

light, or magnetism, or the voltaic current have been under such a restraint of the mind?

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‘Again thanking you most truly for the attention you have given to me and the subject, I beg you to believe that

‘I am, very gratefully, your faithful servant,

‘M. FARADAY.’

FARADAY TO MR. CLERK MAXWELL.

‘Royal Institution : November 13, 1857.

‘My dear Sir,—If on a former occasion I seemed to ask you what you thought of my paper, it was very wrong, for I do not think anyone should be called upon for the expression of their thoughts before they are prepared and wish to give them. I have often enough to decline giving an opinion, because my mind is not ready to come to a conclusion, or does not wish to be committed to a view that may by further consideration be changed. But having received your last letter, I am exceedingly grateful to you for it ; and rejoice that my forgetfulness of having sent the former paper on conservation has brought about such a result. Your letter is to me the first intercommunication on the subject with one of your mode and habit of thinking. It will do me much good, and I shall read and meditate on it again and again.

‘I dare say I have myself greatly to blame for the vague use of expressive words. I perceive that I do not use the word “force” as you define it, “the tendency of a body to pass from one place to another.” What I mean by the word is the source or sources of

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Æt. 66. all possible actions of the particles or materials of the universe, these being often called the powers of nature when spoken of in respect of the different manners in which their effects are shown.

‘In a paper which I have received at this moment from the “Phil. Mag.,” by Dr. Woods, they are called the *forces*, “such as electricity, heat, &c.” In this way I have used the word “force” in the description of gravity which I have given as that expressing the received idea of its nature and source, and such of my remarks as express an opinion, or are critical, apply only to that sense of it. You may remember I speak to labourers like myself; experimentalists on force generally who receive that description of gravity as a physical truth, and believe that it expresses all and no more than all that concerns the nature and locality of the power,—to these it limits the formation of their ideas and the direction of their exertions, and to them I have endeavoured to speak, showing how such a thought, if accepted, pledged them to a very limited and probably erroneous view of the cause of the force, and to ask them to consider whether they should not look (for a time, at least), to a source in part external to the particles. I send you two or three old printed papers with lines *marked* relating to this point.

‘To those who disown the definition or description as imperfect, I have nothing to urge, as there is then probably no real difference between us.

‘I hang on to your words, because they are to me weighty; and where you say, “I, for my part, cannot realise your dissatisfaction with the law of gravitation, provided you conceive it according to your own

principles," they give me great comfort. I have nothing to say against the law of the action of gravity. It is against the law which measures its total strength as an inherent force that I venture to oppose my opinion; and I must have expressed myself badly (though I do not find the weak point), or I should not have conveyed any other impression. All I wanted to do was to move men (not No. 1, but No. 2), from the unreserved acceptance of a principle of physical action which might be opposed to natural truth. The idea that we may possibly have to connect *repulsion* with the lines of gravitation-force (which is going far beyond anything my mind would venture on at present, except in private cogitation), shows how far we *may* have to depart from the view I oppose.

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‘There is one thing I would be glad to ask you. When a mathematician engaged in investigating physical actions and results has arrived at his own conclusions, may they not be expressed in common language as fully, clearly, and definitely as in mathematical formulæ? If so, would it not be a great boon to such as we to express them so—translating them out of their hieroglyphics that we also might work upon them by experiment. I think it must be so, because I have always found that you could convey to me a perfectly clear idea of your conclusions, which, though they may give me no full understanding of the steps of your process, gave me the results neither above nor below the truth, and so clear in character that I can think and work from them.

‘If this be possible, would it not be a good thing if mathematicians, writing on these subjects, were to give us their results in this popular useful working state

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‘Ever, my dear Sir, most truly yours,
‘M. FARADAY.’

His second lecture for the Institution was on the relations of gold to light. At the end of the lecture he said: ‘The object of these investigations was to ascertain the varied powers of a substance acting upon light when its particles were extremely divided, to the exclusion of every other change of constitution.’ In his notes he wrote: ‘We are looking for the first small, and as yet unknown, effects, for these grow up into the great advanced truths of science—as a bubble—a breaking forth—a cascade—a storm—Niagara or Schaffhausen—the cannon’s mouth.’

After Easter he gave a course of six lectures on static electricity.

An account of a ready method of determining the presence, position, depth, length and motion (if any) of a needle broken into the foot, was published in the ‘Proceedings’ of the Medical and Chirurgical Society for March 18th. In this, as in all that he did, the perfection of his hand work as well as his head work is to be seen.

He gave the Juvenile Lectures on electricity.

He made six reports to the Trinity House. The most important was on Holmes’s magneto-electric light, which was put up at Blackwall, and observed from Woolwich, and compared with a Fresnel lamp in the centre of Bishop’s lens, and also in the focus of a parabolic reflector. He critically examined the cost of the apparatus, the price of the light, the suppositions