tions and repetitions in unrestricted sequence. The aggregate of all the operations, which thus emerge, is termed a group; so that a function is automorphic under a group of transformations. But just as the properties of the integers, which occur in the arithmetic of any calculation, merge into the general theory of number without regard to any specific application, so the properties of a group of transformations of an automorphic function are but a part of a more comprehensive calculus. That calculus deals with the composition, the construction, and the resolution, and the essential properties of a group, regarded as an abstract entity subject to mathematical laws, and without any consideration of the regions of its use, whether they are algebraic equations, or analytic functions, or differential equations, or rotations of a solid body, or the divisions of space, to mention only some instances. The first expression of the general notion was due to Galois: later, it found a fine exponent in Camille Jordan. By the late 'sixties it had secured increasing attention in the continental Schools, where soon it divided into two co-ordinate theories, continuous groups and discontinuous groups. The former theory became a grand body of growing knowledge under the inspired researches of Sophus Lie.

It was to the theory of discontinuous groups that Burnside devoted himself in the main, though he attained a stage in the discussion of their invariants where some processes of the theory of continuous groups may yet be drafted into service. Paper after paper appeared from him, on a variety of issues, in ordered development, ever adding fresh contributions to the theory, and marked, all of them, by imaginative vision and compelling power. They found their first culmination in his book on the "Theory of Groups," published in 1897, a systematic and continuous exposition of the subject as it then stood, embodying researches of continental workers (always with ample references) as well as his own. His production of papers, on the theory of groups, continued unhastingly and unrestingly; and the range of the second edition of the book, in 1909, was considerably greater than that of the original volume. Even so, his activity in the subject still continued, though with a gradually decreasing production. All this work, original from himself and copious in extent, is a splendid contribution, emanating from one mind, and sufficient to secure the remembrance of his name.

With the coming of the War, there was comparative cessation in Burnside's work. His frame was almost as lithe as ever and apparently as full of easy spring, seeming to belie the passage of years: but his constructive activity in published mathematics slackened, some of it passing silently into the service of his country, in certain naval matters. In those years he undoubtedly continued to produce papers; but the main body of his creative work might be regarded as verging towards its termination.

There stands, however, in the list of Burnside's memoirs, one brief paper (dated 1918) dealing with a topic in probability; among its fellows, it seems strangely isolated. It now appears that his thought had been settling towards that subject for some time. He has left a draft, which could have been developed into a treatise, on probability: though only consisting of the initial chapters, it is complete within its range; it will make a small volume which can proceed to publication exactly as it was written.

In recognition of his eminence as a mathematician, not a few academic honours came to Burnside in life. He received honorary degrees, Sc.D. from Dublin, LL.D. from Edinburgh. He was elected a fellow of the Royal Society in 1893, served on the Council of that body in 1901 and 1902, and was awarded one of the two Royal Medals in 1904. He was a member of the Council of the London Mathematical Society for the long continuous period from 1899 to 1917, where he was a tower of strength in advice; he was awarded the De Morgan medal in 1899: and in 1906–7–8 he served as president (he had accepted the office with grave and characteristic reluctance). The honour which he esteemed perhaps most of all, was conferred on him in 1900: he was then elected an honorary fellow of his old college, Pembroke, of which he had become the senior among the honorary fellows at the time of his death. Yet even in the few remarks of thanks which he made at the College dinner welcoming, by courteous custom, the newly elected honorary members of the foundation, he urged that the happy and successful pursuit of research was its own reward; and the sincerity of his plea was appreciated not least by those who had done their part in recognition of his labours.

Significant and merited as were the academic honours conferred upon him in life, to William Burnside, as to men of like mark in their generations, the most enduring monument is the work that his genius contributed to the progress of his science.

A. R. F.

MR. C. M. WOODFORD, C.M.G.

WE regret to record the death at Steyning, Sussex, on Oct. 4, of Mr. Charles Morris Woodford, for eighteen years administrator of the Solomon Islands. Mr. Woodford was born at Gravesend in 1852, and educated at Tonbridge School. On leaving in 1871, he went to the western Pacific as a naturalist and collector for the Rothschild Museum at Tring. For ten years he explored Melanesia, visiting the Solomons three times between 1886 and 1888. These islands then had few European inhabitants. Most of them were British, and they lived in constant danger from the native inhabitants, whose habits then fully accorded with the popular idea of a savage, as they were bloodthirsty cannibals, and assiduous in head-hunting. Woodford, however, succeeded in acquiring a considerable knowledge of their habits and characteristics, which he was afterwards to turn to good use.

