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MICHAEL FARADAY

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J. H. Gladstone

Michael Faraday / Third Edition, with Portrait

PREFACE

Shortly after the death of Michael Faraday, Professor Auguste de la Rive, and others of his friends, gave to the world their impressions of his life, his character, and his work; Professor Tyndall drew his portrait as a man of science; and after a while Dr. Bence Jones published his biography in two octavo volumes, with copious extracts from his journals and correspondence. In a review of this "Life and Letters" I happened to mention my thought of giving to the public some day my own reminiscences of the great philosopher; several friends urged me to do so, not in the pages of a magazine, but in the form of a little book designed for those of his fellow-countrymen who venerate his noble character without being able to follow his scientific researches. I accepted the task. Professor Tyndall and Dr. Bence Jones, with Messrs. Longman, the publishers, kindly permitted me to make free use of their materials; but I am indebted to the Corporation of the Trinity House, and to many friends, for a good deal of additional information; and in compiling my book I have preferred, where practicable, to illustrate the character of Faraday by documents or incidents hitherto unpublished, or contained in those sketches of the philosopher which are less generally known.

It is due to myself to say that I had pretty well sketched out the second part of this book before I read M. Dumas' "Eloge Historique." The close similarity of my analysis of Professor Faraday's character with that of the illustrious French chemist may perhaps be accepted as an additional warrant for the correctness of our independent estimates.

PREFACE TO SECOND EDITION

The very favourable reception which my book has met with, both from the press and the public, seems to call for my grateful acknowledgment on the issue of a second edition.

In revising the former, I have added some further particulars about Faraday, especially in regard to "his method of working;" and an engraving from a photograph by Watkins, which best recalls to my recollection the features and the usual expression of the genial philosopher.

SECTION I

THE STORY OF HIS LIFE

At the beginning of this century, in the neighbourhood of Manchester Square, London, there was an inquisitive boy running about, playing at marbles, and minding his baby-sister. He lived in Jacob's Well Mews, close by, and was learning the three R's at a common day-school. Few passers-by would have noticed him, and none certainly would have imagined that this boy, as he grew up, was to achieve the truest success in life, and to die honoured by the great, the wise, and the good. Yet so it was; and to tell the story of his life, to trace the sources of this success, and to depict some of the noble results of his work, are the objects of this biographical sketch.

It was not at Jacob's Well Mews, but in Newington Butts, that the boy had been born, on September 22, 1791, and his parents, James and Margaret Faraday, had given this, their third child, the unusual name of Michael. The father was a journeyman blacksmith, a skilful workman who, in spite of poverty and feeble health, strove to bring up his children in habits of industry and the love of God.

Of course young Michael must soon do something for his living. There happened to be a bookseller's shop in Blandford Street, a few doors from the entrance to the Mews, kept by a Mr. Riebau, an intelligent man, who is said to have had a leaning to astrology; and there he went as errand boy when thirteen years old. Many a weary walk he had, carrying round newspapers to his master's customers; but he did his work faithfully; and so, after a twelvemonth, the bookseller was willing to take him as an apprentice, and that without a premium.

Now, a boy in a bookseller's shop can look at the inside as well as the outside of the books he handles, and young Faraday took advantage of his position, and fed on such intellectual food as Watts's "Improvement of the Mind," Mrs. Marcet's "Conversations on Chemistry," and the article on "Electricity" in the *Encyclopædia Britannica*, besides such lighter dishes as Miss Burney's "Evelina;" nor can we doubt that when he was binding Lyons' "Experiments on Electricity," and Boyle's "Notes about the Producibleness of Chymicall Principles," he looked beyond the covers.¹ And his thirst for knowledge did not stop with reading: he must see whether Mrs. Marcet's statements were correct, and so, to quote his own words, "I made such simple experiments in chemistry as could be defrayed in their expense by a few pence per week, and also constructed an electrical machine, first with a glass phial, and afterwards with a real cylinder, as well as other electrical apparatus of a corresponding kind."

He kept too a note-book called "The Philosophical Miscellany," intended, he tells us, "to promote both amusement and instruction, and also to corroborate or invalidate those theories which are continually starting into the world of science;" and miscellaneous indeed were the scraps he gathered from the magazines of the time.

One day, early in 1810, walking somewhere in the neighbourhood of Fleet Street, he saw in a shop-window a bill announcing that lectures on natural philosophy were delivered by Mr. Tatum, at 53, Dorset Street, at eight in the evening, price of admission one shilling. He wanted to hear these lectures. His master's permission was obtained, but where was the money to come from? The needful shillings were given him by his elder brother, Robert, who earned them as a blacksmith; and so Michael Faraday made his first acquaintance with scientific lectures. And not with lectures only, for Tatum's house was frequented by other earnest students, and lifelong friendships were formed.

¹ These books, with others bound by Faraday, are preserved in a special cabinet at the Royal Institution, together with more valuable documents, – the laboratory notes of Davy and those of Faraday, his notes of Tatum's and Davy's lectures, copies of his published papers with annotations and indices, notes for lectures and Friday evening discourses, account books, and various memoranda, together with letters from Wollaston, Young, Herschel, Whewell, Mitscherlich, and many others of his fellow-workers in science. These were the gift of his widow, in accordance with his own desire.

Among these students was Benjamin Abbott, a young Quaker, who had received a good education, and had then a situation in a City house as confidential clerk. With him Faraday chatted on philosophy or anything else, and happily for us he chatted on paper, in letters of that fulness and length which the penny post and the telegraph have well-nigh driven out of existence; and happily for us, too, Abbott kept those letters, and Dr. Bence Jones has published them. They are wonderful letters for a poor bookseller's apprentice; they bear the stamp of an innate gentleman and philosopher.

Long afterwards, when Benjamin Abbott was an old man, he used to tell how Faraday made his first experiments in the kitchen of his house, and delivered his first lecture from the end of that kitchen table. The electrical machine made by him in those early days came into the possession of Sir James South, and now forms one of the treasures of the Royal Institution.

As the eager student drank in the lectures of Tatum, he took notes, and he afterwards wrote them out carefully in a clear hand, numbering and describing the different experiments that he saw performed, and making wonderfully neat drawings of the apparatus, in good perspective. These notes he bound in four volumes, adding to each a copious index, and prefixing to the first this dedication to his master: —

"To Mr. G. Riebau

"Sir,

"When first I evinced a predilection for the sciences, but more particularly for that one denominated electricity, you kindly interested yourself in the progress I made in the knowledge of facts relating to the different theories in existence, readily permitting me to examine those books in your possession that were in any way related to the subjects then occupying my attention. To you, therefore, is to be attributed the rise and existence of that small portion of knowledge relating to the science which I possess, and accordingly to you are due my acknowledgments.

"Unused to the arts of flattery, I can only express my obligations in a plain but sincere way. Permit me, therefore, Sir, to return thanks in this manner for the many favours I have received at your hands and by your means and believe me,

"Your grateful and obedient Servant,

"M. Faraday."

