R.S.R.S. Newsletter

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Michael Faraday

The 25th August 1967 will be the centenary of the death of Michael Faraday. It is a measure of his greatness that many in the present age can visualise the true power of his mind even more fully than did his contemporaries. The radical nature of his thoughts seem to us, on occasion, to outstrip the vocabulary of the mid-nineteenth century. Faraday himself attempted to remedy this defect and, in consultation with Nicholl and the omniscient William Whewell, produced the terminology now familiar to all.

Try to describe, in concise terms, basic electrical processes, without using the words ion, electrolyte, anode, cathode, electrode etc. Faraday had to visualise the processes themselves and to grasp the significance of his experimental data in terms of an underlying unity in electric, magnetic and optical phenomena - a unity only suspected by many brilliant contemporaries, but, it would seem, never doubted by the man himself. The Prince of Experimenters was a title conferred upon him by the Victorians; now it does not seem too much to describe him as an Emperor among Natural Philosophers who established his right to rule on the basis of revolution. This revolution was one of physical theory generated, sustained and developed by Faraday so as to enfold the results of experiments of great power and simplicity. A combination of Lazare Carnot and Napoleon might be the military equivalent though the latter, at any rate, makes an odious comparison in terms of motives and morals.

The son of a blacksmith living in London, Faraday had a background of financial poverty, though it was rich in family affection within the atmosphere of firm though cheerful piety of the Sandemanian Church, a non-conformist sect of which he was a life-long member. His formal education was, in his own words, 'of the most ordinary description, consisting of little more than the rudiments of reading writing and arithmetic at a common day-school'.

At the age of fourteen he was errand boy to Mr. Riebau, a bookseller of Blandford Street and later was apprenticed to him to learn bookbinding. This was a fortunate situation, Riebau was a good master and, whilst training the boy well, allowed him to read whatever might be of interest among books that came in for sale or binding.

Self-improvement did not come in with Queen Victoria, thirty years before her accession this gifted apprentice arranged a study-programme based upon Dr. Isaac Watts 'Improvement of the Mind' and the well-demonstrated scientific lectures of a Mr. Tatum. Of all the books he read, Mme. Marcet's 'Conversations on Chemistry' was most valuable to the young Faraday; it was up-to-date and told him of Humphry Davy's recent electrochemical discoveries, opening his eyes to the possibility of electricity as a means of explaining diverse chemical phenomena. Finally he contrived to hear Davy himself lecture. During all these years he was served in a tutorial capacity by conversations and letters exchanged with better-educated contemporaries, particularly with Benjamin Abbott, a well-educated clerk who became a life-long friend. With this help and first-class natural critical and analytical faculty, Faraday was probably better placed to derive benefit from Davy's lectures than were many nominally better schooled contemporaries. He resolved to work at the Royal Institution and eventually obtained a post as laboratory assistant to replace a certain William Payne who was thrown out for brawling. Let us hope Mr. Payne settled down happily elsewhere, we owe much to the bellicose habits of his youth.

Soon after his appointment to the Royal Institution Faraday saw something of Europe in company with Davy and Lady Davy. His position carried rather anomalous social status, a sort of amateur valet and professional assistant to Davy and he was not very happy about this, particularly since Lady Davy lost no opportunity of treating him de haut en bas. Still he did see Europe and met some of the leading scientists there. Eventually the party returned to England and duties at the Royal Institution were resumed. From then onward Faraday progressed, though not always smoothly; it was difficult for Davy to realise that the very intelligent and able young man he had helped, was going to be even more than a first-rate second-in-command. Did not this position itself constitute an unimaginable advancement for a self-educated bookbinder?

Initially it was not in physics that reputation came. Old books can be found which refer to 'Mr. Faraday the well-known chemist' and he was well on the way to earning substantial fees as a consultant; work he later gave up, at considerable financial loss, to have more time to devote to pure research. At about this time he married Sarah Barnard, the sister of a friend of his. This happy union lasted some forty years, until his death. A photograph taken late in life shows a rather quaint old lady, in fact she seems to have been a companionable, spirited woman of good general education with no pretensions to science or 'intellectualism' and she was an ideal wife for him. The Barnard and Faraday families were all good friends, the young Barnard children forming, as it were, the family for the childless Michael and Sarah.

