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OBITUARY.

FREDERICK AUGUSTUS ABEL.

BY

J. SPILLER.



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## FREDERICK AUGUSTUS ABEL.

BORN JULY 17TH, 1827; DIED SEPTEMBER 6TH, 1902.

THE sudden death of Sir Frederick Abel on September 6, 1902, at his residence, Whitehall Court, London, S.W., at the age of seventy-five years, removed from the English scientific societies one of their most distinguished and energetic representatives. Almost every branch of Technical Science had been enriched by his labours, and he became in turn the active official head of many important organisations during the latter part of the last century.

Born in London on July 17th, 1827, eldest son of the late J. L. Abel, of Kennington, a music master of German descent (whose father is said to have been Court Miniature Painter to the Grand Duke of Mecklenburg Schwerin), the subject of this memoir enjoyed the advantage of home training in two languages, his mother being English. At the age of fourteen he went to Hamburg on a visit to his uncle, A. T. Abel, a mineralogist and pupil of Berzelius, and probably to this circumstance may be ascribed his leaning towards scientific pursuits. Electing to become a chemist, young Abel commenced his studies in 1844 under Dr. Ryan at the Royal Polytechnic Institution; but, not finding this course of instruction acceptable, he changed over in the following year (October 1845) to the newly-founded Royal College of Chemistry, which, starting on the approved Giessen system with a pupil of the illustrious Liebig as the Professor, offered greater advantages. Abel was one of the twenty-six original students who began work in the temporary laboratories at George Street, Hanover Square, and migrated with the Professor, Dr. A. W. Hofmann, a year later, into the specially-erected buildings in Oxford Street, of which the foundation-stone had been laid by the Prince Consort in June 1846. So apt was he as a pupil that he was speedily elected an assistant, having for colleagues E. C. Nicholson, T. H. Rowney, and C. L. Bloxam, and being joined later by Dr. David S. Price, fresh from Professor Erdmann's laboratory at Leipzig. Here he spent five more years, teaching in the laboratory and doing some original work on his own account. He likewise assisted the Professor in some of his important

early researches, *e.g.* "Volatile Organic Bases." Abel was elected a Fellow of the Chemical Society of London in 1848, and read the following papers at meetings of that body:—

1847. F. A. Abel. "Products of the Oxidation of Cumol by Nitric Acid."  
 1848. Abel and Rowney. { "Mineral Waters of Cheltenham."  
 "Water from Artesian Wells, Trafalgar Square."  
 1849. Abel and Nicholson. "On Strychnine."

In 1851, Abel left the College to become Demonstrator of Chemistry at St. Bartholomew's Hospital under Dr. John Stenhouse; and when, two years later, the post of Lecturer on Chemistry at the Royal Military Academy, Woolwich, became vacant by the retirement of Michael Faraday (who had held it since 1829), Abel applied for it and was duly elected. This was the turning-point in his career, and marked the commencement of a long period of active service at Woolwich as the Scientific Adviser to the War Office, almost immediately resulting in his definite appointment as Chemist of the War Department, with official residence at Woolwich Arsenal, about the year 1854, when all the Government resources were being strained to their utmost in preparation for the great Russian war. At this time also his scientific reputation and influence were doubtless strengthened by the joint publication of a *Handbook of Chemistry* by Abel and Bloxam, with a Preface by Dr. A. W. Hofmann (724 pages), issued from the well-known press of John Churchill, London, in 1854.\* This quickly ran through two editions, but when later a third was required, Abel, "not having leisure to devote to its preparation," as stated in the Preface, the work was reproduced in a somewhat different form by Charles L. Bloxam alone.

To enumerate the activities of the thirty-four years (1854–1888) during which Sir Frederick Abel retained his position at Woolwich Arsenal is no light task, inasmuch as it covers a period of great reforms in the Army and alterations of military equipment. The cast-iron ordnance and bronze field guns were superseded, breech-loading arms of greater precision were introduced, and new percussion fuses provided; also torpedoes, submarine mining, and blasting materials—even the black gunpowder in common use had to be changed—all demanding careful study and innumerable experiments.