Now there happened to be lodging at Mr. Riebau's a notable foreigner of the name of Masquerier. He was a distinguished artist, who had painted Napoleon's portrait, and had passed through the stirring events of the first French Revolution, not without serious personal danger, and was now finding a refuge and a home in London. He was struck with the intelligence of the apprentice, whose duty it was to do various offices for him; and he lent the young man his books, and taught him how to make the drawings in perspective which have already been alluded to.

But the lectures in Dorset Street were not the only ones that Michael Faraday attended; and as the Royal Institution is the central scene of all his subsequent history, we must pay a mental visit to that building. Turning from the busy stream of Piccadilly into the quiet of Albemarle Street, we see, in a line with the other houses, a large Grecian façade with fourteen lofty pilasters. Between these are folding doors, which are pushed open from time to time by grave-looking gentlemen, many of them white-headed; but often of an afternoon, and always on Friday evening during the season, the quiet street is thronged with carriages and pedestrians, ladies and gentlemen, who flock through these folding doors. Entering with them, we find ourselves in a vestibule, with a large stone staircase in front, and rooms opening on the right and left. The walls of these rooms are lined with myriads of books, and the tables are covered with scientific and other periodicals of the day, and there are cabinets of philosophical apparatus and a small museum. Going up the broad staircase and turning to the right,

we pass through an ante-room to the lecture theatre. There stands the large table, horseshoe-shaped, with the necessary appliances for experiments, and behind it a furnace and arrangements for black-board and diagrams; while round the table as a centre range semicircular seats, rising tier above tier, and surmounted by a semicircular gallery, the whole capable of seating 700 persons. On the basement is a new chemical laboratory, fitted up with modern appliances, and beyond it the old laboratory, with its furnaces and sand-bath, its working tables and well-stored shelves, flanked by cellars that look like dark lumber-rooms. A narrow private staircase leads up to the suite of apartments in which resides the Director of the house. Such is the Royal Institution of Great Britain, incorporated by Royal Charter in the year 1800, "for the diffusing knowledge and facilitating the general introduction of useful mechanical inventions and improvements, and for teaching, by courses of philosophical lectures and experiments, the application of science to the common purposes of life;" – with the motto, "Illustrans commoda vitæ." Fifty or sixty years ago the building was essentially what it is now, except the façade and entrance, and that the laboratory, which was considered a model of perfection, was even darker than at present, and in the place of the modern chemical room there was a small theatre. The side room, too, was fitted up for actual work, though even at mid-day it had to be artificially lighted; and beyond this there was, and still is, a place called the Frogger, from a certain old tradition of frogs having been kept there. The first intention of the founders to exhibit useful inventions had not been found very practicable, but the place was already famous with the memories of Rumford and Young; and at that time the genius of Sir Humphry Davy was entrancing the intellectual world with brilliant discoveries, and drawing fashionable audiences to Albemarle Street to listen to his eloquent expositions.

Among the customers of the bookseller in Blandford Street was a Mr. Dance, who, being a member of the Royal Institution, took young Faraday to hear the last four public lectures of Davy. The eager student sat in the gallery, just over the clock, and took copious notes of the Professor's explanations of radiant matter, chlorine, simple inflammables, and metals, while he watched the experiments that were performed. Afterwards he wrote the lectures fairly out in a quarto volume, that is still preserved – first the theoretical portions, then the experiments with drawings, and finally an index. "The desire to be engaged in scientific occupation, even though of the lowest kind, induced me," he says, "whilst an apprentice, to write, in my ignorance of the world and simplicity of my mind, to Sir Joseph Banks, then President of the Royal Society. Naturally enough, 'No answer' was the reply left with the porter."

On the 7th of October his apprenticeship expired, and on the next day he became a journeyman bookbinder under a disagreeable master – who, like his friend the artist, was a French *émigré*. No wonder he sighed still more for congenial occupation.

Towards the end of that same October Sir Humphry Davy was working on a new liquid which was violently explosive, now known as chloride of nitrogen, – and he met with an accident that seriously injured his eye, and produced an attack of inflammation. Of course, for a while he could not write, and, possibly through the introduction of M. Masquerier,² the young bookseller was employed as his amanuensis. This, however, Faraday himself tells us lasted only "some days;" and in writing years afterwards to Dr. Paris, he says, "My desire to escape from trade, which I thought vicious and selfish, and to enter into the service of Science, which I imagined made its pursuers amiable and liberal, induced me at last to take the bold and simple step of writing to Sir H. Davy, expressing my wishes, and a hope that, if an opportunity came in his way, he would favour my views; at the same time I sent the notes I had taken of his lectures." Davy, it seems, called with the letter on one of his friends – at that time honorary inspector of the models and apparatus – and said, "Pepys, what am I to do? Here is a letter from a young man named Faraday; he has been attending my lectures, and wants me to give him employment at the Royal Institution —*what can I do?*" "Do?" replied Pepys;

² This idea was suggested by some remarks of Faraday to the Baroness Burdett Coutts.

"put him to wash bottles: if he is good for anything, he will do it directly; if he refuses, he is good for nothing." "No, no," replied Davy, "we must try him with something better than that."

So Davy wrote a kind reply, and had an interview with the young man upon the subject; in which, however, he advised him to stick to his business, telling him that "Science was a harsh mistress, and, in a pecuniary point of view, but poorly rewarding those who devoted themselves to her service." He promised him the work of the Institution, and his own besides.

But shortly afterwards the laboratory assistant was discharged for misconduct, and so it happened that one night the inhabitants of quiet Weymouth Street were startled by the unusual apparition of a grand carriage with a footman, which drew up before the house where Faraday lived, when the servant left a note from Sir Humphry Davy. The next morning there was an interview, which resulted in the young aspirant for scientific work being engaged to help the famous philosopher. His engagement dates from March 1, 1813, and he was to get 25s. per week, and a room in the house. The duties had been previously laid down by the managers: – "To attend and assist the lecturers and professors in preparing for, and during lectures. Where any instruments or apparatus may be required, to attend to their careful removal from the model room and laboratory to the lecture-room, and to clean and replace them after being used; reporting to the managers such accidents as shall require repair, a constant diary being kept by him for that purpose. That in one day in each week he be employed in keeping clean the models in the repository, and that all the instruments in the glass cases be cleaned and dusted at least once within a month."

The young assistant did not confine himself to the mere discharge of these somewhat menial duties. He put in order the mineralogical collection; and from the first we find him occupying a higher position than the minute quoted above would indicate.

