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AN ESSAY

1843

CAUSE AND EFFECT.

BY ROBERT SPEAR,

OR AND LIGENTIATE OF MEDICINE, OF THE UNIVERSITY OF CAMBRIDGE MEMBER OF THE ROYAL COLLEGE OF PHYSICIANS, LONDON.

TORONTO:

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Quam infeliciter se habeat scientia humana, que in usu est, etiam ex illis liquet, que vuigo asseruntur. Recte ponitur ; "Vere acire, esse per causas acire." Etiam non male constituuntur cause quatuor ; materia, forma, efficiens, et finis. At ex his cause finalis tantum abeat ut prosit, ut etiam scientias corrumpat, nisi in hominis actionibus. Forme inventio habetur pró desperáta. Efficiens vero, et materia (qualea queruntur et recipiuntur, remote scilicet, abeque *latenti processu* ad formam) res perfunctorie sunt et superficiales, et nihili fere ad scientiam veram et activam. Licet enim in natura nihili vere existat preter corpora individua, edentia actus puros individuos ex lege; in doctrinis tamen, illa ipsa lex, ejusque inquisitio, et inventio, atque explicatio, pro fundamento-est tam ad sciendum quart ad operandum.

Bac: Nov: Org: Lib. 2, Aph. 2.

AN ESSAY, &c.

1. To superinduce on, or to take away from, a fit subject any sensible quality, contains the whole mystery of causation, so far as change, in the state of things which co-exist, is considered; and the cause is that, by virtue of which such addition or subtraction of qualities is established; and the effect is the change itself.

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Although the observation of change in things (the elements of which are everlasting) is the ground work from which we are enabled to derive the idea of causation: still it must not be supposed that its law applies to those things only which do actually change; for it is by the same forces or causes that nature keeps together the particles, for instance, of any body for ages, or for any indefinite time, by which we are enabled to compound a body with the same sensible qualities, by bringing its constituent parts within each other's influence. Therefore, causes and their effects may be stable. For every action in nature, whether it endure or be transitory, is by one or other law; and these laws, immutable and everlasting as the sorts of things to which they belong,

in reference to individual actions performed by them, are termed the causes, and the actions themselves are termed the effects. These laws constitute the theory of science, and the determination of them, by the ways of experience, constitutes its practical part.

2. The relation between cause and effect, is a necessary relation.

It is of the last importance, for an adequate comprehension of the relation of cause and effect, to distinguish between (1), its metaphysical or general requirements; and (2), its physical and well-defined examples. The necessity of some causes known or unknown, for each event, the mind determines by the former; the real causes can only be discovered by observing the examples; and these two can never coincide. The one can never have the same kind of evidence with the other; the example will always be a matter of fact, resting for its evidence on some observed sensible quality. The other (that is, the principle or law of causation) is the statement of a universal and necessary truth, the intuitive knowledge of which forces the mind to admit the existence of the relation as the only sufficient reason for each phenomenon. The experiment, on the other hand, assists the mind to the actual or apparent cause merely; and if we ask ourselves what engages us to seek after this, the true answer can only be found in the universality of the principle, the necessity of a cause; and, although we

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failed altogether to find the cause by experiment. still its necessity would be as firmly fixed in the mind reflecting thereon, as if it were questionless disclosed. The necessity, therefore, of the relation does not, for us, result from any clear view we may have into any ample of cause and effect, but it results from considerations of the relation in its uttermost generality. This will be at once seen, if we consider that knowledge on which the relation rests. Man knows by an intuitive certainty, that bare nothing cannot produce any action-that, therefore, there must be a sufficient cause for every action which takes place between Or the case may be stated thus : either things. a quality or action springs from something or from nothing: if it be granted, that reason has sure ground to deny the last as impossible, then it is thrown on the other as necessary.

From such principles as these we may derive infallible conclusions, where all experience utterly fails us; as, for instance, the necessary existence of a first cause, incomprehensible to us in every other respect save the necessity of its existence the existence of God. For we possess the highest possible certainty (1), of our own existence, and (2), of our dependent existence; we cannot doubt these things, and our knowledge of them is at the basis of all truth. For, as to the first, the thinking on any proposition whatsoever, of necessity involves the reality of consciousness; there cannot be certainty or knowledge, which are but

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modes of thinking, without it; nor is it in a man's power to gainsay this evidence of consciousness, for every effort so to do must establish to his own mind the action itself; and, secondly, our dependent existence is abundantly shewn in every one of our ideas-for each of these, as it is in nature, is, and (as we are at present constituted) must be, very different from what it is for us, We perceive an object, and this is for us a perception; that is, we take for granted the object and the consciousness, and their union; whereas, in nature, all these must be produced and established-the former is the mental act (if I may so distinguish it), the other is the physical and unrevealed being required to produce that act. And, if the reality of any conscious act be admitted, then the groundwork, the elements and formative causes thereof (apart from the conscious act, and rendering this possible), must be allowed; but our ignorance of these causes, is equivalent to our want of power to produce them -hence we know ourselves to be dependent.

