to the proof and found that it corresponded with fact: the microfilariæ were sucked into the stomach of his mosquitoes, and some of them migrated into the insects' tissues and there underwent definite changes of growth and development, and were thus set on their course, *via* the infected mosquito, for infecting other human beings.

It must be borne in mind that Manson was a busy medical practitioner working, far off and alone, as he could find time, and without particular appliances. It is not surprising, therefore, that he did not follow the exact course taken by infected mosquitoes in transferring their infection to man. He was content to have demonstrated the essential realities of a great original conception, and to have established the great pathogenetic discovery—so pregnant with further possibilities of knowledge, so abundant in its practical applications to human welfare—that a common blood-sucking insect is *the essential factor* in the maintenance and dissemination of a widely-diffused parasitic disease.

In 1894, when he had left China, Manson found his opportunity of applying this great principle to the problem of malarial infection. He had followed all the work that had been done on the parasites of malaria since their discovery by Laveran in 1880, and he had come to the conclusion that the secret lay in the motile filaments extruded from forms of the parasite now known to be male gametocytes. Other observers regarded these filaments as degenerations: Manson interpreted them in the light of his filaria observations. He argued that as the forms that produce them are so persistent and resistant, the filaments must have some vital meaning; that since they are not produced until the blood has been shed, their destiny lies in the outside world; and that since they cannot get out spontaneously, they possibly are extracted and nursed —like the microfilariæ—by mosquitoes. This is Manson's mosquito-malaria theory, that inspired and guided Ross in his wonderful discovery of the sexual cycle of the malaria parasite and final solution of the problem of malarial infection. The theory has sometimes been referred to as if it were one of the several ingenious speculations that have attributed the spread of malarial fevers to mosquitoes: quite otherwise; it stands apart as a closely-reasoned working hypothesis based on known facts in the history of the malaria parasite and legitimate inferences from the history of *Filaria bancrofti*. Ross, writing with all the combined authority of an historian and a malariologist, says of it (NATURE, vol. 61, 1900, p. 523): "Manson's theory was what I have called it—an *induction*—a chain of reasoning from which it was impossible to escape. . . . I have no hesitation in saying that it was Manson's theory, and no other, which actually solved the problem; and, to be frank, I am equally certain that but for Manson's theory the problem would have remained unsolved at the present day."

Manson had retired from China in 1890 and settled in London. In 1894 he joined the staff of the Seamen's Hospital, and in 1897 was appointed Medical Adviser to the Colonial Office. He was now able to realise his lifelong dream of a school in London where medical men going to the tropics could acquire all the necessary craftsmanship that he himself had yearned after in his early days in China. In this design he happily obtained the countenance of Joseph Chamberlain and the co-operation of the Seamen's Hospital Society, and in 1899 the London School of Tropical Medicine was established under him at the Albert Dock. Here, until his retirement from all active practice in 1913, he radiated rather than imparted wisdom and inspiration to many hundreds of his younger professional brethren; and here, under his sage and benign influence, there grew up a sort of Mansonian tradition that for useful work in the tropics a medical man, though always a clinician at heart and a sanitarian in his general outlook, must be a biologist in his attitude to pathology and ætiology.

Manson's place in the history of medicine can be estimated only when we consider how much of what for convenience we speak of as "tropical disease" is due to animal and animalcule parasites, and to what extent those parasites are fostered and diffused by blood-sucking arthropoda. Men before Manson had speculated on the pathogenetic possibilities—or even probabilities—of predaceous insects, but no man before him had followed—or gone near following—a specific pathogenic organism into a specific predaceous arthropod and discovered what happened to it there. "The light of humane minds," says Hobbes, "is perspicuous words, by exact definition snuffed and purged from ambiguity": it is Manson's pre-eminent distinction to have been the first to discover a connected series of facts and to have recorded them in exact definitions purged and snuffed from ambiguity—which is the acquisition of science. With Manson's high achievements as an original investigator and a teacher we have to consider also his extraordinary influence as a most prescient clinician—and a clinician who never forgot the comfort of his patients: in all this, as in his large humanity and his benevolent attitude to his fellow-workers, he worthily upheld the ideal of Hippocrates; and I have often thought that, as the Father of Tropical Medicine, his name may, perhaps, have the same lasting fragrance as that of his immortal archetype.

A. A.

## SIR A. B. KEMPE, F.R.S.

SIR ALFRED BRAY KEMPE, whose death occurred on April 21, was born in 1849, and educated at St. Paul's School and at Cambridge, where he was twenty-second Wrangler. His first contribution to the science of mathematics was in 1876, when, in a paper on a general method of describing curves of the $n$th degree by link-work, he laid the foundation of the excellent discoveries he was destined to make in "linkages"—a subject in which he took a lifelong interest. In 1877 he gave his well-known lecture, "How to draw a straight line," in which he traced the history of the connection between the straight line and linkages from the partially successful attempts of Watt, Richard Roberts, and Tchebicheff, to the practical solution of the problem by Peaucellier in 1864. Together with Hart of Woolwich Academy and Sylvester he had added much to the knowledge of the subject, and these additions he described with models.