In the course of a few days he was extracting sugar from beet-root; but all his laboratory proceedings were not so pleasant or so innocent as that, for he had to make one of the worst smelling of all chemical compounds, bisulphide of carbon; and as Davy continued to work on the explosive chloride of nitrogen, his assistant's career stood some chance of being suddenly cut short at its commencement. Indeed it seems that before the middle of April he had run the gauntlet of four separate explosions. Knowing that the liquid would go off on the slightest provocation, the experimenters wore masks of glass, but this did not save them from injury. In one case Faraday was holding a small tube containing a few grains of it between his finger and thumb, and brought a piece of warm cement near it, when he was suddenly stunned, and on returning to consciousness found himself standing with his hand in the same position, but torn by the shattered tube, and the glass of his mask even cut by the projected fragments. Nor was it easy to say when the compound could be relied on, for it seemed very capricious; for instance, one day it rose quietly in vapour in a tube exhausted by the air-pump, but the next day, when subjected to the same treatment, it exploded with a fearful noise, and Sir Humphry was cut about the chin, and was struck with violence on the forehead. This seems to have put an end to the experiments.

Nevertheless, in spite of disagreeables and dangers, the embryo philosopher worked on with a joyful heart, beguiling himself occasionally with a song, and in the evening playing tunes on his flute.

The change in Michael Faraday's employment naturally made him more earnest still in the pursuit of knowledge. He was admitted as a member of the "City Philosophical Society," a fraternity of thirty or forty men in the middle or lower ranks of life, who met every Wednesday evening for mutual instruction; and here is a contemporary picture of him at one of its debates: —

"But hark! A voice arises near the chair!
Its liquid sounds glide smoothly through the air;
The listening muse with rapture bends to view
The place of speaking, and the speaker too.
Neat was the youth in dress, in person plain;

His eye read thus, *Philosopher in grain*;
Of understanding clear, reflection deep;
Expert to apprehend, and strong to keep.
His watchful mind no subject can elude,
Nor specious arts of sophists e'er delude;
His powers, unshackled, range from pole to pole;
His mind from error free, from guilt his soul.
Warmth in his heart, good humour in his face,
A friend to mirth, but foe to vile grimace;
A temper candid, manners unassuming,
Always correct, yet always unassuming.
Such was the youth, the chief of all the band;
His name well known, Sir Humphry's right hand.
With manly ease towards the chair he bends,
With Watts's Logic at his finger-ends."

Another way in which he strove to educate himself is thus described in his own words: – "During this spring Magrath and I established the mutual improvement plan, and met at my rooms up in the attics of the Royal Institution, or at Wood Street at his warehouse. It consisted, perhaps, of half-a-dozen persons, chiefly from the City Philosophical Society, who met of an evening to read together, and to criticise, correct, and improve each other's pronunciation and construction of language. The discipline was very sturdy, the remarks very plain and open, and the results most valuable. This continued for several years."

Seven months after his appointment there began a new passage in Faraday's life, which gave a fresh impulse to his mental activity, and largely extended his knowledge of men and things. Sir Humphry Davy, wishing to travel on the Continent, and having received a special pass from the Emperor Napoleon, offered to take him as his amanuensis: he accepted the proposal, and for a year and a half they wandered about France, Italy, and Switzerland, and then they returned rapidly by the Tyrol, Germany, and Holland.

From letters written when abroad we can catch some of the impressions made on his mind by these novel scenes. "I have not forgot," he writes to Abbott, "and never shall forget, the ideas that were forced on my mind in the first days. To me, who had lived all my days of remembrance in London, a city surrounded by a flat green country, a hill was a mountain, and a stone a rock; for though I had abstract ideas of the things, and could say rock and mountain, and would talk of them, yet I had no perfect ideas. Conceive then the astonishment, the pleasure, and the information which entered my mind in the varied county of Devonshire, where the foundations of the earth were first exposed to my view, and where I first saw granite, limestone, &c., in those places and in those forms where the ever-working and all-wonderful hand of nature had placed them. Mr. Ben., it is impossible you can conceive my feelings, and it is as impossible for me to describe them. The sea then presented a new source of information and interest; and on approaching the shores of France, with what eagerness, and how often, were my eyes directed to the South! When arrived there, I thought myself in an uncivilized country; for never before nor since have I seen such wretched beings as at Morlaix." His impression of the people was not improved by the fact of their having arrested the travellers on landing, and having detained them for five days until they had sent to Paris for verification of their papers.

Again, to her towards whom his heart was wont to turn from distant lands with no small longing: "I have said nothing as yet to you, dear mother, about our past journey, which has been as pleasant and agreeable (a few things excepted, in reality nothing) as it was possible to be. Sir H. Davy's high name at Paris gave us free admission into all parts of the French dominions, and our passports were granted with the utmost readiness. We first went to Paris, and stopped there two months; afterwards we

passed, in a southerly direction, through France to Montpellier, on the borders of the Mediterranean. From thence we went to Nice, stopping a day or two at Aix on our way; and from Nice we crossed the Alps to Turin, in Piedmont. From Turin we proceeded to Genoa, which place we left afterwards in an open boat, and proceeded by sea towards Lerici. This place we reached after a very disagreeable passage, and not without apprehensions of being upset by the way. As there was nothing there very enticing, we continued our route to Florence; and, after a stay of three weeks or a month, left that fine city, and in four days arrived here at Rome. Being now in the midst of things curious and interesting, something arises every day which calls for attention and observations. The relics of ancient Roman magnificence, the grandeur of the churches, and their richness also – the difference of habits and customs, each in turn engages the mind, and keeps it continually employed. Florence, too, was not destitute of its attractions for me, and in the Academy del Cimento and the museum attached to it is contained an inexhaustible fund of entertainment and improvement; indeed, during the whole journey, new and instructive things have been continually presented to me. Tell B. I have crossed the Alps and the Apennines; I have been at the Jardin des Plantes; at the museum arranged by Buffon; at the Louvre, among the *chefs d'œuvre* of sculpture and the masterpieces of painting; at the Luxembourg Palace, amongst Rubens' works; that I have seen a Glowworm!!! waterspouts, torpedo, the museum at the Academy del Cimento, as well as St. Peter's, and some of the antiquities here, and a vast variety of things far too numerous to enumerate."

But he kept a lengthy journal, and as we turn over the pages – for the best part of it is printed by Bence Jones – we meet vivid sketches of the provokingly slow custom-house officers, the postilion in jack-boots, and the thin pigs of Morlaix – pictures of Paris, too, when every Frenchman was to him an unintelligible enemy; when the Apollo Belvidere, the Venus de Medici, and the Dying Gladiator were at the Louvre, and when the First Napoleon visited the Senate in full state. "He was sitting in one corner of his carriage, covered and almost hidden from sight by an enormous robe of ermine, and his face overshadowed by a tremendous plume of feathers that descended from a velvet hat." We watch Sir Humphry as Ampère and others bring to him the first specimens of iodine, and he makes experiments with his travelling apparatus on the dark lustrous crystals and their violet vapour; we seem, too, to be present with the great English chemist and his scholar as they burn diamonds at Florence by means of the Grand Duke's gigantic lens, and prove that the invisible result is carbonic acid; or as they study the springs of inflammable gas at Pietra Mala, and the molten minerals of Vesuvius. The whole, too, is interspersed with bits of fun, and this culminates at the Roman Carnival, where he evidently thoroughly enjoyed the follies of the Corso, the pelting with sugar-plums, and the masked balls, to the last of which he went in a nightgown and nightcap, with a lady who knew all his acquaintances; and between the two they puzzled their friends mightily.