Taking these premises for granted, we are enabled, as we have said, to demonstrate the necessary existence of a first cause; although in ignorance of the number, force and kinds of secondary causes. For we certainly know that time and place (which contain all conceivable secondary causes) are by matter and motion, and finite existences bounded; and, overleaping these, we derive the pure conception of a being necessary as a cause for all things. To deny then the necessity of the relation between real beings, is all one with denying its existence, which, taking the above case, can only be done by denying our own existence, or the existence of God. A man is incapable of doubting his own existence; and although atheists have promulgated the other extravagant doctrine, yet the most subtle among them manifestly contradict themselves, by applying the law of causation in a deistical way to account for phenomena.

And here we stand on very sure ground, in the midst of the metaphysics of things, far apart from the region of sense and of opinion—among first principles and axioms, which contain in themselves those data to which the human mind refers, as of indubitable and unalterable truth; and by the aid of which it traces à priori the outlines of a world which is co-extensive with possible existencies.

3. The origin of our idea of causation.

From objects acting on our minds, and from appetites implanted in our organs, we are enabled oftentimes to observe, or to bring about, effects; by instinct or by habit, &c.,—without having an adequate idea of causation, or, in fact, without having any idea of it at all. For man in a savage as well as in a civilized condition, in infancy and at other ages, is guided by that experience which is forced on him by constantly recurring objects; appetites, and associations. Lower animals are

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subject to the same laws, they, equally with ourselves, associate particular sensible ideas, which are in many cases, unknown examples of causes and effects. They fear, for instance, the application of the rod or of fire, from the pain it has before occasioned them-like ourselves, they hunt after objects to satisfy their inclinations, appetites, &c. Their instincts, may be more perfect, and less liable to mislead, than our own, but still of the same nature; for an unerring instinct, if such there be, can only be conceived of as an appetite implanted in an exquisitely working organ, and guided by pleasure and pain. All things in nature being subservient to the law of cause and effect, so it would be impossible for animals to act in harmony with the established order of things, or even to exist at all, if they were not endowed with principles, by which they are enabled to obey that law, and to adapt, as if with foresight, and discrimination of events, means to ends.

Now if the human understanding be in possession of an idea of causation, which answers not only to this or that phenomenon, but also to all phenomena necessarily and uniformly,—an idea which remains unchanged in every variety of change of sensation—an idea which has not for its object light as if it came in by the eye, nor sound as if it entered by the ear, nor yet any other sensible object, as if it entered through any organ of sense whatsoever. Moreover an idea

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which is not confined to sense, but is universally applicable, alike to all things which really exist, and to those things which are conceived of as merely possible; then such an idea cannot be a sensation, and to say with Mr. Hume and others; that a child is in possession of that idea, because having been burnt by fire, he keeps away from it —is just as unreasonable, as to assert, that he has an idea of number or time, because he has had a few successive sensations, or that he has an idea of power, a vacuum, or motion, because he wills, sucks or crawls.

Although we never could have an idea of this relation, unless we previously had our, senses open, and observed particular cases, the examples of causes and effects, which abstract science from its nature is precluded from affording-still, in abstract science alone, is to be found those general and fundamental principles, on which the necessary truth of the relation rests. For since certainty in our minds, has to do with universal propositions only-so the necessary truth, (which is the indispensable, and definitive requisite) of the relation, can only be known by propositions of universal import, brought to light by reason. And without a knowledge of which, we should be in the condition of children, and of lower animals, totally ignorant of the relation, and guided by instinctive actions and associations.

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ny lea 4. Any change whatsoever requires at least two elements acting in concert, both of which contain the causes (of such change).

Any one elementary particle is incapable, of itself and alone, of being changed. For a change of state in such a particle would require an active force either within or without that particle. If such a force were external, then a second particle is supposed, from which it proceeds ; if such a force be internal, what exists now to make it active, which did not exist previously? The mere lapse of moments could not make it active, for time is a constant quantity, it remains the same throughout. Either, then, the particle (for the supposed change of state) must lose something which it formerly had, or it must gain something which it formerly had not; and, in either case, its elementary nature would be destroyed. And hence it is said that a particle in motion or at rest, would for ever continue in motion or at rest. unless by virtue of other forces external to, and acting on it.

