subject of Dixey's second address, on "Entomology and Evolution", to the Entomological Society (now Royal) of which he was president in 1909-10. He maintained that the Lamarckian interpretation of the effect of climatic conditions was not justified: "the modification is not inherited from the soma of the parent but is consequent upon the direct action of this external influence upon that parent's germ plasm".

Dixey's other favourite subject, in which he will long be recognised as a master, was the study, in Pierinæ, of specialised scent-producing scales to which Fritz Müller had directed attention in 1877-78. He found in 1899 that the peculiar scent of a male 'green-veined white' (*napi*), which had long been known to exist, could be detected on a brush used for removing scales from the wing, and in 1904 wrote that the scent of male butterflies is associated with specialised scales, confined to that sex, which can be removed from the wing and their odour perceived. Such scales are confined to the upper surface of the wing, and may be aggregated to form scent-producing organs supplied with air by special tracheæ. These studies culminated in a memoir (1932) containing 437 drawings of scent-scales in different species of Pierinæ.

At the time of his death Dixey had commenced the final copy of a paper on specialised scales on a portion of the wing of an American Pierine which, it is hoped, may be published as a posthumous contribution. The investigation of special scent-producing structures, carried on by Dixey, has been splendidly developed along different lines, following Fritz Müller's suggestion of 1877, by H. Eltringham. Elaborate apparatus on both wings and abdomen of male Danaine butterflies have been minutely described, and their use in the field has been witnessed by more than one observer. Further developments have resulted in the discovery of an intricate scent-producing apparatus on the head of a minute 'caddisfly', and specialised glands, the function of which is unknown, are being discovered on many different parts of the body in insects of diverse kinds.

Dixey returned to histology in 1931, and published an account of the development of wings in Lepidoptera.

Dixey was elected a fellow of the Royal Society in 1910, and was vice-chairman of the Association of British Zoologists: he was a familiar figure at meetings of the British Association, and played a genial part in the social gatherings.

G. D. HALE CARPENTER.