This year and a half may be considered as the time of Faraday's education; it was the period of his life that best corresponds with the collegiate course of other men who have attained high distinction in the world of thought. But his University was Europe; his professors the master whom he served, and those illustrious men to whom the renown of Davy introduced the travellers. It made him personally known, also, to foreign *savants*, at a time when there was little intercourse between Great Britain and the Continent; and thus he was associated with the French Academy of Sciences while still young, his works found a welcome all over Europe, and some of the best representatives of foreign science became his most intimate friends.

In May 1815, his engagement at the Royal Institution was renewed, with a somewhat higher position and increased salary, which was again raised in the following year to 100*l.* per annum. The handwriting in the Laboratory Note-book changes in September 1815, from the large running letters of Brande to the small neat characters of Faraday, his first entry having reference to an analysis of "Dutch turf ash," and then soon occur investigations into the nature of substances bearing what must have been to him the mysterious names of Paligenetic tincture, and *Baphe eugenes chruson*. It is to be hoped that the constituents of this golden dye agreed together better than the Greek words of its name.

We can imagine the young philosopher taking a deeper interest in the researches on flame which his master was then carrying out, and in the gradual perfection of the safety-lamp that was to bid defiance to the explosive gases of the mine; this at least is certain, that Davy, in the preface to his celebrated paper on the subject, expresses himself "indebted to Mr. Michael Faraday for much able assistance," and that the youthful investigator carefully preserved the manuscript given him to copy.

Part of his duty, in fact, was to copy such papers; and as Sir Humphry had a habit of destroying them, he begged leave to keep the originals, and in that way collected two large volumes of precious manuscripts.

But there came a change. Hitherto he had been absorbing; now he was to emit. The knowledge which had been a source of delight to himself must now overflow as a blessing to others: and this in two ways. His first lecture was given at the City Philosophical Society on January 17, 1816, and in the same year his first paper was published in the *Quarterly Journal of Science*. The lecture was on the general properties of matter; the paper was an analysis of some native caustic lime from Tuscany. Neither was important in itself, but each resembled those little streams which travellers are taken to look at because they are the sources of mighty rivers, for Faraday became the prince of experimental lecturers, and his long series of published researches have won for him the highest niche in the temple of science.

When he began to investigate for himself, it could not have been easy to separate his own work from that which he was expected to do for his master. Hence no small danger of misunderstandings and jealousies; and some of these ugly attendants on rising fame did actually throw their black shadows over the intercourse between the older and the younger man of genius. In these earlier years, however, all appears to have been bright; and the following letter, written from Rome in October 1818, will give a good idea of the assistant's miscellaneous duties, and of the pleasant feelings of Davy towards him. It may be added that in another letter he is requested to send some dozens of "flies with pale bodies" to Florence, for Sir Humphry loved fly-fishing as well as philosophy.

"To Mr. Faraday

"I received the note you were so good as to address to me at Venice; and by a letter from Mr. Hatchett I find that you have found the parallax of Mr. West's Sirius, and that, as I expected, he is mistaken.

"If when you write to me you will give the 3 per cents. and *long annuities*, it will be enough.

"I will thank you to put the enclosed letters into the post, except those for Messrs. Morland and Messrs. Drummond, which perhaps you will be good enough to deliver.

"Mr. Hatchett's letter contained praises of you which were very gratifying to me; and pray believe me there is no one more interested in your success and welfare than your sincere well-wisher and friend,

"H. Davy.

"Rome."

It must not be supposed, however, that he had any astronomical duties, for the parallax he had found was not that of the Dog-star, but of a reputed new metal, Sirium, which was resolved in Faraday's hands into iron, nickel, and sulphur. But the impostor was not to be put down so easily, for he turned up again under the *alias* of Vestium; but again he was unable to escape the vigilant eye of the young detective, for one known substance after another was removed from it; and then, says Faraday, "my Vestium entirely disappeared."

His occupations during this period were multifarious enough. We must picture him to ourselves as a young-looking man of about thirty years of age, well made, and neat in his dress, his cheerfulness of disposition often breaking out in a short crispy laugh, but thoughtful enough when something important is to be done. He has to prepare the apparatus for Brande's lectures, and when the hour has arrived he stands on the right of the Professor, and helps him to produce the strange transformations of the chemical art. And conjurers, indeed, the two appear in the eyes of the youth on the left, who waits upon them, then the "laboratory assistant," now the well-known author, Mr. William Bollaert, from whom I have learnt many details of this period. When not engaged with the lectures, Faraday is manufacturing rare chemicals, or performing commercial analyses, or giving scientific evidence on trials. One of these was a famous one, arising from the Imperial Insurance Company resisting the claim of Severn and King, sugar-bakers; and in it appeared all the chemists of the day, like knights in the lists, on opposite sides, ready to break a lance with each other.

All his spare time Faraday was occupied with original work. Chlorine had a fascination for him, though the yellow choking gas would get out into the room, and he investigated its combinations with carbon, squeezed it into a liquid, and applied it successfully as a disinfectant when fatal fever broke out in the Millbank Penitentiary. Iodine too, another of Davy's elements, was made to join itself to carbon and hydrogen; and naphthaline was tormented with strong mineral acids. Long, too, he tried to harden steel and prevent its rusting, by alloying it with small quantities of platinum and the rarer metals; the boy blew the bellows till the crucibles melted, but a few ordinary razors seem to have been the best results. Far more successful was he in repeating and extending some experiments of Ampère on the mutual action of magnets and electric currents; and when, after months of work and many ingenious contrivances, the wire began to move round the magnet, and the magnet round the wire, he himself danced about the revolving metals, his face beaming with joy – a joy not unmixed with thankful pride – as he exclaimed, "There they go! there they go! we have succeeded at last." After this discovery he thought himself entitled to a treat, and proposed to his attendant a visit to the theatre. "Which shall it be?" "Oh, let it be Astley's, to see the horses." So to Astley's they went; but at the pit entrance there was a crush; a big fellow pressed roughly upon the lad, and Faraday, who could stand no injustice, ordered him to behave himself, and showed fight in defence of his young companion.

The rising philosopher indulged, too, in other recreations. He had a wonderful velocipede, a progenitor of the modern bicycle, which often took him of an early morning to Hampstead Hill. There was also his flute; and a small party for the practice of vocal music once a week at a friend's house. He sang bass correctly, both as to time and tune.

