

H J Josephs 233 pp

E² Emma Edwards

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ISOLATION

The isolation of Oliver Heaviside was not entirely bad. If he had been a member of a large research organisation he would have been subjected to conventional discipline. He would not have been allowed to choose his own giant theme. Moreover, he would not have been allowed to choose his own giant theme. He would have to accept the problems ~~given to~~ given to him by his superiors. Also the standards of the organisation would have been applied to his work.

Under these organised conditions Oliver Heaviside would have felt that was holding his own brain only in commendam as a medieval ~~vassal~~ vassal held his fiefs. Oliver was too ~~out~~ independent a person to be an intellectual ~~thief~~ lachey and clock-puncher. He believed that great discoveries are not made by massing
→ P 53 the machinery of research. They depend on the original, unconventional individual; the man

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with a flame in his mind. He felt that he was such a man.

The leaders of scientific research in the eighteenth-seventies had much of the psychology of heroes. They were the kings of the intellectual world. It was not necessary for them to submit their work to the criticism of the intellectual democracy. They could afford to ignore what was happening outside their particular academic circle. Some of them believed betwixt that mathematical science was far superior to experimental science. They stated that theoretical deductions gave greater mental satisfaction than experimental discoveries. Their belief undoubtedly contributed to the immense prestige of ~~some~~ certain mathematicians of that period.

Oliver Heaviside was quick to attack the belief. He stated categorically that,

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"Physics is above mathematics, and the slave must be trained to work to suit the master's convenience."

...

Oliver Heaviside was never popular with mathematicians."

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Mr. Preece rejected this (PH & OH) work contemporarily Thus the Heaviside paper was never published."

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There was the most complete possible antagonism between Oliver's views and official views, both in principle and in detail, and a careful consideration and discussion of the matter was desirable. Yet Oliver found it next to impossible to ventilate the matter. All the normal channels of communication were being closed to him.

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UNPUBLISHED WORK

The first volume of Oliver Heaviside's great work 'Electromagnetic Theory' was published in 1893 and the second volume in 1899. In the Preface to the first edition of the third volume, Oliver stated it had been his intention (if circumstances had been favourable) to publish the third volume in 1904 and the fourth in 1910. But circumstances had not been favourable, and the third volume was not published until 1912. While the fourth and concluding volume was never published.

When Oliver found his plan to finish 'Electromagnetic Theory' in 1910 would not be realized, he rearranged his third volume and included certain parts of the fourth volume as originally projected. He then attacked new problems he intended to discuss in his revised fourth volume.

In 1913, in a letter to Dr. Searle, Oliver wrote, 'I am trying to get on with Vol. 4 of E.M.T. It is a question of health and freedom from disturbance and petty worries It is slow work for an old man in any case.' In 1914 the first world war came and with it additional hardship for Oliver. Nevertheless, in 1916 the complete manuscript (except for one small item) was practically ready for publication.

Dr. L. Silberstein and the publishers, Messrs. Taylor and Francis, were anxious that Volume 4 should be published in this country. They suggested that it should first appear in the form of serial articles in the Philosophical Magazine. In this way they helped to meet Oliver's complaint that '..... others are publishing work I have in Vol. 4 of E.M.T.' Early in 1917, Dr. Silberstein wrote to Oliver and offered to see Volume 4 through the press for him, or do any mathematical work that might accelerate the publication. In his letter of thanks Oliver said he had recently decided to rewrite a small part of the section on 'Interference', and consequently was not yet ready to hand over the manuscript. And with regard to the offer of mathematical help he underlined the words '.... no one can do this work save myself.'

After the completion of the manuscript Oliver asked Dr. Silberstein to get the publishers to give him an advance payment of £1,000. But potential publishers would not meet this demand, and consequently Volume 4 was not published here.

In the summer of 1918 Oliver was in touch with Dr. B. A. Behrend of Boston, Mass., with a view to the publication of Volume 4 in America. From the tattered scraps of old letters now in the possession of the I.E.E. it appeared that Dr. Behrend tried hard to find a publisher who would agree to Oliver's demand for £1,000 payment in advance. It is possible, therefore, that Oliver sent one of the two copies of the manuscript to Dr. Behrend.