From the late 1820's onward, Faraday, now a Fellow of the Royal Society, became more and more concerned with the investigation of electromagnetic phenomena, culminating in 1831 with his great work on induction. Over the years he had come to support theories which were decidedly unconventional, the chief of these being to reject 'Action at a distance', wrongly attributed to Newton, which required that one body exerting a force upon a distant body did so instantaneously and without affecting the space between them, and to adopt Boscovitch's hypothesis which rejected the Daltonian billiard-ball atomic concept and replaced it with the idea of atoms as point centres of force.

From his electromagnetic discoveries and with this background, Faraday constructed the foundation of an electromagnetic field theory involving the idea of curved lines of force and a finite transmission time for the force across a space which was, in some strange way, modified by the presence of the field. These ideas went much against conventional theories which had performed sterling work in the hands of such giants as Laplace, Poisson, Ampere and Coulomb. Qualified support for the new ideas came from Kelvin, but later on another brilliant young worker read of them with deep interest - James Clerk Maxwell.

Whilst elaborating his theories and experimenting, there was much other work to be done. The Royal Institution Friday Evening Discourses were inaugurated and Faraday, who had carefully developed his lecturing talents as a youth, was the main attraction with his excellent clear style and first-class demonstrations in which he was aided by his only full-time assistant, an old solider, Sergeant Anderson, who remained with Faraday and the Royal Institution all his life.

In earlier years work had been done on the nature of steels, optical glass and mysterious residues in bottled fuel gas in which Faraday discovered a new compound, Benzene. He contributed to knowledge of the liquefaction of gases and to what later became known as the colloidal state. The glass investigation yielded extra dividends in that it provided a suitable medium to demonstrate the rotation of the plane of polarisation of light by a magnetic field, a fact which had been suspected as a result of his ideas concerning light as an electro-magnetic disturbance. Para and dia-magnetism also was discovered and investigated.

Throughout all the years of his work Faraday retained robust physical health; he thought little of a walk of thirty miles and Sarah only became alarmed on one occasion when at the age of fifty he covered a distance of fifty miles in one of his rambles! Unfortunately his mental health was less tough. He had always regarded his memory as poor and in his days of self-improvement had gone to great lengths to better it. Nonetheless, as years passed he had recurrent intervals when he could retain little or nothing in his memory and felt giddy and confused. In this state, rest was a great help and after a spell of enforced idleness he would return to work with vigour and power of mind almost unabated. From his mid-sixties onwards, however, memory lapses increased and it became evident to all, himself included, that lack of co-ordination would force him to give up his famous lectures and demonstrations at the Royal Institution.

On 20th June 1862 he delivered his last lecture and resigned from those duties, going to live at a pleasant grace and favour house near Hampton Court which had been made available to him since 1858. In 1865 he resigned from the Royal Institution and sank into quiet senility for the remaining two years of his life. There were moments of clarity, but in general he just sat staring into space. A visitor called to question him on his work on colloidal gold; he could elicit no answer save the remark 'Oh yes...be utiful gold....' in a feeble voice. The volcano was extinct. Faraday remained thus calm and peaceful and one day, sitting in his chair, sleep passed gently into death.

His influence on physics was enormous. Through the mathematical work of Maxwell, who knew him well in later years, his new ideas about electro-magnetism were developed, elaborated and communicated to more conventionally educated men of science who could not always grasp his peculiarly personal way of expressing his advanced ideas. Indeed some of the more extraordinary implications of Maxwell's Dynamical Theory of the Electromagnetic Field had to wait for almost twenty years after Faraday's death before the work of Hertz furnished experimental proof convincing to all. There is some evidence that in the mid-nineteenth century, he was dimly groping towards field theory concepts more in keeping with thoughts of later generations. We cannot know, but at least one eminent authority on Faraday (L. Pearce Williams) feels that to be the case. There just wasn't the vocabulary to express what was hovering in his mind.