The Navy also underwent a crucial change from the time-honoured "wooden walls" to iron ships and armour-plating. Chilled shot and

\* The prime motive for the appearance of this work was the want of a suitable text-book to put into the hands of the cadets studying at the Royal Military Academy, who would find the Waltham Abbey processes for the purification of saltpetre and manufacture of gunpowder fully described, together with other details of professional interest.

steel shells were introduced, and then began the interminable contest between means of attack and defence. Trials were constantly made in Woolwich Marshes and at Shoeburyness of new schemes and constructions, all of which were supervised by military committees, on which Sir Frederick Abel invariably found a place.

As juror or British representative he was sent to do duty at the Paris and Vienna Electrical Exhibitions of 1881 and 1883; also he was Chief of the Executive of the International Inventions and Music Exhibition held in London in 1885; Member of the Ordnance Select Committee; of the Royal Commission on Accidents in Coal Mines; Expert for Petroleum Legislation, Submarine Defences, and Smokeless Powders; and until cut off by death he was for many years President of the Explosives Committee.

The lamentable accident at Messrs. Prentice's Stowmarket factory brought to light a hitherto unsuspected property of gun-cotton, showing that even in the form of moist pulp, and under water, it could be fired by detonation or extreme compression. Working on this basis, and with the happy collaboration of one of his assistants, Edwin O. Brown (who devised and carried out a special series of experiments, for which he was rewarded by the Government), Abel was driven to the conclusion that his first opinion as to the cause of the Stowmarket disaster would have to be modified; and as a final outcome of this inquiry most important results followed, which were immediately put to practical use in submarine and torpedo warfare. Then, again, as to the old form of gunpowder, working with Sir Andrew Noble on grains of enormous size, "pebble powder," it was found that the rapidity of ignition and pressure under which it was fired, exerted a vast influence upon the expansive force generated, and that even the products of combustion were variable under these different conditions. The powder had therefore to be specially prepared when the huge chambers of the 81-ton gun required to be supplied with ammunition, charges of "prism powder" being the result.

From 1868 to 1875, Abel devoted much of his time to the investigation of gun-cotton, publishing his results in the *Philosophical Transactions* of the Royal Society, and delivering lectures on special points at the Royal Institution, London, and Royal Artillery Institution, Woolwich. He was elected President of the Chemical Society for 1875-7, and during the tenure of this office he invited the Fellows to Woolwich on March 14, 1876, to witness a series of practical demonstrations in the Royal Arsenal. About four hundred members attended, and they were favoured with an ever-memorable programme of great scientific interest. Two rounds were fired from the 81-ton gun, called at that time "The Woolwich Infant." A grand series of gun-cotton experiments were displayed, showing the extraordinary difference in the

destructive effects according to the mode of ignition and confinement of the charges—sometimes burning slowly away or, if detonated, exploding with terrific violence. Torpedoes were launched in the Military Canal; the 40-ton steam-forging hammer was set in action, and the whole of the workshops and gun factories were open for inspection.

In September 1877, Abel was President of Section B (Chemistry) at the Plymouth meeting of the British Association; in 1881 and 1882, President of the Institute of Chemistry. The following year, 1883, he succeeded Sir Henry Roscoe as President of the Society of Chemical Industry, served at the Vienna Exhibition, as already mentioned, and was knighted. Then we find him busy on "Dangerous Dusts," Steel Testing, Nitro-Glycerine and Cordite, and helping the cause of Technical Education whilst on the governing body of the City and Guilds of London Institute and as Prime Warden of the Goldsmiths' Company; filling up his time by serving as Chairman of the Society of Arts, and President of the Institution of Electrical Engineers; Member of the Board of Managers, Royal Institution, and of the Council of the Royal Academy of Music. He was also Chairman of the British Committee in promotion of the Hofmann Testimonial, 1888, which added a considerable sum—about £270—to the International Fund.

Another subject upon which Sir F. A. Abel was consulted took the form of a reference touching the safety of Petroleum for storage and use as an illuminant in domestic lamps. In 1868, investigations led to the adoption of an Open-Test apparatus with the limit of 100° F. as "flash point"; but it was found later that more precise results could be obtained by the use of Abel's Close-Test apparatus and substitution of 73° F. (instead of 100°). This standard was legalised in 1879, and has ever since been adopted.

