

THE CORRELATION OF PHYSICAL FORCES

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The Correlation of Physical Forces by W. R. Grove

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WHEN natural phenomena are for the first time observed, a tendency immediately develops itself to refer them to something previously known,—to bring them within the range of acknowledged sequences. The mode of regarding new facts, which is most favourably received by the public, is that which refers them to recognised views,—stamps them into the mould in which the mind has been already shaped. The new fact may be far removed from those to which it is referred, and may belong to a different order of analogies, but this cannot then be known, as its co-ordinates are wanting. It may be questionable whether the mind is not so moulded by past events that it is impossible to advance an entirely new view, but, admitting such

possibility, the new view, necessarily founded on insufficient data, is likely to be more incorrect and prejudicial than even a strained attempt to reconcile the new discovery with known facts.

The theory consequent upon new facts, whether it be a co-ordination of them with known ones, or the more difficult and dangerous attempt at remodelling the public ideas, is generally enunciated by the discoverers themselves of the facts, or by those to whose authority the world at that period defers; others are not held enough, or if they be so, are unheeded. The earliest theories thus enunciated obtain the firmest hold upon the public mind, for at such a time there is no power of testing, by a sufficient range of experience, the truth of the theory; it is accepted solely or mainly upon authority: there being no means of contradiction, its reception is, in the first instance, attended with some degree of doubt, but as the time in which it can fairly be investigated far exceeds that of any lives then in being, and as neither the individual nor the public mind will long tolerate a state of abeyance, a theory shortly becomes, for want of a better, admitted as an established truth: it is handed from father to son, and gradually takes its place in education. Succeeding generations, whose minds are thus formed to an established view, are much less likely to abandon it. They have adopted it, in the first instance, upon authority, to them unquestionable, and subsequently to yield up their faith would involve a laborious remodelling of ideas, a task which the public as a body will and can

rarely undertake, the frequent occurrence of which is indeed inconsistent with the very existence of man in a social state, as it would induce an anarchy of thought—a perpetuity of mental revolutions.

This necessity has its good ; but the evil with regard to the point we are considering is, that by this means, theories the most immature frequently become the most permanent ; for no theory can be more immature, none is likely to be so incorrect, as that which is formed at the first flush of a new discovery, and though time exalts the authority of those from whom it emanated, time can never give to the illustrious dead such means of analysing and correcting erroneous views as subsequent discoveries confer.

Take for instance the Ptolemaic System, which we may almost literally explain by the expression of Shakspeare : “ He that is giddy thinks the world turns round.” We now see the error of this system, because we have all an immediate opportunity of refuting it, but this identical error was received as a truth for centuries, because, when first promulgated, the means of refuting it were not at hand, and when the means of its refutation became attainable, mankind had been so educated to the supposed truth, that they rejected the proof of its fallacy.

I have premised the above for two reasons : first, to obtain a fair hearing by requesting as far as possible that dismissal from the minds of my readers of pre-conceived views by and in favour of which all are liable to be prejudiced ; and secondly, to defend myself

from the charge of undervaluing authority, or treating lightly the opinions of those to whom and to whose memory mankind looks with reverence. Properly to value authority, we should estimate it together with its means of information: if a dwarf on the shoulders of a giant can see further than the giant, he is no less a dwarf in comparison with the giant.

The subject on which I am about to treat,—viz. the relation of the affections of matter to each other and to matter, peculiarly demands an unprejudiced regard. The different aspects under which these agencies have been regarded; the different views which have been taken of matter itself; the metaphysical subtleties to which these views unavoidably lead, if pursued beyond fair inductions from existing experience, present difficulties almost insurmountable.

The extent of claim which my views on this subject may have to originality, must be left to the judgment of the reader; they became strongly impressed upon my mind at a period when I was much engaged in experimental research, and were, as I then believed, and still believe regarding them as a whole, new: expressions in the works of different authors bearing more or less on the subject have subsequently been pointed out to me, some of which go back to a distant period. An attempt to analyse these, and to trace how far I have been anticipated by others, would probably but little interest the reader, and in the course of it I should constantly have to make distinctions showing wherein I differed, and wherein I agreed with others. I might quote

authorities which appear to me to oppose, and others which appear to coincide with certain of the views I have put forth, but this would interrupt the consecutive development of my own ideas, and might render me liable to the charge of misconstruing those of others; I therefore think it better to give at the conclusion such references to different authors as bear upon the subject treated of, which I have discovered, or which have been pointed out to me since the delivery of the lectures of which this essay is a record.

The more extended our research becomes, the more we find that knowledge is a thing of slow progression, that the very notions which appear to ourselves new have arisen, though perhaps in a very indirect manner, from successive modifications of traditional opinions. Each word we utter, each thought we think, has in it the vestiges, is in itself the impress, of antecedent words and thoughts. As each material form, could we rightly read it, is a book containing in itself the past history of the world: so, different though our philosophy may now appear to be from that of our progenitors, it is but theirs added to or subtracted from, transmitted drop by drop through the filter of antecedent, as ours will be through that of subsequent, ages.—The relic is to the past as is the germ to the future.

Though many valuable facts, and correct deductions from them, are to be found scattered amongst the voluminous works of the ancient philosophers; yet, giving them the credit which they pre-eminently deserve for having devoted their lives to purely intellectual pursuits,