had been given to a CC individual. Considering the rarity of transfusion as compared with pregnancy in the general population, this suggests that c not inhibited by C is probably a more powerful immunizing antigen than it is when so inhibited.

In the case of E, maternal immunization with a single dose is rarer than with C, but many cases are known. On the other hand, no case has hitherto been described of maternal immunization by e. Here the presence of a single dose of antigen in the babies of mothers lacking it is rarer than for E, but not incomparably so (about 1/7 as common). The only case yet described of immunization by e is that of an EE male who had been transfused with blood from about forty different donors, of whom nearly thirty would be expected to be homozygous for e. Here again, therefore, it appears that e, when homozygous, is a much better antigen than when heterozygous.

D is undoubtedly the best immunizer of all the *Rh* antigens, acting very well on mothers when single doses are present in their babies. Though single doses of d are very common in babies, only one case has ever been mentioned where it is claimed[13] that a mother has been immunized by d.

The evidence in the case of c and e shows that these are antigens comparable in strength of antigen-antibody reactions and probably in immunizing power with C, D and E when, and only when, they are not inhibited by C and E, the partial dominance of which is thus demonstrated.

The position with regard to D is not so clear. The strength of its reactions with anti-D is clearly not inhibited by the presence of d in the genotype, and thus D is to be regarded as a dominant. The antigenic status of d has only recently been announced. It is clearly a very weak antigen, and indeed until this announcement the d gene was regarded as resembling the recessive O gene in that neither had been proved to give rise to an antigen.

In general, nearly every blood group gene has been found to give rise to a corresponding antigen, and this is always detectable whether present in double or single dose in the genotype. Within each blood group system a linear series of antigenic characters can be established, of which each member shows a slight degree of dominance to the next. The evidence is, however, of a very patchy nature, and the subject is one which deserves, and is indeed receiving, much further investigation.

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OBITUARIES

Prof. W. W. Watts, F.R.S.

By the death on July 30 of Prof. William Whitehead Watts, the doyen of British geology, we have lost a great exponent of the science and an able administrator.

Born on June 7, 1860, at Broseley, in Shropshire, he received his early education at Denstone College, where he distinguished himself in classics. But his youthful interests had already turned to geology, since the opportunities for the collection of fossils from the famous localities near his home and the study of a great variety of rock-formations and scenic types were unusually attractive, and he made full use of them. He entered Sidney Sussex College, Cambridge, in 1878, and later was elected to a fellowship. It is worthy of note that he took the Tripos papers in geology (and not those in chemistry, as he had intended, because on the examination day they looked more healthy), being placed in the first class of the Natural Science Tripos. We cannot assess the loss to chemical science, but the gain to geology is obvious.

Soon after Watts left Cambridge, he was occupied as a University extension lecturer in geology. By deputising for the professors of geology at Leeds, Birmingham and Oxford, he gained valuable experience in dealing with men individually and collectively. From 1891, for a period of six years, he acted as petrographer to the Geological Survey of Great Britain, spending much time in Ireland, where he produced the "Guide to the Collection of Rocks . . . belonging to the Geological Survey of Ireland", which has been a valuable work of reference to this day.

Then followed his appointment as assistant professor of geology at Birmingham, a post held in part conjointly with the professorship of geography. There, with the impress of Chas. Lapworth's genius strong upon him, he re-investigated and described the geology of parts of his native county, including the Shelve District, the Breidden Hills and the Long Mountain. He also published geological accounts of the country around Birmingham and the neighbouring Forest of Charnwood, where the landscape of pre-Cambrian rocks, buried under Triassic deserts, was so graphically described by him that it will be for ever associated with his name. His elegant interpretation of the stratigraphy, volcanic phenomena and tectonic history of this unique development of pre-Cambrian rocks made his work a model for students. In recent years, he returned to and amplified these early studies, and had the satisfaction of seeing shortly before his death the page-proofs of his book on Charnwood.

During the Birmingham epoch, also, Watts produced his famous little manual, "Geology for Beginners" (Macmillan and Co., Ltd.), which brought him, as he rejoiced in saying, a host of friends: certainly, it inspired many students to take up a geological career.

It was thus as an experienced teacher and an original investigator of considerable repute that he was invited to succeed J. W. Judd in 1906 as professor of geology in the Royal College of Science and Royal School of Mines, London, at that time in course of being incorporated with the City and Guilds Engineering College to form the Imperial College of Science and Technology. His outstanding success as an organiser had already become manifest since, among other offices to which he had been called, he had been secretary of the Geological Society (when he organised the centenary celebrations), secretary and recorder of Section C of the British Association and prime mover in originating and running its Geological Photographs Committee.

