

# Sir William de Wiveleslie Abney



Sir William Abney 1916

Sir William de Wiveleslie Abney, pioneer in the chemical aspects of photography, and member of the first Science Abstracts committee.

Sir William de Wiveleslie Abney, RE, KCB, FRS. was born in Derby in 1843, the eldest son of the Rev. Canon E. H. Abney. When he was 18 years old, he left Rossall School and joined The Royal Engineers (1864) and was promoted to Captain by 1873, retiring in 1881. He continued to be known as Captain until he was created a K.C.B. in 1900.

The first scientific society he joined was The Royal Photographic Society in 1870 who later elected him as their President from 1892-94, in 1896, 1903 and again in 1905.

In 1871, he became a Fellow of the Chemical Society, joining the Physical Society in 1876 with the Royal Society admitting him as a Fellow that same year. From 1882-84 he was on the Council of the Chemical Society. 1893 saw him elected President of The Royal Astronomical Society. From 1895-1897 he was President of the Physical Society.

In 1898, the first issue of *Science Abstracts* was published by The Institution of Electrical Engineers (IEE), with Sir William as one of the members of the editorial committee. He was elected as Chairman of the Council by The Royal Society of Arts in 1903.

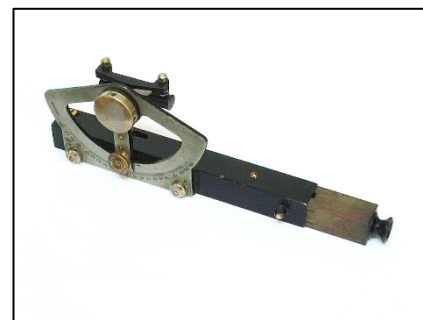
Sir William's work revolved, in the main, around light, vision and associated subjects - in particular, photography. He was responsible for numerous books and handbooks which remained for a long time as standard guides for practical photographers who found all the technical advice needed in the information contained within them. In all the societies to which he belonged, he obtained high honours.

His activities in later years were principally devoted to scientific education and he became a member of the Advisory Council for Education to the War Office. In later years, after his long and distinguished career, failing health forced him into retirement.

He died 3 December 1920.

## Topographic Abney level

An Abney level and clinometer is an instrument used in surveying which consists of a fixed sighting tube, a movable spirit level that is connected to a pointing arm, and a protractor scale. An internal mirror allows the user to see the bubble in the level while sighting a distant target. It can be used as a hand-held instrument or mounted on a Jacob's staff for more precise measurement, and it is small enough to carry in a coat pocket.



The Abney level is an easy to use, relatively inexpensive, and, when used correctly, an accurate surveying tool. Abney levels typically include scales graduated in measure degrees of arc, percent grade, and in topographic Abney levels, grade in feet per surveyor's chain, and chainage correction. The latter is the cosine of the angle, used to convert distances measured along the slope to horizontal distances. By using trigonometry, the user of an Abney level can determine height, volume, and grade.

Abney levels are made with square tubular bodies so that they may also be used to directly measure the slopes of plane surfaces by simply placing the body of the level on the surface, adjusting the level, and then reading the angle off of the scale.

The Abney level was invented by Sir William de Wiveleslie Abney who was an English astronomer and chemist best known for his pioneering of colour photography and colour vision. Abney invented this instrument under the employment of the School of Military Engineering in Chatham, England prior to late 1870. It is described by W. & L. E. Gurley as an English modification of the Locke hand level.

Elliott Brothers of London registered an "improved clinometer and spirit level combined" in December 1870 based on "the old form as originally designed by Lieutenant Abney." By 1871, a committee of the Royal Geographical Society recommended a long list of instruments that explorers should carry. Along with necessary tools such as a watch, compass, sextant and plenty of paper, the committee included "a pocket level (Abney's)" in a secondary list of "additional instruments, not necessary, but convenient."

## Sir William de Wiveleslie Abney

(Obituary Monthly Notices of the Royal Astronomical Society, Vol. 81, p.250, Feb 1921)

SIR WILLIAM DE WIVELESLE ABNEY, K.C.B., F.R.S., better known by a former familiar designation as Captain Abney, R.E., whose death during the past year we have to record, was one of the Fellows of the Society, of whom there have been other examples, whose activities lay in a branch of science other than astronomy, but have been chosen to occupy the Presidential chair because they excelled in some branch that had close relation to our science. Sir William Abney was worthily famous for his knowledge of the theory and practice of photography, of colour, and of light in general, and this knowledge was put freely at the service of astronomy. In this note it will scarcely be possible to follow in detail all his researches in these matters, but it may be sufficient to record the incidents of his career which connect him specially with astronomy.

