No tumours were encountered in any of the lungs in the first 4 weeks after injection. Between the sixth and twelfth weeks, 32 animals of each strain were killed, and 25 strain *A/J* mice (11 males and 14 females) were found to have lung tumours. Twenty-three had been given 3-methylcholanthrene and lard, and two had been given the lard alone. No tumours were found in the control group of *C57BL/6J* mice. Histologically, all the tumours were adenomas, apparently of alveolar origin. Many were multiple, and all were situated in the lung parenchyma itself; squamous metaplasia or squamous cell carcinomas were not found.

The development of a tumour results from an unknown alteration in the hereditable characteristics of the cells from which it arises. Present knowledge suggests that the carcinogenic process responsible for malignant tumours occurs in two stages[3]. The first is the relatively rapid and irreversible mechanism of initiation during which cellular mutation takes place without recognizable histological change. This is followed by the more gradual and potentially reversible stage of promotion by which the process of malignancy becomes obvious. All known tumour promoters cause epithelial hyperplasia; but although this permits recognition of the temporal sequence of events, this hyperplasia may not be of major importance in tumour production—but only an accompaniment of it.

Although *C57BL/6J* mice have a negligible incidence of spontaneous or induced pulmonary tumours, more than 75 per cent of inbred strain *A/J* mice have been shown to have spontaneous pulmonary adenomas of alveolar origin by the age of 18 months[4,5]. Metastasis is occasionally found in distant organs, and the primary tumours are often multicentric[6]. The subcutaneous injection of polycyclic hydrocarbons has resulted in a shortening of the development time of these adenomas, which then appear in a majority of the susceptible strain within 12 weeks[7]. The numbers of strain *A/J* mice (48 per cent) that developed typical adenomas within 12 weeks of the subcutaneous injections of methylcholanthrene in this experiment is in keeping with these observations. In these circumstances, it seems reasonable to assume that adequate absorption of the chemical occurred in this group and that the lungs of these mice, already genetically conditioned to produce these tumours, were exposed to its action. The intravenous route of administration was avoided in order that pulmonary infarction would not occur. The only known initiating factor in the production of these tumours was the genetic predisposition of this strain of mice to tumour development, which involved the lung parenchyma diffusely. The tumours themselves do not bear any resemblance to squamous cell epitheliomas or other human bronchogenic carcinomas.

In contrast, Stanton and Blackwell[1] were able to produce squamous metaplasia and squamous cell carcinomas in the lungs of rats after methylcholanthrene was given intravenously in a suitable medium. They observed that malignant lesions did not occur in the absence of pulmonary infarction. The focal damage produced was the most significant factor identified apart from the action of the hydrocarbon itself. The results of the work recorded here substantiate the efficacy of methylcholanthrene in accelerating the development of hereditable lung tumours in strain *A/J* mice. They also show that it failed to produce squamous metaplasia or squamous cell carcinomas in the lungs of these mice, even though genetic predisposition to spontaneous pulmonary adenomas existed. While allowance must be made for difference in species, it seems significant that the same carcinogen produced such changes in regions of focal damage in the lungs of rats without a known tendency to produce lung tumours. This gives indirect support to the suggestion that induced injury of this type to a non-conditioned lung is important in the production of these experimental tumours[1] and appears to be more significant in producing premalignant epithelial change than diffuse congenital susceptibility to tumour formation, within the conditions of the investigation. The influence of genetic factors on the cell type of a subsequent tumour remains unknown. In this work, shortening of the time of development of heritable pulmonary adenomas was not associated with any detectable alteration in the behaviour or morphological appearance of the tumours themselves, which was similar in all respects to those previously described by others[5,6].

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OBITUARIES

Sir George Simpson, K.C.B., F.R.S.