And though the City Philosophical Society was no more, the ardent group of students of nature who used to meet there were not wholly dispersed. They seem to have carried on their system of mutual improvement, and to have read the current scientific journals at Mr. Nicol's house till he married, and then alternately at those of Mr. R. H. Solly, Mr. Ainger, and Mr. Hennel, of Apothecaries' Hall, who came to a tragical end through an explosion of fulminating silver. Several of them, including Mr. Cornelius Varley, joined the Society of Arts, which at that time had committees of various sciences, and was very democratic in its management; and, finding that by pulling together they had great influence, they constituted themselves a "caucus," adopting the American word, and meeting in private. Magrath was looked upon as a "chair-maker," and Faraday in subsequent years held the office of Chairman of the Committee of Chemistry, and occasionally he presided at the large meetings of the Society.

During this time (1823) the Athenæum Club was started, not in the present Grecian palace in Pall Mall, but in a private house in Waterloo Place. Its members were the aristocracy of science, literature, and art, and they made Faraday their honorary secretary; but after a year he transferred the office to his friend Magrath, who held it for a long period.

Among the various sects into which Christendom is divided, few are less known than the Sandemanians. About a century and a half ago, when there was little light in the Presbyterian Church

of Scotland, a pious minister of the name of John Glas began to preach that the Church should be governed only by the teaching of Christ and His apostles, that its connection with the State was an error, and that we ought to believe and to practise no more and no less than what we find from the New Testament that the primitive Church believed and practised. These principles, which sound very familiar in these days, procured for their asserter much obloquy and a deposition by the Church Courts, in consequence of which several separate congregations were formed in different parts of Great Britain, especially by Robert Sandeman, the son-in-law of Mr. Glas, and from him they received their common appellation. In early days they taught a simpler view of faith than was generally held at that time; it was with them a simple assent of the understanding, but produced by the Spirit of God, and its virtue depended not on anything mystical in the operation itself, but on the grandeur and beauty of the things believed. Now, however, there is little to distinguish them in doctrine from other adherents of the Puritan theology, though they certainly concede a greater deference to their elders, and attach more importance to the Lord's Supper than is usual among the Puritan Churches. Their form of worship, too, resembles that of the Presbyterians; but they hold that each congregation should have a plurality of elders, pastors, or bishops, who are unpaid men; that on every "first day of the week" they are bound to assemble, not only for prayers and preaching, but also for "breaking of bread," and putting together their weekly offerings; that the love-feast and kiss of charity should continue to be practised; that "blood and things strangled" are still forbidden as food; and that a disciple of Christ should not charge interest on loans except in the case of purely business transactions, or lay up wealth for the unknown future, but rather consider all he possesses as at the service of his poorer brethren, and be ready to perform to them such offices of kindness as in the early Church were expressed by washing one another's feet.

But what gives the remarkable character to the adherents of this sect is their perfect isolation from all Christian fellowship outside their own community, and from all external religious influence. They have never made missionary efforts to win men from the world, and have long ceased to draw to themselves members from other Churches; so they have rarely the advantage of fresh blood, or fresh views of the meaning of Scripture. They commonly intermarry, and are expected to "bear one another's burthens;" so the Church has acquired somewhat of the additional character of a large intertwined family and of a mutual benefit society. This rigid separation from the world, extending now through three or four generations, has produced a remarkable elevation of moral tone and refinement of manner; and it is said that no one unacquainted with the inner circle can conceive of the brotherly affection that reigns there, or the extent to which hospitality and material help is given without any ostentation, and received without any loss of self-respect. The body is rendered still more seclusive by demanding, not merely unity of spirit among its members, but unanimity of opinion in every Church transaction. In order to secure this, any dissentient who persists in his opinion after repeated argument is rejected; the same is also the consequence of neglect of Church duties, as well as of any grave moral offence: and in such a community excommunication is a serious social ban, and though a penitent may be received back once, he can never return a second time.

It was in the midst of this little community that Faraday received his earliest religious impressions, and among them he found his ecclesiastical home till the day of his entrance into the Church above.

Among the elders of the Sandemanian Church in London was Mr. Barnard, a silversmith, of Paternoster Row. The young philosopher became a visitor at his house, and though he had previously written, —

"What is't that comes in false deceitful guise,
Making dull fools of those that 'fore were wise?
'Tis Love."

– he altered his opinion in the presence of the citizen's third daughter, Sarah, and wrote to her what was certainly not the letter of a fool: —

"You know me as well or better than I do myself. You know my former prejudices and my present thoughts – you know my weaknesses, my vanity, my whole mind; you have converted me from one erroneous way, let me hope you will attempt to correct what others are wrong... Again and again I attempt to say what I feel, but I cannot. Let me, however, claim not to be the selfish being that wishes to bend your affections for his own sake only. In whatever way I can best minister to your happiness, either by assiduity or by absence, it shall be done. Do not injure me by withdrawing your friendship, or punish me for aiming to be more than a friend by making me less; and if you cannot grant me more, leave me what I possess, – but hear me."

The lady hesitated, and went to Margate. There he followed her, and they proceeded together to Dover and Shakspeare's Cliff, and he returned to London full of happiness and hope. He loved her with all the ardour of his nature, and in due course, on June 12, 1821, they were married. The bridegroom desired that there should be no bustle or noise at the wedding, and that the day should not be specially distinguished; but he calls it himself "an event which more than any other contributed to his happiness and healthful state of mind." As years rolled on the affection between husband and wife became only deeper and deeper; his bearing towards her proved it, and his letters frequently testify to it. Doubtless at any time between their marriage and his final illness he might have written to her as he did from Birmingham, at the time of the British Association: – "After all, there is no pleasure like the tranquil pleasures of home, and here – even here – the moment I leave the table, I wish I were with you in quiet. Oh! what happiness is ours! My runs into the world in this way only serve to make me esteem that happiness the more."

He took his bride home to Albemarle Street, and there they spent their wedded life; but until Mr. Barnard's death it was their custom to go every Saturday to the house of the worthy silversmith, and spend Sunday with him, returning home usually in the evening of that day. His own father died while he was at Riebau's, but his mother, a grand-looking woman, lived long afterwards, supported by her son, whom she occasionally visited at the Institution, and of whose growing reputation she was not a little proud.

With a mind calmed and strengthened by this beautiful domestic life, he continued with greater and greater enthusiasm to ask questions of Nature, and to interpret her replies to his fellow-men. Just before his marriage he had been appointed at the Royal Institution superintendent of the house and laboratory, and in February 1825, after a change in the management of the Institution, he was placed as director in a position of greater responsibility and influence. One of his first acts in this capacity was to invite the members to a scientific evening in the laboratory; this took place three or four times in 1825, and in the following years these gatherings were held every week from Feb. 3 to June 9; and though the labour devolved very much upon Faraday, other philosophers sometimes brought forward discoveries or useful inventions. Thus commenced those Friday evening meetings which have done so much to popularize the high achievements of science. Faraday's note-books are still preserved, containing the minutes of the committee-meetings every Thursday afternoon, the Duke of Somerset chairman, and he secretary; also the record of the Friday evenings themselves, who lectured, and on what subject, and what was exhibited in the library, till June 1840, when other arrangements were probably made.