In 1921, Dr. G. A. Campbell sent a letter to Dr. F. B. Jewett (who was then staying with Sir Frank Gill in England) in which he said he had asked Mr. C.E. Spiers, vice-president of the D. Van Nostrand Co. (American publishers of the first three volumes of 'Electromagnetic Theory'), for the approximate cost of publishing Volume 4. Mr. Spiers told him that Heaviside's books did not pay and were not expected to do so.

On 3rd February, 1925, Oliver Heaviside died at the Mount Stuart Nursing Home in Bury. Shortly after the radio announcement of his death that evening, his house 'Rosefield' was burgled. And it is possible that Oliver's own copy of the finished manuscript upon which he had laboured for over twenty years was stolen. It was found possible to reconstruct some of the features of Oliver's fourth volume from the scattered notes that the burglars left behind.

In 1927 many of Oliver's books, papers and medals were bought by the I.E.E. for the moderate sum of £120. The manuscript of Volume 4 was not included in this collection but mathematical notes revealed the existence of many new and significant theorems that Oliver may have developed and included in the manuscript of Volume 4.

In 1933 the books and papers of Oliver Heaviside gathered by Dr. Behrend in America were exhibited at the Massachusetts Institute of Technology by Mrs. Behrend. This exhibition included a number of Oliver's letters and other memorabilia. But the prepared manuscript of Volume 4 was not in the exhibition. In 1936, Mrs. Behrend presented this collection to the I.E.E.

At the start of the second world war in 1939 the question of finding safe protection for the Heaviside Collection arose. The Collection was divided: some of

the books and papers were stored in the vaults of a London bank, while others were stored in the cellars of a house in North Wales. After nearly five years in storage the books and papers were returned to the I.E.E. in 1945. Most of the unpublished work was in the Welsh consignment which was, unfortunately, much damaged by water during transit.

In the spring of 1949 Dr. W. G. Radley suggested that if a thorough search failed to locate the manuscript of Volume 4, an attempt should be made to reconstruct some of its features from the unpublished notes. And that these features could then be described in the 'Heaviside Centenary Volume' and published by the I.E.E. in 1950.

A thorough search failed to locate the manuscript. This search included the archives of the Massachusetts Institute of Technology. Dr. J. A. Stratton, the Provost, could find no evidence that this manuscript was ever at the Institute. The results of this search gave little hope of ever being able to find Volume 4. But in the summer of 1949 a manuscript draft of a substantial part of Oliver's intended

~~manuscript~~ was discovered.

The unearthed documents, however, were in very bad shape. They were in a decayed condition and covered with mud, soot and mildew. Also they were firmly stuck together and any attempt to separate them made them fall to pieces. By very careful physical and chemical treatment the tattered documents were restored and made legible by Mrs. B. A. Turner.

A study of these documents showed clearly that Oliver's views on the nature of the interaction of matter and energy changed after 1905. They show his desire to discover how electrons are made and what goes on in the inside of atoms. After deducing the relationship between mass and energy from Maxwell's pressure of radiation formula, Oliver appears to have rejected the Maxwell-Faraday interpretation of electrical phenomena as a series of stresses in a continuous medium, and to have modified some of his ideas concerning the fundamental principles of ponderable matter.

Problems connected with the fact that mass and energy are inseparable were found. It appears that Oliver formulated a system of non-Newtonian mechanics in

which mass is a function of velocity. He then applied his system to the calculation of the characteristics of moving electrons. These calculations led him to postulate the existence of lower limits in the division of space and time, these limits being conditioned upon the presence of energy.

The unpublished work also showed that Oliver was beginning to think in terms of statistical discontinuity in nature. His new outlook was clear in his calculations of the atomic or particle-like structure of electromagnetic pulses. These calculations were based upon the extension of his theory of energy-tubes (produced by the superposition of electric and magnetic fields) to include their contraction and condensation into sub-atomic particles. Many years may pass before the great merit of this manuscript is appreciated. But sooner or later the work **of interpretation will be done.** Then the reputation of Oliver Heaviside, great as it now is, will become yet greater.