Had Faraday never lived, the phenomena he observed would have been found by other workers; indeed Joseph Henry in the U.S.A. was well advanced and in some respects slightly ahead of him in work on induction. Despite this, it is in the unravelling, following up and unifying of the diverse experimental results; in the creation of a unified science of electro-magnetism and optics and in its setting out as a broad foundation for later men to build on that is made manifest the particular genius of Michael Faraday.

G. W. Gardiner

Get Me an Estimate .....

"Britain needs a progressive industry, and dynamic salesmanship" (Chairman I.C.I.)

"It says here that Ellisons are agents for Rhomandl now", I said, "It used to be Waverley Electric." "No harm in trying 'em", said Jock. "Elstree 5096". I dialled. The ringing tone went on for a very long time ..... Eventually - " 'Ello", said a tired female voice. " 'Ello", I said, "Ellisons?" "Yes", it said. "May I speak to your Sales Department please?" "Wot department?" "Sales", I said. "Yes, so you said, but wot of?" "I want to make enquiries about Rhomandl equipment". There was a pause. "About wot?" it said.

"Rhomandl equipment". Another pause. "Can you spell it?". "R-H-O-M-A-N-D-L", I said. "No", said the voice, judicially. "But I have their catalogue with your name on it". "Oh!" (Pause) " 'Ang on - I'll make enquiries". The line went dead for four minutes. "Are you still there?" said the voice. "Yes", I said. "I'm putting' you through to our Sales Department" I waited for two minutes. "Hello", said a new voice. "Hello", I said, "I would like to make some enquiries about Rhomandl equipment, please". There was a pause. "Would you mind spelling it, please?". "Not at all", I said, "R-H-O-M-A-N-D-L". "Funny name", said the voice critically; "Sounds German". "It is", I said. "Hold the line please". There was a further wait of four minutes. "Hello" said the voice. "Yes?" I said. "Apparently we do deal with it, but I'm not sure which department has it. Would you mind continuing to hold on?" "With pleasure", I said, reaching for a cigarette. A further wait of three minutes. "Hello", said the voice breathlessly. "Welcome back", I said. "Sorry", said the voice, "but I find we don't deal with it ourselves - only through one of our subsidiaries, but now we can't find their address or telephone number. Could you hold a little longer?" "I might as well", I said, "now we've got so far". I put my feet up on a chair.

"Hello", said the voice. "Yes?" I said. "Well, it's something like Aveney Electronics, but I'm terribly sorry we just can't lay our hands on their address or telephone number. Ha! Ha! You must think we're terribly inefficient!" "I wouldn't have said that, exactly", I said, - "I suppose it wouldn't be Waverley Electric, by any chance?" "Just a moment - I'll see". I lit another cigarette.

"Hello", said the voice. "Any luck?" I said. "Well no, - I mean its something like that, but we just can't find it. I'm terribly sorry". "Thank you", I said, "I'll ring them and see". I rang Healtham 4096. "Hello?", said a voice. "Waverley Electric?" I said. "Yes" said the voice. "Are you still the agents for Rhomandl equipment? " I said. "How do you spell it?", said the voice. "R-H-O-M-A-N-D-L". "Just one moment please".

"Hello?", said a new voice. "Good afternoon, I think it is", I said; "Are you still the agents for Rhomandl?" "We are indeed". "Thank God!", I said, "I want to know the price of their Marine Radar, type SZOK 18". "Who did you say you were?", said the voice. "Radio and Space Research, Slough", I said. There was a pause. "You've got some ships then?", said the voice. "No", I said, "they're all in use on the Brain Drain". "Ha-ha!", said the voice, "then you don't want a marine radar - really - do you!" "Well - yes, I do", I said, "It's one way of getting a cheap Y-band radar". "Yes", said the voice, in the tone one uses to impoverished relatives, "I'm afraid we don't deal with it here. You want Navigational Aids- Greenwich 3096". "Thank you", I said, but the line was already dead.

