

might mean little or nothing. By splitting up a large sample of Blennies into groups representing successive years of age, Dr. Schmidt obtained significantly different average values. By taking average values of a character in a number of mothers, and average values of the same character in a number of their offspring, he again obtained different "racial pictures." Finally, by taking different broods of young from the same mothers and rearing these in different conditions significantly different average values for the characters were again obtained. Character differences are thus both "genotypical" and "phenotypical," in Johannsen's terminology. The "race" is a mixture of "genotypes," pure lines of descent in which there is constancy of value of character, and variational studies only give statistical expressions for these mixtures of genes.

The average racial character is much more the result of the mixture, in various proportions, of genes than due to the environment; nevertheless, the latter may be very important. Thus Dr. Schmidt shows that all the fresh-water eels of Europe are racially the same, the average values of the diagnostic characters being practically identical; this is because the environment is really the same, that of the deep water in the Atlantic, where all those eels are spawned and undergo larval development, fixing certain characters for the rest of the lifetime. But the Blennies are non-migratory fishes, and each locality has its own stock. Selection has therefore operated in helping to produce the differences that variation statistics reveal. The environment also acts directly, as is indicated by the experiments recorded in Dr. Schmidt's second paper, producing significant character differences which need not, of course, be transmissible.

J. J.

CANON ALFRED MERLE NORMAN, F.R.S.

IT has often been remarked that the study of science in this country has been notably advanced by the efforts of those who have never been professionally engaged in it. Canon Norman, who died on October 26, belonged to the best type of this class of scientific worker. His name will be long remembered for the conspicuous service he rendered to the study of the marine Invertebrate fauna of the Atlantic and Arctic areas, and for the special interest he took in deep-sea dredging at the time when the wonders of the abysses were first being revealed. The youngest son of John Norman, D.L., of Iwood, Congresbury, and Claverham House, Yatton, Somerset, he was born at Exeter in 1831, and was educated at Winchester and Christ Church, Oxford, where he took his first degree in 1852.¹ He was ordained deacon in 1856, and priest in 1857. After holding several curacies he was presented to the living of Burnmoor, Co. Durham, in 1866, where he spent nearly thirty years, becoming rector of Houghton-le-

Spring, in the same county, in 1895, and rural dean. He was obliged by illness to give up this appointment in 1898, and he soon afterwards settled at Berkhamsted, Herts, where he died. He had become Hon. Canon of Durham Cathedral in 1885.

When quite a child A. M. Norman was interested in botany by his brother, the Hon. John Paxton Norman, officiating Chief Justice of Bengal, who was assassinated by a fanatic in 1871. At Winchester he studied entomology, and at Oxford he devoted his attention specially to the Mollusca of the county, of which he published an account. While acting as private tutor in the house of the Dowager Countess of Glasgow, at Cumbrae, in 1854-55, he first seriously took up the study of the marine fauna, and from that time he spent nearly all his summer vacations in dredging round the British Isles, Norway, and Madeira, and in the Mediterranean. He thus formed the nucleus of his famous collection of the marine Invertebrates of the Arctic circumpolar seas and of the temperate North Atlantic, together with the inland representatives of the same classes of animals which inhabit the Palæarctic region. This collection was estimated to consist of about 10,000 species and named varieties in 1895. While a large part of it was obtained by himself, many of his choicest treasures were specimens of historical interest which had been purchased or given to him. It was thus extraordinarily rich in type-specimens acquired in these various ways, and it surpassed in importance anything of the same kind existing elsewhere. Before his death Canon Norman transferred it to the British Museum (Natural History), and he presented his almost equally noteworthy collection of books and pamphlets to the zoological departments of the University of Cambridge.

In these days of specialisation the breadth of Canon Norman's interests may well be considered remarkable. It would be difficult to find another modern zoologist able to write with authority on two groups so different as the Polyzoa and the Crustacea, for example. Not only was Dr. Norman an acknowledged authority on both of them, but he was equally well acquainted with others, such as Mollusca, Tunicata, Foraminifera, and sponges. Most of his work was systematic, and a good idea of its general character can be obtained from his papers entitled "A Month on the Trondhjem Fiord," published in 1893 and 1894. It is scarcely necessary to add that he made many additions to the British fauna in many diverse groups, besides describing large numbers of new species.

The remarkable genus *Rhabdopleura* was dredged by Canon Norman in ninety fathoms off the Shetland Islands and sent to Prof. G. J. Allman, by whom it was described. This organism had no near allies among forms then known, and its affinities were not properly understood until after the discovery by the *Challenger* of *Cephalodiscus*, a second member of the same group. Another of his specially noteworthy discoveries

¹ These personal details have been taken from "Bucks, Beds, and Herts in the Twentieth Century." (Brighton: W. T. Pike and Co.)

was the enigmatic encrusting organism obtained by him in the neighbourhood of Madeira, and afterwards named *Merlia normani*, in his honour, by Mr. R. Kirkpatrick. A third genus of remarkable interest which we owe to his enthusiasm is the parasitic Crustacean, *Synagoga*, belonging to the Ascothoracica, a highly specialised and degenerate subdivision of the Cirripedia.