History under the floorboards 621.3.011

An account of the recent discovery of some Heaviside papers

The unique series of Heaviside manuscripts, which with Heaviside's books forms one of the treasured special collections of the Institution Library, was acquired from his family in 1927, after Heaviside's death. Examination showed, however, that there were gaps in the sequence of papers, and widespread inquiries were made. Towards the end of 1957, three sackfuls of manuscripts, galley proofs and other papers were discovered under floorboards in the house where Oliver Heaviside lived in Paignton, Devon. The author of this article was concerned in sorting the documents, and an Institution Monograph (319) entitled 'The Heaviside papers found at Paignton in 1957', by Mr. Josephs, is published this month (see p. 45). The author is at the Post Office Research Station.

H. J. JOSEPHS, MEMBER

ON the 9th November 1957, Sir Edward Appleton received a letter which began 'I have a sackful of Oliver Heaviside's papers in my garage . . .'. Mr. Harold Saunders, the writer of this letter, who is a chemistry master at a school near Bude, Cornwall, went on to describe his discovery.

Sir Edward Appleton, who at once realized the significance of the find, replied immediately 'I was naturally both excited and delighted by your news . . .' and referred the correspondence to The Institution, who asked Mr. Saunders for permission to send a couple of representatives to Bude to make a preliminary survey of the documents.

Meanwhile Mr. Saunders had started to sort the papers, and on the 23rd November he wrote:

A first inventory of the collection runs like this:

All the papers, dated by their associated envelopes, are between 1892 and 1898.

There are about 2000 sheets of manuscript notes, and they are all reasonably legible, even the worst of them.

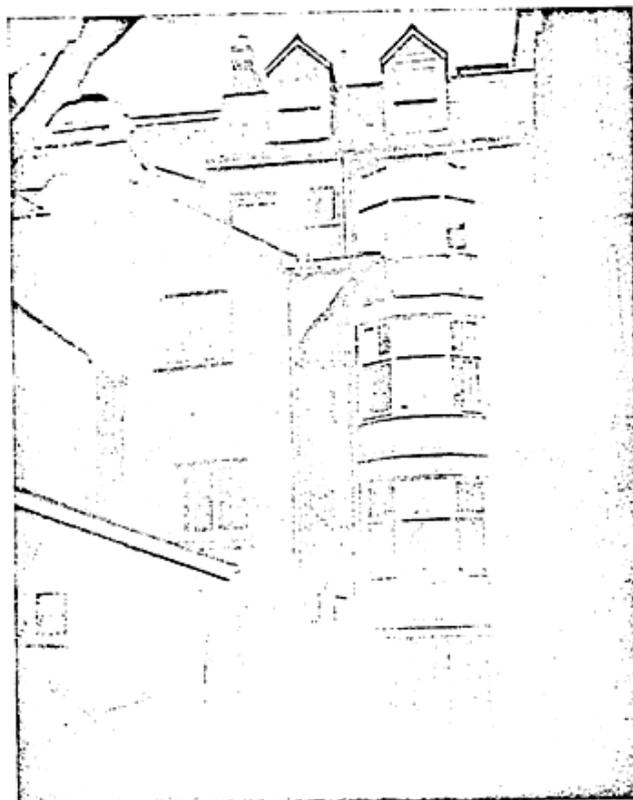
There are practically no private papers.

Every foreign envelope has had its stamp removed.

Every envelope from a British source is empty, with the exception of those containing advertisements.

The find

Mr. Saunders received the representatives and gave them every possible help. He had discovered the papers



The house in Paignton where Oliver Heaviside lived from 1889 to 1897 and where the papers were found

while he and his wife were paying a visit in Paignton, Devon, to their friends Mr. and Mrs. Howard. Mr. Howard had recently been appointed manager of the Paignton branch of Barclays Bank, and his wife, knowing of Mr. Saunders's interest in scientific matters, remarked that a scientist used to live in the house now owned by the bank. Mr. Saunders inquired his name. 'Heaviside' he was told; and his friend explained that there were many of his papers under the floorboards in the attic and that some of the papers could be seen through the spaces between the boards. Mr. Saunders was immediately interested. Continuing the story in his own words:

The following morning I pulled up one of the floorboards and the truth of the statement was confirmed. The papers were almost exclusively in Heaviside's handwriting. They were written on the backs of bills, mainly from music publishers or musical-instrument makers. There were galley proofs of his books and