If a second particle be supposed capable of acting, and which now acts with the first, then the change which each has conspired to bring about will be the effect. Thus, for example, gravity is not spoken of in a particle of matter in relation to pure space, but in relation to anotherparticle in which the like force exists. Thus, suppose pure water to be formed by a particle of oxygen in combination with a particle of hydrogen, the causes of such combination will be in the oxygen and also in the hydrogen ; for an absolute inactivity in one or other particle would for ever prevent their mutual action on each other. Thus. the cohesion between the particles of water, proves, that the causes thereof are equally in or about each particle; for no possible reason can be assigned why they should appertain to one, rather than to another particle. Thus a living seed, in given conditions (warmth, moisture, &c.), will grow; these conditions are as requisite to its growth, as the life itself-both are requiredall the life in the world could not give growth to a seed wanting such conditions; similarly as those required conditions could not give growth to a dead seed. Thus, any idea requires an object in the mind, and a consciousness of that object; take away the one or the other, and the effect or idea is impossible; and by whatever complicated organization the object acts on the mind, and the mind, by its consciousness, on the object, still it is necessary that both contain the causes of the idea.

The like might be said of all phenomena with which we are acquainted, (as we shall more at large endeavour to shew, under the next head). Hence, for any change or effect whatsoever, an efficient requires a co-efficient.

5. In any phenomenon some causes may cease,

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while the effects still continue; and other causes are in their nature as durable as their effects.*

It is very requisite to distinguish between these two sorts of efficients. First, the occasional efficients, which admit of great diversity, and which may cease although the effect remains; and secondly, the proximate efficients, which, in a given phenomenon, are always the same, and which must continue while the effect continues. These last are they by which a quality is, and without which that quality could not continue: are they which, in the words of Bacon, "ascertain that quality universally, and accompany it everywhere." Thus, soft clay receives and holds an impression given by another body, when the body which gave the impression is removed; the impression is received and retained by virtue of causes in the clay itself, and the body which gave the impression acted merely as the instrument, to set them at work. Thus, a particle of any sort, thrown into a saturated solution of a crystallizable salt, disposes the salt to assume a crystalline form according to laws or causes peculiar to

* The different efficient causes, and the examples of them, given by many logicians, are destitute of analytical procedure; and cannot with advantage be employed as guides in inductive science. That the reader may judge for himself, we subjoin a few examples:---Proximate efficient, as the father of his child. Remote efficient, as the grand-father to his child. Productive efficient, as the mother of the child. Conservative efficient, as the nurse of the child. Necessary efficient, as fire which burns wood. Physical efficient, as fire of the destruction of a house. Predisposing efficient; as a short neck, and robust frame of apoplexy, &c. &c. that salt. Thus fire, applied to the living body, gives pain; and to gunpowder, it inflames. The fire may die away, but the pain, and the combinations into which gunpowder is changed, remain; and these effects continue, by virtue of causes in the organized living body, and in the elements of gunpowder.

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The occasional efficients are required to give an action to a fit subject. The proximate efficients, are those on which that fitness depends, and are necessary to receive, and to keep or sustain the action so given. The former are as the agents by which natural processes are developed, and merely serve to bring into play, or to make manifest, or to give a new determination to, latent or concealed structures, qualities or motions. They are, to give a homely illustration, as the scaffolding to the erection of a house, or as the instruments of a workman to the work which he And it is evident that, in the enquiry performs. into the nature of structures, qualities or motions, occasional causes can only give us a clew, as it were, to an analysis of them; can only be as a help in practice-they cannot by themselves open out to us, those laws on which such structures, &c. depend, or by which they are regulated, and therefore cannot by themselves much contribute to real knowledge.

That both kinds of efficients are required in every change, further appears. 1. Because without some occasional efficient, the condition of a

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body could not be altered. 2. Because, with the same occasional efficient, we can produce different forms, on different bodies, as hardness in clay, and softness in wax, by fire. 3. Because, with different occasional efficients, we can produce the same form, as death, by over feeding, and by starvation, &c. Many authors of late, however, who have made especial enquiry into the nature of causes, seem but little to have regarded this difference between them. Thus they tell us that the application of fire to wax and iron, in given conditions, liquefies them; that the heat of the fire is the cause, and that the liquefaction spoken of is the effect; and here they leave off, as if the whole subject were sufficiently investigated and concluded; or as if there were an omnipotent activity in fire, and an essential passivity in the body acted on (wax or iron); in fine, as if the liquefaction spoken of, were merely an effect, without any admixture of causes whatsoever. 'Now we need only make trial with fire on another body, as gunpowder, and liquefaction not ensuing, it is certain that something indispensable to liquefaction is contained in the iron, which requisite is not in the gunpowder. If, then, heat be supposed to give a certain motion to the minute particles of iron, by which the cohesion of each for another is lessened, and liquefaction of the mass ensue ; this motion among the particles of iron, must have its proper causes in or about those particles, which admit of this motion ; else there

is no assignable reason, why any other body, common salt or gunpowder, by the application of a like heat in similar conditions, should not also take on a similar motion and form. The difference of the action of one quality (heat), on two different bodies, iron and gunpowder, can only be found in the different constitutions or states of those bodies which admit, the one of a liquid, and the other of a gaseous form. So that had we any other way, but by fire, of inducing this motion in iron, we should have as a result its liquefaction, as may be partly seen by beating iron with a hammer sufficiently. And precisely for the same reason we can bring about the decomposition and explosion of certain sorts of gunpowder, by means of a liquid and cold acid.