The year 1827 was otherwise fruitful in lectures: in the spring, a course of twelve on chemical manipulation at the London Institution; after Easter, his first course at Albemarle Street, six lectures on chemical philosophy (he had helped Professor Brande in 1824);³ and at Christmas, his desire to

³ Sir Roderick Murchison used to tell how he was attending Brande's lectures, when one day, the Professor being absent, his assistant took his place, and lectured with so much ease that he won the complete approval of the audience. This, he said, was Faraday's first lecture at the Royal Institution.

convey knowledge, and his love to children, found expression in a course of six lectures to the boys and girls home for their holidays. These were a great success; indeed, he himself says they "were just what they ought to have been, both in matter and manner, – but it would not answer to give an extended course in the same spirit." He continued these juvenile lectures during nineteen years. The notes for courses of lectures were written in school copy-books, and sometimes he appends a general remark about the course, not always so favourable as the one given above. Thus he writes, "The eight lectures on the operations of the laboratory, April 1828, were not to my mind." Of the course of twelve in the spring of 1827, he says he "found matter enough in the notes for at least seventeen."

Up to 1833 Faraday was bringing the forces of nature in subjection to man on a salary of only 100*l.* per annum, with house, coals, and candles, as the funds of the Institution would not at that time afford more; but among the sedate *habitúes* of the place was a tall, jovial gentleman, who lounged to the lectures in his old-fashioned blue coat and brass buttons, grey smalls, and white stockings, who was a munificent friend in need. This was John Fuller, a member of Parliament. He founded a Professorship of Chemistry with an endowment that brings in nearly 100*l.* a year, and gave the first appointment to Faraday for life. When the Institution became richer, his income was increased; and when, on account of the infirmities of age, he could no longer investigate, lecture, or keep accounts, the managers insisted on his still retaining in name his official connection with the place, with his salary and his residence there. Nor indeed could they well have acted otherwise; for though the Royal Institution afforded in the first instance a congenial soil for the budding powers of Faraday, his growth soon became its strength; and eventually the blooming of his genius, and the fruit it bore, were the ornament and glory of the Institution.

It will be asked, Was this 100*l.* or 200*l.* per annum the sole income of Faraday? No; in early days he did commercial analyses, and other professional work, which paid far better than pure science. In 1830 his gains from this source amounted to 1,000*l.*, and in 1831 to considerably more; they might easily have been increased, but at that time he made one of his most remarkable discoveries – the evolution of electricity from magnetism,⁴– and there seemed to lie open before him the solution of the problem how to make one force exhibit at will the phenomena of magnetism or of common or voltaic electricity. And then he had to face another problem – his own mental force might be turned either to the acquisition of a fortune, or to the following up of those great discoveries; it would not do both: which should he relinquish? The choice was deliberately made: Nature revealed to him more and more of her secrets, but his professional gains sank in 1832 to 155*l.* 9*s.*, and during no subsequent year did they amount even to that.

Still his work was not entirely confined to his favourite studies. In a letter to Lord Auckland, long afterwards, he says: – "I have given up, for the last ten years or more, all professional occupation, and voluntarily resigned a large income that I might pursue in some degree my own objects of research. But in doing this I have always, as a good subject, held myself ready to assist the Government if still in my power, *not for pay*; for, except in one instance (and then only for the sake of the person joined with me), I refused to take it. I have the honour and pleasure of applications, and that very recently, from the Admiralty, the Ordnance, the Home Office, the Woods and Forests, and other departments, all of which I have replied to, and will reply to as long as strength is left me." He had declined the Professorship of Chemistry at the London University – now University College, – but in 1829 he accepted a lectureship at the Royal Academy, Woolwich, and held it for about twenty years. In 1836 he became scientific adviser to the Trinity House, and his letter to the Deputy Master also shows his feelings in reference to such employment: – "You have left the title and the sum in pencil. These I look at mainly as regards the character of the appointment; you will believe me to be sincere in this, when you remember my indifference to your proposition as a matter of interest, though *not*

⁴ The laboratory note-book shows that at this very time he was making a long series of commercial analyses of saltpetre for Mr. Brande.

as a matter of kindness. In consequence of the goodwill and confidence of all around me, I can at any moment convert my time into money, but I do not require more of the latter than is sufficient for necessary purposes. The sum, therefore, of 200*l.* is quite enough in itself, but not if it is to be the indicator of the character of the appointment; but I think you do not view it so, and that you and I understand each other in that respect; and your letter confirms me in that opinion. The position which I presume you would wish me to hold is analogous to that of a standing counsel." For nearly thirty years Faraday continued to report on all scientific suggestions and inventions connected with lighthouses or buoys, not for personal gain or renown, but for the public good. His position was never above that of a "standing counsel." In his own words: "I do not know the exact relation of the Board of Trade and the Trinity House to each other; I am simply an adviser upon philosophical questions, and am put into action only when called upon."

In regard to the lectureship at Woolwich, Mr. Abel, his successor, writes thus: – "Faraday appears to have enjoyed his weekly trips to Woolwich, which he continued for so many years, as a source of relaxation. He was in the habit of going to Woolwich in the afternoon or evening preceding his lecture at the Military Academy, then preparing at once for his experiments, and afterwards generally taking a country ramble. The lecture was delivered early the following morning. No man was so respected, admired, and beloved as a teacher at the Military Academy in former days as Faraday. Many are the little incidents which have been communicated to me by his pupils illustrative of his charms as a lecturer, and of his kindly feelings for the youths to whom he endeavoured to impart a taste for, if not a knowledge of, science. But for some not ill-meant, though scarcely judicious, proposal to dictate modifications in his course of instruction, Faraday would probably have continued for some years longer to lecture at Woolwich. In May 1852, soon after I had been appointed his successor, Faraday wrote to me requesting the return of some tubes of condensed gases which he left at the Academy. This letter ends thus: – 'I hope you feel yourself happy and comfortable in your arrangements at the Academy, and have cause to be pleased with the change. I was ever very kindly received there, and that portion of regret which one must ever feel in concluding a long engagement would be in some degree lessened with me by hearing that you had reason to be satisfied with your duties and their acceptance. – Ever very truly yours, M. Faraday.'"

For year after year the life of Faraday afforded no adventure and little variety, only an ever-growing skill in his favourite pursuit, higher and higher success, and ever-widening fame. But simple as were his mind and his habits, no one picture can present him as the complete man; we must try to make sketches from various points of view, and leave it to the reader's imagination to combine them.