In 1895, Mr. Woodford became acting Consul and Deputy Commissioner in Samoa, and in the following year he was appointed first resident

Commissioner in the Solomon Islands by Sir J. B. Thurston, Governor of Fiji. In 1900 he proclaimed the Solomons a British Protectorate and hoisted the flag. In 1912 he was made a C.M.G. and in 1915 he retired. During his term of office he succeeded in impressing his strong personality on the natives. He induced them to abandon their head-hunting and cannibalistic habits, and put down the murder of white traders and missionaries. Under his influence the natives provided the labour for the extensive coconut plantations established in the comparatively settled conditions which he set up, even though sporadic outrages, such as that reported within a day or two of his death, still occurred.

Mr. Woodford's profound knowledge of the natives was mainly turned to profit in the practical affairs of administration; but such contributions as he made to anthropological literature were marked by their powers of close observation and careful and accurate record.

WE regret to announce the following deaths:

Prof. Max von Gruber, president of the Bavarian Academy of Sciences, known for his work on social hygiene, on Sept. 17, aged seventy-four years.

Lord Iveagh, K.P., G.C.V.O., F.R.S., Chancellor of the University of Dublin, who, among numerous public benefactions, gave £250,000 to the Lister Institute of Preventive Medicine for the endowment of bacteriological research, and was elected in 1906 to the Royal Society under Rule 12, which provides for the election by the Council of "persons who, in their opinion, . . . have rendered conspicuous service to the cause of science," on Oct. 7, aged seventy-nine years.

Prof. Emil Gottheil, director of the department of photomicrography at the Robert Koch Institute in Berlin, on Sept. 7, aged eighty-five years.

News and Views.

IN an article in last week's issue of NATURE, the main characteristics of several types of metallurgical photomicrographic apparatus at present on the market were discussed, and it was suggested that British manufacturers must pay more attention to details of mechanical construction and design of this type of apparatus if they are to compete successfully with Continental manufacturers. That such competition is making itself felt is shown by the fact that twenty-two institutions and firms in Great Britain, and also sixteen in the United States, have recently installed Reichert metallurgical photomicrographic equipments of the type referred to in the article. From the point of view of British industry, it is unsatisfactory that so many British purchasers should have to place their orders with a foreign firm for an apparatus of such importance in industry and in scientific investigations. In 1920 the Faraday Society, under the presidency of Sir Robert Hadfield, in conjunction with the Royal Microscopical Society, the Optical Society, and the Photomicrographic Society, held a symposium on "The Microscope: Its Design, Construction, and Applications." A valuable discussion took place, in which microscope users stated their requirements and manufacturers presented their proposals to meet these requirements. The meetings aroused a considerable amount of enthusiasm on the part of manufacturers and resulted in the production of several types of microscopes of such a quality and in such quantity as to meet fully the requirements and the demands of the users. It would seem, however, that in regard to photomicrographic apparatus for metallurgy, the manufacturers have not kept pace with the demands of the metallurgists.

MESSRS. HADFIELD'S, LTD., desire to purchase an up-to-date metallurgical photomicrographic outfit. In order to avoid the necessity of placing the order abroad, Sir Robert Hadfield informs us that he or his firm is prepared to pay to any manufacturer who will supply a British-made equipment similar to the Reichert large photomicrographic apparatus, or one which fulfils the requirements of the metallurgist at least as fully as does the Reichert, a premium of £50 in addition to the price at which the Reichert equipment is now obtainable. For photomicrographic work, the adjustment of the intensity of illumination requires a system of auxiliary lenses and light filters. These must be held in definite relation to the microscope itself, as must also the camera. For metallurgical purposes, the camera must be capable of being used also for macrophotographic work. This involves the production of an elaborate and delicate piece of apparatus, but it is certainly not beyond the resources of British microscope manufacturers. They have the advantage of a Scientific Instrument Research Association which is rendering valuable service to the industry. There is also a chair of instrument design at the Imperial College of Science and Technology, where the scientific principles of design are taught. The technical knowledge and skill of the British optician and mechanician are of a high standard, as is evidenced by several other types of instrument at present on the market. Since attention has now been directed to mechanical details in British photomicrographic apparatus in which improvement might be effected, it may be confidently anticipated that Sir Robert Hadfield's offer will meet with a ready response. Its acceptance and the successful completion of the order would undoubtedly result in increased sales of British-made apparatus of this type.

ON Oct. 10, Prof. W. C. McIntosh, of St. Andrews, the Nestor of marine biology in Great Britain, entered upon his ninetieth year. Prof. E. E. Prince, Dominion Commissioner of Fisheries for Canada, who is visiting England, has sent us an appreciation of Prof. McIntosh's work, from which we are glad to print the following extracts. Born in St. Andrews in 1838, Prof. McIntosh passed through his arts course in the University of St. Andrews and his medical course at the University of Edinburgh. On graduating M.D. he was awarded the University gold medal, for a thesis on some peculiar features in the shore crab. Though burdened with heavy official duties when appointed to the Perth Mental Hospital in the late