In London, Watts was soon heavily engaged in administrative duties, both in the geological world and in the University, where he became chairman of the Board of Studies in Geology, dean of the Faculty of Science and senator. He planned the lay-out and equipment of a new department at the College and extended its activities by establishing a Sub-Department of Oil Technology shortly after his arrival, and after the First World War a Sub-Department of Mining Geology. With commendable foresight he insisted on the retention of the school of the fundamental science as a department of the Royal College of Science, while the other two departments—applied science—appropriately found a home in the Royal School of Mines. Believing strongly in "Geology in the Service of Man" (the subject of one of his presidential addresses) he arranged for students of the City and Guilds College to attend a full course of lectures, laboratory work and field-surveying in geology for civil engineers, the first of its kind in Great Britain. Under his inspiration, research students steadily increased in numbers, coming from other universities in Britain, the Dominions and foreign countries.

Watts was wont to say that early in his London days he realized that he had to choose between being a teacher or a researcher. He never regretted his choice as time passed and he saw his old students occupying responsible posts, a score as professors, many as directors of geological surveys in various parts of the world, and even more as leading technologists in the business world, in oil, mining and other undertakings.

Among the public offices Watts filled were the presidential chair of Section C of the British Association (twice), the Geologists' Association (twice), the Geological Society, the Mineralogical Society and the British Association (Norwich, 1935). During 1917–23 he was secretary of the Conjoint Board of Scientific Societies—at the time when the world-embracing Catalogue of Scientific Periodicals was compiled.

Many other honours came to him. He was made an honorary fellow of Sidney Sussex College and of the Imperial College, hon. LL.D. of the Universities of St. Andrews and Edinburgh, fellow of the Royal Society (1904), Murchison Medallist (1915) and Wollaston Medallist (1927) of the Geological Society. He was an emeritus professor of the Imperial College and the University of London, an honorary fellow of the Royal Society of Edinburgh, a fellow of the Royal Society of Canada and an honorary member of many other learned societies.

Among the subjects he dealt with, in his characteristically vivid and witty style, were informative reviews of palæogeography in the light of present-day crustal features, the potentialities of British coalfields, other economic aspects of the science, the history of geology and continental drift.

Such, in brief, is the record of a remarkable career. No man exercised more beneficent influence on the progress of British geology in his day, doubtless in no small measure by reason of his dominating personality, manifest humanity and great personal charm. Small wonder is it that his students felt an immense affection for him.

P. G. H. Boswell

Mr. H. A. Hancock

Coming straight from a Manchester school in 1916 to the newly formed Experimental Department of the Fine Spinners' and Doublers' Association, Ltd., Hancock presently became the writer's personal assistant. He had useful hands, and a remarkable freedom from subjective error; long dull series of observations were in no way biased, and yet—the data at last obtained—he switched over to keenness in extracting every significant fact from them. In later years he similarly used statistical technique with exceptional discrimination. He became joint author of papers in cotton cell-wall structure, contributing several essential points. Although primarily a physicist, he acquired botanical interests which were of value later when he worked in closest liaison with cotton growers in a mill standing on a farm.

He was Lancashire, with a business sense, and also a diplomatist, so that he was the usual envoy to any distrustful mill manager. This diplomacy had full scope during his service in Egypt; but, like statistical technique or his skilled photography, it was only a tool for use in helping to do the job.

In the use of words his method was like a drawing by Phil May; nothing unessential was left in. Two pages of foolscap held his report on six weeks mission in the United States; nothing was omitted in its definite and important conclusions. It was his last writing before his death on July 23 at the age of forty-four.

In 1927 he moved to the Shirley Institute, Manchester, where he worked on the testing side, widening his experience of the cotton industry, taking a first-class honours B.Sc. in physics and making a happy marriage with one of our former colleagues. Meanwhile, in Egypt it had been made practicable to start on the project of a spinning test mill. Hancock was not an obvious chief for it; he had never been a spinner, but the job was evidently going to be beyond all boundaries of precedent. So he arrived in 1934, finding only a climate-insulated building under construction for him to equip and staff. Scrupulously fair dealing served as a charm whereby skilled operatives were made out of raw material, and his infinite capacity for taking pains made the "S.T.M." incredibly efficient.

Results began to arrive fast and faster. Egypt had been promised a hundred and fifty tests a year, though privately we expected a thousand; after twelve years Hancock was producing a hundred and twenty a day with improved accuracy as routine, for weeks on end. Having shown mixtures to give an exact weighted-mean result he sampled all Egypt every year, with the collaboration of Alexandria's exporters, and thereby proved that smooth curves connected world-price and relative yarn-strengths. So the spinning-test became a direct valuation; after that we knew the market value of newly bred varieties years ahead of their public appearance. Matters of trade argument were swept up in the meshes of ordinary routine, a thousand spinnings or so at a time. Prediction of the all-important yarn-strength from the hair-properties was not quite complete, but the correlation coefficient reached 0·95. He located the effects of 'grade' and analysed most of its causes. The detailed incidence of natural crossing in the field was measured by spinning.

Such things as these were all useful, but he struck a vein of fundamental research by applying his technique to statistical genetics. Our unobtrusive