I rang Greenwich 3096. "Hello", said a voice. "Waverley Electric?" "Uh-huh", said the voice. "I'm making enquiries about Rhomandl Marine Radar, type SZOK 18", I said. "Radar?", said the voice. "That's right", I said. "We don't deal with Radar here", said the voice, "only Nav. Aids." "Isn't radar a nav. aid, then?", I said. "Opinion", said the voice sententiously, "is divided. And we don't deal with it now. You want Ellisons - Elstree 5096". I rang Ellisons. The ringing tone went on for a very long time ..... " 'Ello", said a tired female voice. "I'm back", I said "Could I speak to your Sales Department again about Rhomandl equipment?" "Oh, it's you". Pause.

"Hello", said a familiar voice, "I rang you a little while ago about Rhomandl" I said. "So you did", said the voice, "Any luck?" "Yes and no", I said. "Waverley do Rhomandl gear, but not Radar. They say that you deal with radar at Ellisons". "Oh! I didn't know you meant Radar! We do deal with that but not here. You want one of our subsidiaries - if you hang on a minute I can give you their address and telephone number ....."

F.V.B.

"To Whom ....."

So you think the world's yours, you poor little man,
With your pencil and paper and slide-rule in hand,
Your bombs and your rockets that never can miss -
How could I ever explain the warmth of a kiss?
And your puny electrons that whizz round and round,
The cry of young children? Your ears hear no sound.
Your eyes you were given so that you might see,
Yet you turn them away 'n' let suffering be.
So long as it's others and never your own,
You're up in the morning, by evening you're home,
You think your salvation is well within sight,
Because you did nothing, you think you did right.
With all of your power, d'you think you can stand,
On the edge of Life's doorway, while the last grain of sand,
Falls through the glass, as Death's lancet sting,
Strikes deep in your bosom and reveals everything?
D'you think then my friend you can give all the answers,
With plasmas and protons and satellite passes?

R.D.M.

The following letter in the New Scientist of 27th July 1967 may be of interest to readers:-

Sir,

I have been asked by Lady Appleton to write the life of Sir Edward Appleton, and would be most grateful to hear from any of your readers who have letters or other material bearing on his life and work; or who have reminiscences of Sir Edward.

Ronald W. Clark,
10, Campden Street,
Kensington, London, W.8.

Staff News

Congratulations to:

John and Eileen Pearson on the birth of their daughter Rebecca Jane.

Chris. and Pat Martin on the birth of their son.

Mike and Maureen Bethell (Maureen Armstrong) on the birth of their son Stuart Alexander.

Welcome to:

C. E. F. Brant	Non-Perm. S.A.
Mrs R. H. Bigland	Non-Perm. Personal Secretary
C. P. Kerr	Non-Perm. C.O.
K. Feldmesser	Non-Perm. E.O.

Resignations

Foo C. L.	Non-Perm. Tech. Officer (Singapore)
P. R. Thornton	Non-Perm. A.E.O.
A. C. Soopee	Perm. A.E.O.
Mrs K. Gourlay	Temp. Personal Secretary
Mrs C. E. Place	Non-Perm. C.O.
Miss T. A. M. Richens	Perm. S.O.
R. B. Haines	Perm. A.E.O.
M. D. Austin	Temp. A.E.O.
R. G. Flavell	Perm. E.O. (Lerwick)
Mrs B. M. Practor	Non-Perm. Cook

Sports and Social Club News

Return Sports Evening with the A.C.O.

On the 27th July, R.S.R.S. sportsmen (and women) of varying skills, gathered in the sinister but picturesque grounds of the Admiralty Compass Observatory, to join in the battle (in a friendly sort of way) against our neighbours who work on the other side of the moat.

The disappointingly dull evening did not affect the vigour of activity, and after the strife was over the scores came out as follows.

Cricket R.S.R.S. won by 25 runs.