George Clarke Simpson was born at Derby on September 2, 1878, third of the seven children of Arthur and Alice Simpson. He left school at sixteen and was for two years in his father's business. This he left for Owens College, Manchester, then one of the three colleges of Victoria University. There he sat under Arthur Schuster and Horace Lamb and graduated in 1900 with first-class honours in physics. In 1902 he was awarded an 1851 Exhibition. On Schuster's advice he went first to Göttingen, then a centre of research in atmospheric electricity, and in September 1903 to Karasjok, a village in Lapland, away from the coast, in lat. 69° 17′. He chose this in order to find how the conditions in the absence of daylight in winter and in continuous daylight in summer differed from those revealed in the temperate zone by the relatively new weapons of Ebert, Elster and Geitel, and Benndorf. The results of a year's work were given in a paper in the *Philosophical Transactions of the Royal Society*, 1905. Potential gradient in winter was double, and its diurnal variation treble, the summer values. Radioactivity was greater than that measured anywhere previously. Both positive and negative ionization at low temperatures of $-20°$ C were less than half their values at 0° C. These and many other results were a rich harvest.

After his return, Simpson worked for a time, without pay, in the Meteorological Office investigating the relation between the Beaufort number, B, for wind force and the speed of the wind, V, at a height of about 30 ft. above ground in an open situation. The result was, briefly, $V = 1 \cdot 87\ B^{3/2}$ m.p.h. and led, twenty years later, to the international adoption of B for reports of wind.

In 1906 Simpson joined the India Meteorological Office. At Simla, in his spare time, he attacked the problem of the electricity of thunderstorms, a problem which was to exercise his mind for more than thirty years. He designed, and set up, apparatus to record automatically the charge on falling rain and at the same time made experiments to ascertain the charge, if any, on drops of water after splitting up. From the records for the five months, April–September 1908, he found that the charge on rain was predominantly positive, always positive on rain falling at a rate greater than 0·5 mm/min, contrary to the generally accepted belief that the predominant charge was negative; the laboratory experiments showed that drops of distilled water, broken into spray by a jet of air, became positively charged, the air becoming negatively charged. From these results and the fact that, in thunderstorms, there are vertical currents greater than 8 m/s, that is, enough to carry the largest raindrops upwards until they split, Simpson concluded that a thundercloud must have positive electricity in its central part near its base and negative electricity higher up and away from the centre. This he maintained with firm confidence, in a succession of papers, against the protagonists of the 'influence theory'. Eventually he designed apparatus, carried by free balloons, which recorded the sign of the electric field during the ascent through thunderclouds. Ascents from Kew in 1934–6, and again in 1937–9, showed a positive charge in the upper layers, for which C. T. R. Wilson had contended, a wide distribution of negative in the lower layers with a positive charge near the active centre, as Simpson had pictured it. The upper positive charge and the negative charge beneath it were always at levels where temperature was well below the ice-point. Simpson interpreted this as meaning that the separation of the electricity there was due to collisions of ice crystals.

In 1909 Captain Scott invited Simpson to go as meteorologist with him to the Antarctic. Simpson accepted, came to England to collect the equipment and sailed from London on the *Terra Nova* in June 1910, arriving at McMurdo Sound on January 4, 1911. The ship had nearly foundered when the pumps failed in a very bad storm in December. Observations on the voyage of potential gradient, round the clock, gave for the first time its diurnal variation at sea. At Cape Evans he kept complete meteorological and magnetic records for a year until he was recalled, a year earlier than expected, owing to the illness of Dr. G. T. Walker, his chief in India. In the following seven years, first full of administrative work, then service with the army in Mesopotamia and secondment to the Indian Munitions Board, he wrote a paper demonstrating that coronae seen in the Antarctic could only have been due to liquid-water drops in the atmosphere at temperatures far below the ice-point; and a second paper showing that the spatial distribution of the amplitude and phase of the semi-diurnal variation of atmospheric pressure indicated that it was compounded of two waves, one from east to west and one from equator to pole. In 1920 Simpson was the physicist member of the Egyptian Government Commission appointed to advise on projects for the further regulation of the Nile.