A paper on conjugate 4-piece linkages followed in 1878, and some smaller papers, but Kempe's principal

contributions appeared in the years 1885–86. The "Memoir on the Theory of Mathematical Form" is a first-rate piece of work. Its avowed object is to separate the necessary matter of exact or mathematical thought from the accidental clothing—geometrical, algebraical, logical, etc.—in which it is usually presented for consideration, and to indicate wherein consists the infinite variety which that necessary matter exhibits. This long and thoughtful research shows that as a thinker Kempe perhaps resembled W. K. Clifford more than any one else has done in the world of science. This indeed was recognised by Spottiswoode, who, coming into possession of "Mathematical Fragments" which had been reproduced in facsimile from the papers left by Clifford, decided to send them to Kempe. He dealt with them, and finding inspiration in the graph theory which they contained he wrote a very valuable and suggestive paper upon the "Application of Clifford's graphs to ordinary binary quantics." Clifford had not at the time of his death succeeded in effecting this, and it required a man like Kempe who was well versed in the rapidly growing theory of invariants to accomplish it.

In 1894–96 Kempe was president of the London Mathematical Society. In his valedictory address he dealt in a thoughtful and learned manner with the question of defining the subject matter of mathematical science. He finally suggests the statement, "Mathematics is the science by which we investigate the characteristics of any subject matter of thought which are due to the conception that it consists of a number of differing and non-differing individuals and pluralities." Here we can trace the influence of his studies of mathematical form. He always tried to behold the objects of his thoughts in their lowest terms freed so far as possible from all extraneous matter, and it is greatly to be regretted that, shortly after vacating the chair, he became so busy with the duties thrown upon him by his acceptance of the position of chancellor to several dioceses that his direct contributions to science, from which much might have accrued, came to an end.

Indirectly, however, Kempe was for the remaining years of the greatest service to science. Those which he rendered to the Royal Society as treasurer have been described elsewhere. It must be added that from that position he was *ex officio* treasurer of the National Physical Laboratory from its foundation until April 1918, and he was able to do much for that great institution and for its director and executive committee. He never failed to attend particularly the finance committee, and was always fully informed as to the details of finance. His help and advice, often sought, was given ungrudgingly, and it may be said that it was owing largely to him that the funds necessary for maintaining and developing the laboratories were obtained. In the scientific life of the country he took a notable position. He was universally popular and respected. P. A. M.

## Sir Wm. Phipson Beale, Bart., K.C.

Sir William Beale died at Dorking while on a visit to friends, on Thursday April 13, at the ripe age of eighty-two, in full possession of his faculties. His remains were cremated at Golders-green on April 19; a service in his memory was held in Lincoln's Inn Chapel on April 26. His qualities had endeared him to a wide circle of intimates, in scientific, legal and political society, by whom his loss will be deeply mourned.

Beale's early training was that of a chemist, the intention being that he should enter an ironworks at Rotherham in which his family was interested. He made a beginning in the laboratory of Mr. Hill, a well-known consulting chemist in Birmingham; he then studied in Heidelberg and Freiberg, finally in Paris. At Heidelberg he was brought into contact with a number of chemists who afterwards became well-known —Matthiesen, Mond, Roscoe, Russell and others.

After but a short stay in the ironworks, Beale turned his attention to the law as offering better prospects; he entered Lincoln's Inn in 1867. Throughout his life, however, he retained his scientific interests and long acted as honorary legal adviser to the Chemical Society. He was one of the most popular and active members of the now defunct B club, a club of chemists whose doings have been chronicled by Dr. A. Scott in one of his Presidential addresses to the Chemical Society. At Freiberg Beale became interested in mineralogy and crystallography. When, in later years, the subject was developed and he desired to modernise his knowledge, I was able to hand him over to William Pope, then active as demonstrator of crystallography in my department at the Central Technical College; they contracted a firm friendship. Later on Beale even wrote a treatise on the subject, in which he put forward an original graphic method of presenting the facts of crystal symmetry. He was many years Treasurer and finally President of the Mineralogical Society. He also took an active interest in the Royal Institution.

Beale entered Parliament, after several ineffective attempts at Birmingham, as Liberal member for South Ayrshire, in 1906, retaining his seat until he resigned in 1918. He enjoyed a high reputation in legal and political circles, on account of the breadth and accuracy of his knowledge and his wonderfully balanced sane judgment. Of late years he spent much of his time, always surrounded by friends, at his Scotch home, near Barrhill in Ayrshire, most beautifully placed on an open grouse moor in sight of the Galloway Cauldron, Merrick, the highest peak in South Scotland, being a prominent feature in the view. Geikie's "The Ancient Volcanoes of Great Britain" was not infrequently taken down from his shelves. H. E. A.

## Sir A. P. Gould.

Sir Alfred Pearce Gould, whose death at the age of seventy years we announced last week, had been a member of the honorary staff of the Middlesex Hospital since 1882, and was a consulting surgeon at the time of his death. He was a Fellow of the Royal College of Surgeons and a Master of Surgery at the University of London, of which he was Dean of the Faculty of Medicine 1912–16, and Vice-Chancellor 1916–17. His publications include the "Elements of Surgical Diagnosis," which went into five editions, and the Bradshaw Lecture on Cancer (1910). He was joint author of the "International Text-Book of Surgery." Though a surgeon of wide interests, Sir A. P. Gould devoted much work to the study of the clinical treatment of cancer, and was early in recognising the valuable