Let us watch him on an ordinary day. After eight hours' sleep, he rises in time to breakfast at eight o'clock, goes round the Institution to see that all is in order, and descends into the laboratory, puts on a large white apron, the stains and holes in which tell of previous service, and is busy among his pieces of apparatus. The faithful Anderson, an old soldier, who always did exactly what he was told, and nothing more,⁵ is waiting upon him; and as thought flashes after thought through his eager – perhaps impatient – brain, he twists his wires into new shapes, and re-arranges his magnets and batteries. Then some conclusion is arrived at which lights up his face with a gleam of satisfaction, but the next minute a doubt comes across that expressive brow – may the results not be due to something else yet imperfectly conceived? – and a new experiment must be devised to answer that. In the meantime perhaps one of his little nieces has been left in his charge. She sits as quiet as a

⁵ The following anecdote has been sent me on the authority of Mr. Benjamin Abbott: – "Sergeant Anderson was engaged to attend to the furnaces in Mr. Faraday's researches on optical glass in 1828, and was chosen simply because of the habits of strict obedience his military training had given him. His duty was to keep the furnaces always at the same heat, and the water in the ashpit always at the same level. In the evening he was released, but one night Faraday forgot to tell Anderson he could go home, and early next morning he found his faithful servant still stoking the glowing furnace, as he had been doing all night long." A more probable and better authenticated version of this story is that after nightfall Anderson went upstairs to Faraday, who was already in bed, to inquire if he was to remain still on duty.

mouse with her needlework; but now and then he gives her a nod, or a kind word, and throwing a little piece of potassium on to a basin of water for her amusement, he shows her the metal bursting into purple flame, floating about in fiery eddies, and the crack of the fused globule of potash at the end. Presently there is handed to him the card of some foreign *savant*, who makes his pilgrimage to the famous Institution and its presiding genius; he puts down his last result on a slate, comes upstairs, and, disregarding the interruption, chats with his visitor with all cordiality and openness. Then to work again till dinner-time, at half-past two. In the afternoon he retires to his study with its plain furniture and the india-rubber tree in the window, and writes a letter full of affection to some friend, after which he goes off to the council meeting of one of the learned bodies. Then back again to the laboratory, but as evening approaches he goes upstairs to his wife and niece, and then there is a game at bagatelle or acting charades; and afterwards he will read aloud from Shakspeare or Macaulay till it is time for supper and the simple family worship which now is not liable to the interruptions that generally prevent it in the morning. And so the day closes.

Or if it be a fine summer evening, he takes a stroll with his wife and the little girl to the Zoological Gardens, and looks at all the new arrivals, but especially the monkeys, laughing at their tricks till the tears run down his cheeks.

But should it be a Friday evening, Faraday's place is in the library and theatre of the Institution, to see that all is right and ready, to say an encouraging word to the lecturer, and to welcome his friends as they arrive; then taking his seat on the front bench near the right hand of the speaker, he listens with an animated countenance to his story,⁶ sometimes bending forwards, and scarcely capable of keeping his fingers off the apparatus – not at all able if anything seems to be going wrong; when the discourse is over, a warm shake of the hand, with "Thank you for a pleasant hour," and "Good night" to those around him, and upstairs with his wife and some particularly congenial friends to supper. On the dining-table is abundance of good fare and good wine, and around it flows a pleasant stream of lively and intellectual conversation.

But suppose it is his own night to lecture. The subject has been carefully considered, an outline of his discourse has been written on a sheet of foolscap, with all the experiments marked and numbered, and during the morning everything has been arranged on the table in such order that his memory is assisted by it; the audience now pours in, and soon occupies all the seats, so that late comers must be content with sitting on the stairs or standing in the gangways, or at the back of the gallery. Faraday enters, and placing himself in the centre of the horse-shoe table, perfect master of himself, his apparatus, and his audience, commences a discourse which few that are present will ever forget. Here is a picture by Lady Pollock: – "It was an irresistible eloquence, which compelled attention and insisted upon sympathy. It waked the young from their visions, and the old from their dreams. There was a gleaming in his eyes which no painter could copy, and which no poet could describe. Their radiance seemed to send a strange light into the very heart of his congregation; and when he spoke, it was felt that the stir of his voice and the fervour of his words could belong only to the owner of those kindling eyes. His thought was rapid, and made itself a way in new phrases – if it found none ready made – as the mountaineer cuts steps in the most hazardous ascent with his own axe. His enthusiasm sometimes carried him to the point of ecstasy when he expatiated on the beauties of Nature, and when he lifted the veil from her deep mysteries. His body then took motion from his mind; his hair streamed out from his head; his hands were full of nervous action; his light, lithe body seemed to quiver with its eager life. His audience took fire with him, and every face was flushed. Whatever might be the after-thought or the after-pursuit, each hearer for the time shared his zeal and his delight."⁷

⁶ One evening, when the Rev. A. J. D'Orsey was lecturing "On the Study of the English Language," he mentioned as a common vulgarism that of using "don't" in the third person singular, as "He don't pay his debts." Faraday exclaimed aloud, "That's very wrong."

⁷ The *St. Paul's Magazine*, June 1870.

Is it possible that he can be happier when lecturing to the juveniles? The front rows are filled with the young people; behind them are ranged older friends and many of his brother philosophers, and there is old Sir James South, who is quite deaf, poor man, but has come, as he says, because he likes to see the happy faces of the children. How perfect is the attention! Faraday, with a beaming countenance, begins with something about a candle or a kettle that most boys and girls know, then rises to what they had never thought of before, but which now is as clear as possible to their understandings. And with what delight does he watch the performances of Nature in his experiments! One could fancy that he had never seen the experiments before, and that he was about to clap his hands with boyish glee at the unexpected result! Then with serious face the lecturer makes some incidental remark that goes far beyond natural philosophy, and is a lesson for life.

Some will remember one of these occasions which forms the subject of a painting by Mr. Blaikley. Within the circle of the table stands the lecturer, and waiting behind is the trusty Anderson, while the chair is occupied by the Prince Consort, and beside him are the young Prince of Wales and his brother, the present Duke of Edinburgh; while the Rev. John Barlow and Dr. Bence Jones sit on the left of the Princes; Sir James South stands against the door, and Murchison, De La Rue, Mrs. Faraday, and others may be recognized among the eager audience.