Lieutenant Abney of the Royal Engineers, then attached to the Military School of Engineering at Chatham, where he had charge of a small photographic and chemical laboratory and was afterwards (1874) Instructor in these sciences, joined the Royal Astronomical Society on 1870 April 8, and his active participation in astronomical affairs began a few years later in connection with

• Died 1918 November 4 ; death not reported till 1921.

the observation of the Transit of Venus. It will be remembered that for the purpose of observing that phenomenon, which happened in 1874 December, a large sum of money had been supplied by the Government and a band of observers collected, mainly from the naval and military services, who learned the use of their instruments and practised observing at the Royal Observatory, Greenwich, under the direction of Sir George Airy. In 1871, at the instigation of Mr. De La Rue, photographic observation of the Transit was added to the scheme, a further sum of money being supplied for the purpose, and later on sapper engineers, who had been trained at Chatham, and others were added to the personnel as photographers. Captain Abney (he attained the higher rank in 1873) went to Greenwich to advise and superintend the photographic part of the preparations.

The nature of the help that he gave in this work will be judged from a paper by him in the *Monthly Notices*, 34, 275, dated from Greenwich, 1874 March 7, in which he describes a method for preparing dry plates for solar photography, and their development. The pyrogallic development that Mr. De La Rue had used with much success for delineating the Sun's disc did not appear to give the sharpness of limb necessary for accurate measurements, but the albumen dry-plate process perfected by Captain Abney was said to give a fine deposit and a sharp limb free from halation with a moderate exposure, and it was decided to adopt this not only by the English but also by the German and Russian expeditions. For actual observation of the Transit, Abney joined the Egyptian party, and was stationed at Thebes with Colonel Campbell and near to Dr. Auwers of the German expedition. The report of his observations will be found in *Monthly Notices*, 35, 208. It did not anticipate that any great success would follow from measurement of the plates he exposed, though he was favoured with fine, but misty, weather, and, as was afterwards realised, the photographic part of the programme had to be regarded as a failure. The concluding paragraph of the volume recording the British observations of the Transit of Venus runs:—

"The number of images thus taken and entered was: At Thebes 83, at Rodriguez 146, at Roorkee 53. But they have not been further reduced. The ardour of the observers had been much cooled by the apparent general failure of the photographic principle, and they were unwilling to spend further time on these reductions."

It may be added that in his Report to the Board of Visitors for 1872 Sir George Airy wrote: "It is unnecessary for me to remark that our hope of success is founded entirely on our confidence in Mr. De La Rue."

Abney's reputation as a scientific investigator at this time may be inferred from an introductory remark to a paper that he read before the British Association in 1875 to the effect that he had been called upon by the War Office to undertake photometric measurements of certain magneto-electric lights. In the course of the experiments for this purpose he carried out measurements

of the actinic value of the same lights, and brought to the notice of the Society in 1875 June an instrument of the nature of a photometer called a diaphanometer, that he had designed for these determinations. The next communication by Abney (*Monthly Notices*, 1876 March) was a preliminary note on the very extensive investigation made by him of the photography of the infra-red end of the spectrum, in which he referred to methods carried out in the two previous years by Professor Vogel and Captain Waterhouse; but whereas these gentlemen had found that with a red dye the collodion was most sensitive to the red end, he, by mixing gum resins with the collodion, had obtained a compound sensitive to long wave-lengths in a greater degree. The account of his further research on this subject is to be found in the *Monthly Notices* for 1878 April, and in the Memoir published in the *Philosophical Transactions*, 171, pt. 2, p. 653, which was given as the Bakerian lecture in the year 1880, and comprises the map of the infra-red parts of the solar spectrum as photographed by him, in which the prismatic spectrum could be traced as far as wave-length 12,000 tenth-metres. By a later development he produced an emulsion of bromide of silver which was sensitive not only to red and infra-red rays, but also to the heat rays given out by bodies far below the incandescent point (*Phil. Trans.*, 1886), and he is said to have photographed a boiling kettle in a completely dark room. His treatise on photography in Longman's Text-books of Science Series appeared in 1876, and in the same year he produced a third edition of his smaller book, *Instruction in Photography*, first published in 1870, of which a seventh edition was called for in 1886. *Photography with Emulsions* appeared in 1878. A book of another kind, *Thebes and its Five Great Temples*, the outcome of his expedition to observe the Transit of Venus, appeared about the same time. Abney was elected to Fellowship of the Royal Society in 1876. He had a seat at the council table of the Royal Astronomical Society in 1875 and in 1876, and after an interval of some years was elected again in 1883. From that time forward he sat at the table continuously, except in the years 1886 and 1900, either as President, Vice-President, or Ordinary member until the year 1907. In 1877 he gave up his post at Chatham and became officially connected with the Science Department at South Kensington. He held the post of Inspector of Local Schools until 1884, when he was made Assistant Director of the Science Division under Sir John Donnelly, and on reorganisation of the Department in 1899 became Principal Assistant Secretary of the Board of Education, Secondary Branch, at South Kensington, and held the post until 1902, after which date he acted as honorary Adviser to the Board of Education (Science Department).