Somewhat akin to the above was an experimental inquiry undertaken at the request of the Home Office, 1880, into the question of Colliery Explosions and the influence of Coal-dust as one of the causes. The report was presented in June 1881, and went to show that the finely-divided particles suspended in air were a source of danger similar to that occasionally experienced in flour-mills. A lecture was delivered at the Royal Institution in April 1882 on "Dangerous Dusts," in which, after reviewing the Reports of Faraday and Lyell, 1845; Rankin and Macadam, 1872 (referring to the lamentable accident at the Tradeston Flour Mills, Glasgow, when several persons were killed), and to the later report of Marreco and Morison on Coal-dust dangers at Seaham Colliery, Durham, Sir Frederick Abel described his own experimental results, and pointed to the fact that, although a mixture of two or three per cent. of fire-damp with air was not itself inflammable, it became explosive, or "a carrier of flame," as

soon as the particles of coal-dust were diffused through such an atmosphere, as the consequence, for instance, of using the ordinary gunpowder-blast for dislodging masses of coal. The merits of the quicklime system of mining, and of the dynamite and water-blast were discussed.

In 1883, Sir F. A. Abel was elected an Honorary Member of the Institution of Mechanical Engineers, in recognition of his having undertaken for their Research Committee on the Hardening of Steel a series of experiments on the condition in which the carbon exists in that metal. The isolation of the carbide,  $\text{Fe}_3\text{C}$ , believed to be dissolved throughout the steel, was held to be a step to the elucidation of this subject; but it remained for the late Sir W. Roberts-Austen to put the finishing touch to this inquiry by attacking the problem from the physical side. The subject of steel, and the influence of small additions of other metallic elements, such as manganese, nickel, cobalt, chromium, and aluminium, was referred to at Leeds in 1890, when Sir Frederick Abel was President of the British Association for the Advancement of Science, and again in the following year, when he was President of the Iron and Steel Institute.

It had been decided to commemorate the Jubilee of Her Majesty Queen Victoria's reign by the erection of a grand edifice at South Kensington, which was to be devoted to a permanent exhibition of the natural products and articles of commerce obtainable from India and the British Colonies. The Museum was to be a centre of inquiry and conference between merchants and manufacturers of the Empire. Imperfectly-known substances were to be brought to their proper uses and turned to profitable account; some ores and drugs might require to be analysed, or made the subject of research, for which a trained scientific staff and suitable laboratories were provided. Sir Frederick Abel was appointed the Organising Secretary, and for fourteen years he devoted himself to this work (1887 to 1901), ceasing from his labours only when the perfected scheme was placed under the direction of the Board of Trade, and part of the surplus buildings devoted to the needs of the London University.

Blest with good health and indomitable perseverance, Abel succeeded in accomplishing an amount of work—and that of a nature sometimes attended with personal risk—which would have appalled many a scientific professor placed in similar circumstances. It is not surprising that honours fell fast upon him both by Royal patronage and University preferment. He was made a Companion of the Bath in 1877, and promoted to Knight Commander of this Order in 1891; knighted in 1883, and made a Baronet in 1893 (after the opening of the Imperial Institute), while in 1901 he was created a Knight Grand Cross of the Victorian Order. Oxford conferred its D.C.L. in 1883,

and Cambridge its D.Sc. in 1888. He held the Albert, the Royal, and the Telford Medals, also the Bessemer Gold Medal, 1897. As already stated, he was made successively President of many of the learned Societies and Honorary Life Member of others.