Let us now suppose that it is a Sunday on which we are watching this prince among the aristocracy of intellect, and we will assume it to be during one of the periods of his eldership, namely between 1840 and 1844, or after 1860. The first period came to a close through his separation both from his office and from the Church itself. The reason of this is unknown except to the parties immediately concerned, but it will be readily understood how easily differences may arise in such a community as that of the Sandemanians between an original and conscientious mind and his brethren in the faith. He, however, continued to worship among his friends, and was after a while restored to the rights of membership, and eventually to the office of elder. In the morning he and his family group find their way down to the plain little meeting-house in Paul's Alley, Red-cross Street, since pulled down to make room for the Metropolitan Railway. The day's proceedings commence with a prayer meeting, during which the worshippers gradually drop in and go to their accustomed seats, Faraday taking his place on the platform devoted to the elders: then the more public service begins; one of a metrical but not rhyming version of the Psalms is sung to a quaint old tune; the Lord's Prayer and another psalm follow; he rises and reads in a slow, reverent manner the words of one of the Evangelists, with a most profound and intelligent appreciation of their meaning; or he offers an extempore prayer, expressing perfect trust and submission to God's will, with deep humility and confession of sin. It may be his turn to preach. On two sides of a card he has previously sketched out his sermon with the illustrative texts, but the congregation does not see the card, only a little Bible in his hand, the pages of which he turns quickly over, as, fresh from an earnest heart, there flows a discourse full of devout thought, clothed largely in the language of Scripture. After a loud simultaneous "Amen" has closed the service, the Church members withdraw to their common meal, the feast of charity; and in the afternoon there is another service, ending by invariable custom with the Lord's Supper. The family group do not reach home till half-past 5; then there is a quiet evening, part of which is spent by Faraday at his desk, and they retire to rest at an early hour.

Again on Wednesday evening he is among the little flock. The service is somewhat freer, for not the officers of the Church only, but the ordinary members are encouraged to express whatever thoughts occur to them, so as to edify one another. At these times, Faraday, especially when he was not an elder, very often had some word of exhortation, and the warmth of his temperament would make itself felt, for he was known in the small community as an experimental rather than a doctrinal preacher.

The notes of his more formal discourses which I have had the opportunity of seeing, indicate, as might be expected from the tenets of his Church, a large acquaintance with the words of Scripture, but no knowledge of modern exegesis. They appear to have impressed different hearers in different

ways. One who heard him frequently and was strongly attached to him, says that his sermons were too parenthetical and rapid in their delivery, with little variety or attractiveness; but another scientific friend, who heard him occasionally, writes: "They struck me as resembling a mosaic work of texts. At first you could hardly understand their juxtaposition and relationship, but as the well-chosen pieces were filled in, by degrees their congruity and fitness became developed, and at last an amazing sense of the power and beauty of the whole filled one's thoughts at the close of the discourse."

His first sermon as an elder was on Christ's character and example as shown in Matthew xi. 28-30: "Learn of me; for I am meek and lowly in heart." Among the latest of his sermons was one that he preached at Dundee about four years before his death. He began by telling his audience that his memory was failing, and he feared he could not quote Scripture with perfect accuracy; and then, as said one of the elders who had been present, "his face shone like the face of an angel," as he poured forth the words of loving exhortation.

When a mind is stretched in the same direction week-day and Sunday, the tension is apt to become too great. With Faraday the first symptom was loss of memory. Then his devoted wife had to hurry him off to the country for rest of brain. Once he had to give up work almost entirely for a twelvemonth. During this time he travelled in Switzerland, and extracts from his diary are given by Bence Jones. His niece, Mrs. Deacon, gives us her recollections of a month spent at Walmer: – "How I rejoiced to be allowed to go there with him! We went on the outside of the coach, in his favourite seat behind the driver. When we reached Shooter's Hill, he was full of fun about Falstaff and the men in buckram, and not a sight nor a sound of interest escaped his quick eye and ear. At Walmer we had a cottage in a field, and my uncle was delighted because a window looked directly into a blackbird's nest built in a cherry-tree. He would go many times in a day to watch the parent birds feeding their young. I remember, too, how much he was interested in the young lambs, after they were sheared at our door, vainly trying to find their own mothers. The ewes, not knowing their shorn lambs, did not make the customary signal. In those days I was eager to see the sun rise, and my uncle desired me always to call him when I was awake. So, as soon as the glow brightened over Pegwell Bay, I stole downstairs and tapped at his door, and he would rise, and a great treat it was to watch the glorious sight with him. How delightful, too, to be his companion at sunset! Once I remember well how we watched the fading light from a hill clothed with wild flowers, and how, as twilight stole on, the sounds of bells from Upper Deal broke upon our ears, and how he watched till all was grey. At such times he would be well pleased if we could repeat a few lines descriptive of his feelings." And then she tells us about their examining the flowers in the fields by the aid of "Galpin's Botany," and how with a candle he showed her a spectre on the white mist outside the window; of reading lessons that ended in laughter, and of sea-anemones and hermit crabs, with the merriment caused by their odd movements as they dragged about the unwieldy shells they tenanted. "But of all things I used to like to hear him read 'Childe Harold;' and never shall I forget the way in which he read the description of the storm on Lake Lemman. He took great pleasure in Byron, and Coleridge's 'Hymn to Mont Blanc' delighted him. When anything touched his feelings as he read – and it happened not unfrequently – he would show it not only in his voice, but by tears in his eyes also."

A few days at Brighton refreshed him for his work. He was in the habit of running down there before his juvenile lectures at Christmas, and at Easter he frequently sought the same sea-breezes.

But it was not always that Faraday could run away from London when the mental tension became excessive. A shorter relaxation was procured by his taking up a novel such as "Ivanhoe," or "Jane Eyre," or "Monte Christo." He liked the stirring ones best, "a story with a thread to it." Or he would go with his wife to see Kean act, or hear Jenny Lind sing, or perhaps to witness the performance of some "Wizard of the North."

Now and then he would pay a visit to some scene of early days. One of his near relatives tells me: "It is said that Mr. Faraday once went to the shop where his father had formerly been employed as a blacksmith, and asked to be allowed to look over the place. When he got to a part of the premises

at which there was an opening into the lower workshop, he stopped and said: 'I very nearly lost my life there once. I was playing in the upper room at pitching halfpence into a pint pot close by this hole, and having succeeded at a certain distance, I stepped back to try my fortune further off, forgetting the aperture, and down I fell; and if it had not been that my father was working over an anvil fixed just below, I should have fallen on it, broken my back, and probably killed myself. As it was, my father's back just saved mine.'

Business, as well as pleasure, sometimes took him away from home. He often joined the British Association, returning usually on Saturday, that he might be among his own people on the Lord's Day. During the meeting he would generally accept the hospitality of some friend; and it was one of these occasions that gave rise to the following *jeu d'esprit*: —

"That P will change to F in the British tongue is true
(Quoth Professor Phillips), though the instances are few;
An entry in my journal then I ventured thus to parody,
'I this day dined with Fillips, where I hobbled and nobbed with
Pharaday.'

"T. T.

"Oxford, June 27, 1860."

At the Liverpool meeting, in 1837, he was president of the Chemical Section, and on two other occasions he was selected to deliver the evening lecture, but though repeatedly pressed to undertake the presidency of the whole body, he could not be prevailed upon to accept the office.

My first personal intercourse with him, of any extent, was at the Ipswich meeting in 1851. I watched him with all the interest of an admiring disciple, and there is deeply engraven on my memory the vivacity of his conversation, the eagerness with which he entered into some mathematico-chemical speculations of Dumas, and the playfulness with which, when we were dining together, he cut boomerangs out of card, and shot them across the table at his friends.

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