Of the papers communicated to our Society by Abney, a short note on 1877 March, discussing the effect of a star's rotation on its spectrum, with the conclusion that rotation would exhibit itself as a total broadening of the line consisting of a sort of double

penumbra and a black nucleus, seems to embody an idea, worthy of consideration at the present time, when idiosyncrasies of spectral lines are held to prove so much; and, writing broadly, the other communications deal mainly with points connected with the measurement of the light emitted by the heavenly bodies. One (1887 March) is an excerpt from or summary of a paper communicated to the Royal Society on the loss of light of different wave-lengths by transmission through varying thickness of atmosphere; in another (1889 March), scales of density on photographs are evaluated, whilst others deal with the scaling of wedges for photometry and points relating to the precise determination of star magnitudes by photography. Methods of determination of the comparative brightness of the corona at different parts of its surface were subjects to which Abney gave attention, and he was consulted and arranged methods for the photometric and photographic programme to be followed in the observation of eclipses. It was arranged that he should go with Mr. Lockyer and assistants as the Government Expedition to Egypt to observe the total solar eclipse of 1882 May 17, but Abney was prevented by ill-health, and his place was taken by Dr. Schuster. To observe the eclipse of the next year, 1883 May 6, Messrs. Lawrance and Woods, who had accompanied Mr. Lockyer in 1882, went to the Caroline Islands and successfully carried out a photographic programme arranged by Lockyer and Abney. As President of the Society from 1893 to 1895, he occupied the chair with dignity, occasionally diversified by sparks of quiet humour; and his second Presidential address, which was to Dr. Isaac Roberts, in the course of which he spoke of a thirty-two years' experience in every past or present photographic process that had impressed deeply on his mind the remarkable strides that the science of photography had made since he first developed a wet plate, must have been congenial.

It is not proposed to give here a detailed account of the many papers Abney contributed to the Proceedings of the Royal, the Physical, and other Societies, and to other publications, of which more than a hundred appear in the Royal Society catalogue, under either his name alone, or conjointly with that of others. These are, for the most part, on the subjects of colour and colour photometry, and a series of researches, based on the principle of Rumford's shadow photometer, in which the relative brightness of light of different wave-length was determined, made in conjunction with Major-General Festing, who was his collaborator also in other work, formed the subject of the Bakerian lecture in the year 1886 and of a memoir read before the Royal Society on 1888 May 31. The titles of books by Abney, *Colour Vision*, *Colour Measurement and Mixture* (1893), *Trichromatic Theory of Colour* (1914), are sufficiently explanatory of their contents, and indicate the energy the author exhibited in this branch of science. It is well known that Abney continually had before him the problem of photography in natural colours, and that much of the

success of the three-colour process, and of other methods of photographic reproduction, is due to his thought and experiments.

The paper before mentioned, "On Transmission of Sunlight through the Atmosphere," was the result of observations made in London, and at a height of 8000 feet on the Riffel in Switzerland, which must have been a pleasing occupation, for Abney was a keen mountaineer and frequent visitor to the Swiss mountains. A book of which he is the author, with C. D. Cunningham, *Pioneers of the Alps*, was published in 1888.

As to other personal facts, William de Wiveleslie Abney was the eldest son of Canon Abney, vicar of St. Alkmund's, Derby, and of Measham Hall, Leicestershire, and was born at Derby on 1843 July 24. He was educated at Rossall, and was gazetted Second Lieutenant R.E. in 1864. Besides the Presidency of our Society, already mentioned, he was President of the Physical Society from 1895 to 1897, and chairman of the Royal Society of Arts in 1904. He served on the Council of the Royal Society in the years 1883-85 and 1891-93, and received the Rumford Medal in 1882, a distinction which is awarded particularly to the author of a discovery on heat or light. Abney was a member of the Solar Physics Committee from its beginning in 1879, and was President of Section A at the British Association in 1889. In 1897 he was chosen to be a member of the Board of Visitors of the Royal Observatory, Greenwich, as representative of the Royal Astronomical Society, and evidently felt himself called on to exercise his special knowledge at the annual visitation. The writer of this note well remembers a short impromptu lecture on developers given on one occasion by Sir William Abney to a knot of the junior staff who chanced to be gathered near him. He was created K.C.B. in the year 1900. Sir William Abney died at Folkestone on 1920 December 2, leaving a widow, a daughter by this, his second marriage, and a son and two daughters by his first wife. An obituary note bearing testimony to his genial temperament and delightful companionship, by a sympathetic friend and comrade, Mr. A. E. H. Tutton, will be found in *Nature* for December 9.

As already stated, he was elected a Fellow of the Society on 1870 April 8.

H. P. H.

THOMAS WILLIAM BACKHOUSE was the eldest son of Thomas James Backhouse of Sunderland, where he was born on 1842 August 14. He was educated at the Grange School, Sunderland, the Friends' Boarding School, Bootham, York, and at University College, London.

For a short period he was at Backhouse's Bank, Sunderland, but except for attendance at colliery meetings in the capacity of a Director, he was not subsequently engaged in business.

For the greater part of his life he was resident at West Hendon House, Sunderland, where he had an observatory erected furnished with a  $4\frac{1}{4}$ -inch Cooke equatorial refractor.