But it must be emphasised that Canon Norman was much more than a describer of new species and a discoverer of interesting forms. His researches have been of real value in enlarging our knowledge of the marine fauna in general, and few others have contributed more than he did to the faunistic study of the sea.

As one who for many years had the privilege of his friendship I can speak with the most sincere admiration of his genial character, his perfect sincerity, and the high ideals by which he regulated his life. Of his work as a parish priest I am not competent to speak, but I believe that his ministrations were very highly valued by those who came under his influence. Canon Norman was a man of altogether lovable type, and it was impossible to be in his company without feeling the better for it. These characteristics lasted to the end of his life, during the closing years of which he had borne the infirmities of serious illness with an unclouded mind and a fine courage, and without losing the qualities which endeared him to his friends.

SIDNEY F. HARMER.

PROF. OLAUS HENRICI, F.R.S.

OLAUS MAGNUS FRIEDRICH ERDMANN HENRICI was born in the year 1840 at Meldorf, on the west coast of Holstein. After leaving the gymnasium at Meldorf at the age of sixteen, he worked in some engineering works at Flensburg. Thence at the age of nineteen he went to the Karlsruhe Polytechnicum, where he had the inestimable advantage of coming under the influence of Clebsch, by whose advice he devoted himself entirely to the study of mathematics. At the age of twenty-two he went to Heidelberg, where he attended Hesse's lectures, and obtained the degree of Ph.D. He then studied under Weierstrass and Kronecker in Berlin. After a short time spent as *Privatdozent* at Kiel, he came to England in 1865.

For four years Henrici worked at engineering problems. During this time he published a little book on skeleton structures (now called pin-jointed structures), and he supplemented his earnings by giving private lessons to schoolboys. In 1870, after a short time spent as assistant to Prof. Hirst at University College, London, he succeeded him in the professorship of pure mathematics, and retained this position for ten years, when he exchanged it for the professorship of applied mathematics. In 1884 he left University College for the professorship of mechanics and mathematics at the Central Technical College, where he entered on a new field of work in the organisation of a laboratory of mechanics, which has been the model of

many others, and has had an important influence on the education of English engineers. In 1911 Henrici retired to Chandler's Ford, in Hampshire, where he died on August 10 last.

Henrici was a fellow of the Royal Society, and at one time a member of its council. He was president of the London Mathematical Society for two years, and chairman of Section A of the British Association in 1883. In 1884 the University of St. Andrews conferred upon him the honorary degree of LL.D. He acted as examiner in the University of London from 1875 to 1880, and in this capacity made his influence felt on the introduction of modern methods into the teaching of geometry. In 1877 he married the daughter of the late Rev. Dr. Kennedy and sister of Sir Alexander Kennedy, who survives him. There was one child of the marriage, Major E. O. Henrici, of the Royal Engineers.

Henrici was the author of mathematical papers published in *Crelle's Journal* and the Proceedings of the London Mathematical Society. He contributed several articles to the "Encyclopædia Britannica," amongst which that on "Projective Geometry" stands out as a model of lucidity and form of expression. He wrote jointly with his son a valuable memoir on the theory of measurement by metal tapes and wires in catenary, which made it possible to calculate distances on slopes up to 1 in 3 to an accuracy of one in a million. He was the author of a remarkable little book on "Congruent Figures," in which his ideas of the mode of treating elementary geometry are expounded. It covers in a small compass most of the ground of the first four books of Euclid's "Elements." At one time he purposed to write a sequel to it on "Similar Figures," but it would appear from his address to Section A of the British Association in 1883 that he failed to find a method of treating this part of the subject which entirely satisfied him.

The introduction into English teaching of the methods of vector analysis greatly interested Henrici, but of his ideas there remains in permanent form only what is published in the little book on "Vectors and Rotors" written by his assistant, Mr. G. C. Turner, from notes of his lectures. It deals only with the elementary parts of the subject. The matter contained in this book was to form the earlier portion of a more elaborate treatise. A great amount of manuscript has been left by Henrici, and it is much to be desired that someone will be found to go through it with care and save what is possible of his ideas.

Henrici was greatly interested in the construction of models to illustrate his teaching. One of these, made of rods, showed two confocal hyperboloids connected together so that they could be deformed, always, however, remaining confocal. It had a remarkable history, which he gave in the catalogue of the Exhibition of Mathematical Models at Munich in 1892.

Perhaps the most strikingly original piece of work he did was the invention of the harmonic analyser for representing the equation of a curve