At the end of that work Simpson returned to England to succeed Sir Napier Shaw as director of the Meteorological Office, a post which he held from September 6, 1920, to September 2, 1938. Control of the Office had been transferred to the Air Ministry; and the Meteorological Branches of the Admiralty and Air Ministry, and the British Rainfall Organization, had been officially included in the Office. It fell to Simpson to make the unified organization a good and satisfied scientific service. This he did surprisingly well, in spite of the 'Geddes Axe' and the fact that, like Aphrodite, the Meteorological Office sprang from the sea. The staff was largely drawn from those who had entered meteorology during the War; one of the ablest was most unfortunately lost with the airship *R* 101. By 1926 the Office was running well enough for Simpson to be able to take up again the thunderstorm problem and, after that, the balance between the retained solar radiation and the outward radiation from earth and atmosphere. By taking account of Hettner's confirmation of the 'window' in the infra-red spectrum of water-vapour, indicated in 1898 in the experiments of Rubens and Aschkinass, he was able to make close approximations to the outgoing radiation from the Earth, the troposphere and the stratosphere in different zones of latitude and thence the horizontal transfer of heat necessary to ensure radiative equilibrium. This led him to the deduction that an increase in solar radiation would cause an increase in cloud and precipitation and possibly have a bearing on the problem of ice ages. He pursued this idea in a number of papers, arriving at the conclusion that an increase of solar radiation would cause first an extension of the polar ice and then a retreat, while the subsequent decrease of the radiation would turn the retreat into an extension followed by a second retreat.

On the outbreak of War in 1939, Simpson offered his services to his successor, Sir Nelson Johnson, who accepted his offer and put him in charge of the four Observatories and the Edinburgh Office, with his headquarters at Kew, where he was able to make further investigations of the electricity carried down by rain. He was president of the Royal Meteorological Society during 1941–42. His increasing deafness in the 1930's made him decline nomination as successor to E. van Everdingen, on the latter's retirement in 1935 from the presidency of the International Meteorological Committee in whose work he had taken and continued to take a very active part.

Simpson was elected Fellow of the Royal Society in 1915 and appointed K.C.B. in 1935. He married Dorothy, daughter of Cecil and Alice Stephen, at Sydney in September 1914. They had three sons and a daughter, all still living. He died on New Year's Day in hospital at Bristol after a short illness. The simple funeral service on January 6, with the first few moving verses of *Wisdom III*, was held at Westbury-on-Trym, where they had lived since they left London in 1961.

E. GOLD

Prof. A. F. Barker

PROF. A. F. BARKER died on July 22, 1964, in Portland, Victoria, Australia, at the age of ninety-six. Several obituary notices have already been published, in which tributes were paid to this remarkable man who had devoted the whole of his long life to the textile industry. He was head of the Textile Department at the Bradford Technical College from 1892 until 1914 and professor of textile industries in the University of Leeds from 1914 until his retirement in 1933. At the invitation of the Chinese Government he then took up an appointment as professor of textile industries at the University of Chaio-Tung, Shanghai, but because of the Japanese invasion of China he eventually migrated to Australia, living first in Melbourne and then in Portland, Victoria, where his address was appropriately 'Merino Cottage'.

Prof. Barker was a great enthusiast for textiles. He was very aware of the need for the industry to adopt scientific methods, and to that end he was proud to have introduced into the Department of Textile Industries in Leeds such men as the late Prof. W. T. Astbury and Prof. J. B. Speakman. He realized also the importance of a professional organization for the textile industry and was a Founder Member of the Textile Institute, which now has a membership approaching 8,000. In addition, he was active in promoting more local societies such as the Bradford Textile Society.

His death affords an opportunity to place on record the vast changes which occurred in the wool textile industry during his working life. In his early days textiles was essentially a craft industry, dominated by highly skilled men whose jealously guarded methods of processing had little to do with rational thought. Nevertheless, the products were of surprisingly good quality and British wool textiles were highly regarded throughout the world. Man-made fibres were unknown and the processing machinery had changed little over the years. Although the achievements of science were well appreciated in some industries, the potentialities of science in the wool textile industry were almost completely unrecognized. Within Prof. Barker's life-time, however, this situation changed completely. He was not himself a professional