Tennis After a very close struggle, A.C.O. won by 5 sets to 4. The last few sets were played in semi-darkness and the gain or loss of a few points could have swayed the score.

Table Tennis R.S.R.S. won 3 - 0.

Darts I was dragged in to play at the last minute by a drunken colleague - but we still won 2 - 1.

Bowls A.C.O. won 24-9

The evening's sport over, we all retired for beer and "butties", kindly made available in the pleasant and roomy bar.

Our thanks are due to our hosts, the A.C.O., who enabled us to have such an enjoyable evening.

Bob Slater

Tramps' Ball

During the past weeks vast changes in the 'decor' of the Old Building have been taking place. For staff who have not yet observed, two panels dividing the table-tennis room and bar have been removed to create a longer area. A bright array of new red curtaining has been hung and old chairs have taken on a 'get with it '67 look' by the addition of a coat of paint.

You may well ask why the sudden changes? The occasion, a 'Tramps Ball', being held Saturday 23rd September 7.30 p.m. The first of many coming social events to take place in the new atmosphere of the Old Building.

'Tramps' will be dancing to the music of the Merrydown Jump Band. Staff are asked to obtain their ticket (6/- per head, inclusive of supper) from members of the Sports and Social Committee. Not to be forgotten attractions - KEG BITTER and a prize for the best dressed Tramp. Remember and make it a date.

Maureen Stacey
(on behalf of the i
Committee)

P.S. No Respectable People admitted!

Cricket

On July 19th we played a second match against the Met. Office Experimental Station. R.S.R.S batted first and scored 105 for the loss of eight wickets in fifteen overs, thanks mainly to a fine half-century by May (53). The visitors scored 71 for 9, with Lane and Moosagee taking three wickets each.

In the return match against A.C.O. on 27th July, R.S.R.S. scored 93 -5 in fifteen overs, our most successful batsmen being Hopkins (21) and May (45 n.o.) A.C.O. replied with 68 - 3, so we were able to avenge our previous defeat at home.

Several matches have been cancelled recently due to rain or lack of support, and our next match is against I.C.I. (away) on August 24th.

Graham Thomas

What is your "Fog Index"?

Some recent issues of the R.S.R.S. News have contained references to the "readability" of scientific reports. A quantitative measure of this property is now available. In his book, "Writing Technical Reports", (Penguin Books, Ltd. 3/6), B. M. Cooper defines a Fog Index thus:-

F.I. = (Average number of words per sentence + percentage of words of three syllables or more) x 0.4

A Fog Index of 12 is the danger point. Tests on R.S.R.S. publications selected at random have shown values in the range 15-20. Try it out on your own "magnum opus"!

Pea-Souper

Poetry

The Editor is grateful for the poems received; but, owing to limitations of space available, asks for no further contributions of this type until the present collection has appeared in coming Newsletters. Then readers will again be invited to submit their writings.

Letter to the Outstations

Some of you may wonder how we progress to 1905, not the Edwardian date in the past, but the I.C.T. 1905 computer installation date in the future. It cannot honestly be said that the tumult of rebuilding has completely died down, nevertheless we may give thanks that pneumatic drills have ceased to drill and that sharp reports from an explosive nail driver, reminiscent of a humane killer in a knacker's yard, no longer set ringing the heads of startled passers-by.

Dust remains, though abating slowly, and we are permitted faint visions of future delights in the sight of a sort of perforated white metal ceiling now nearly finished and hiding the screening and support work in position above it. All very smooth and scientific it looks, I'm sure.

Nothing is usually written about resignations until the formal notice appears, but its good for the soul to ignore the rules occasionally. This month a worthy excuse for this exists in telling you of the coming retirement of Mr. Curtis, who has played his part in research at the Station for over thirty years. During this time he has been associated with many and various experiments and has recollections of many scientists including those of the stature of

Appleton and his co-workers.

Compared with thirty years' service the writer is a new boy and claims the lad's right to impertinence, for having asked no-one I speak for all in saying that we wish you well for the future, Dump.

A safe assumption on the part of,

Yours sincerely,

The Editor