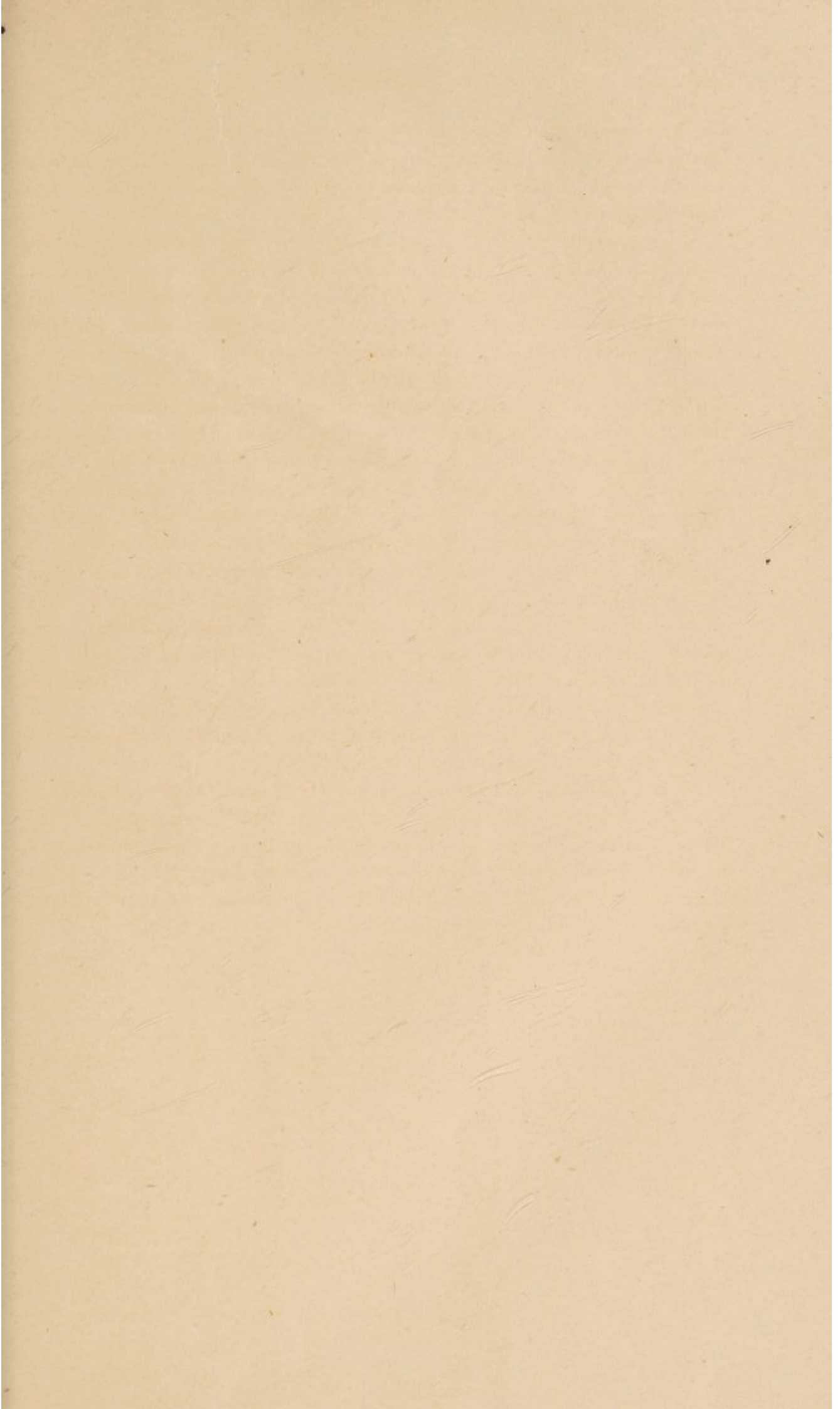
Sir Frederick Abel was one of the six Past Presidents of the Chemical Society, "who had accomplished their Jubilee as Fellows," in whose honour a Banquet was given in London on November 11, 1898, at the Whitehall Rooms. There were to have been seven, but Lord Playfair died while the preliminary arrangements were being made, and the Festival was consequently postponed from an earlier date (June 9th). Of these six or seven distinguished men only Professor Odling survives. The chair was taken by Professor Sir James Dewar, and an illustrious company assembled, including Dr. H. T. Böttinger, Professor W. Ostwald, Lord Lister, P.R.S., Lord Chief Justice Alverstone, several statesmen and heads of scientific departments, together with about two hundred and fifty Fellows of the Chemical Society.


Socially, the late Sir F. A. Abel was doubly acceptable on account of his splendid musical talents. Not a vocalist himself, he was ever ready to play the accompaniments, and even train a band of singers, besides giving exquisite performances on the grand pianoforte at many of the earlier dinners and festivities of the Chemical Societies. To hear his rendering of "William Tell," "Oberon," "Der Freischütz," "Tannhäuser," and other choice operatic selections, generally played without music score, was always a great artistic treat.

As to Clubs, he was a member of the Athenæum, the Savage, and the Garrick, and in former times one of the prominent members of "The Bees"—a small fraternity of chemical students (chiefly Hofmann's pupils) to whose meetings Abel used to take his zither.

Sir Frederick was twice married, but died a widower without children. The Baronetcy is therefore extinct.

J. SPILLER.





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