If we analyze in the least a complex phenomenon-for instance, wood changed and destroyed by the application of fire: smoke, flame, &c. are apparent effects; and these are eliminated from, or they accompany some bodies, while their elements are in progress from one condition to another condition, or from one combination to another combination. Fire in the above case, by raising the wood to a given temperature, served to liberate its elements; and the smoke, flame, heat, &c. are effects of the formation of other combinations, as of water, carbonic oxide and acid; which have their causes of combination in their constituting elements, oxygen, hydrogen, and carbon, and which have on the whole a

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greater specific heat in their separate state, than in the said combinations, so that heat naturally flows from them, while they are in passage from the former to the latter state.

It cannot be reasonably doubted, that if any quality, say heat, contained the whole sum of causes of the effect said to be produced by it on one body, that the precise same effect would result by its application to any other body, on which it could act-and that effect would be of the same nature with the cause-it would be heat and heat only. Such a cause could not produce difference in bodies: it could not in the same quantity or in different quantities make one body or different bodies solid, liquid or aeriform; it could not force some bodies to combine and others to separate; it could not give transparency to this, and opacity to another body, &c. For these different effects, there must be different physical causes, which can only be found in the different natures and states of those bodies; and the analysis of these, is the only method we have for determining "the forms or laws of simple natures," (as of life, heat, light, gravity, electricity, &c.) to which it is ever the chief aim of science, still more closely to approximate.

The error, in taking the occasional for the proximate efficients, is inveterate; and we have examples of it in many authors; and oftentimes the conclusions on the former, being unexceptionable as regards sense, are made universal as if they were drawn from the other. We may instance the conclusions-that "there can be no bile without a liver-no thought without a brain." If these propositions are to be taken in the same sense with the following-that there is no motion without matter, which is as the genus to the species motion-and which matter seems to be inevitably included in our idea of motion-or that there can be no growth in plants or animals without certain elements communicated to them from external bodies, then the error is evident, for bile has its own peculiar nature distinct from the hepatic apparatus, and thought its identity exclusive of the brain.* If, on the other hand, making sense the measure of nature, it be meant that the liver and brain are the only possible occasional causes of bile and thought, the error is in principle the same, as if one should conclude that there could be no electricity, without a similar electrical organ to that possessed by some fishes. Again, some physiologists conclude,† that everlasting pain or pleasure cannot be. The inference is drawn from the state of animals here, i. e. from occasional

* Bacon speaks of the following as a considerable discovery, viz: "Quod etiam secundum sensum philosophandi sumi possit probatio, quod sint entia, et substantize separatæ et incorporeæ. Si enim virtus et actio naturalis emanans a corpore, subsistere possit aliquo tempore et aliquo loco, omnino sine corpore; prope est, ut possit etiam emanare in origine sua a substantia incorporea. Videtar enim non minus requiri natura corporea ad actionem naturalem sustentandam et devehendam, quam ad excitandam aut generandam."

† Bichat, Sur la Vie et la Mort.

causes acting on them, and which world (as we are at present constituted), to verrule lasting misery or happiness in the one. It will nevertheless be granted, that could we separate from such pain or pleasure in any creature, all counteracting influences, by which other states of mind, as of indifference, forgetfulness, &c. are produced-that then pain or pleasure, the one or the other, must continue, so long as thought itmelf continues; just as a body, when in motion, must continue in one direction, and with the same velocity, to move in pure space; that is, till other counteracting influences alter that direction, or bring it to a state of rest. In fine, there is no escaping from the above, and similar imaginary and unnatural conclusions, so long as, in any phenomenon, the occasional efficient is identified or confounded the formal causes.

6. Causes and aneous the their effects. When any phenomenon is considered as a complete whole, when all idea of change is separated from it—in other words, when its commencement, alteration, or destruction, is not thought of, then it is evident the causes must be simultaneous with their effects, because they co-exist. As, for instance, in any chemical combination, in pain now felt, in life or death, in a body now living or dead. It—is not, therefore, essential to the nature of a cause, that it should be prior to its effect, for were it essential, it must be so throughout, in every moment, while the phenomenon

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And such a law of causation would continues. render the continuance of a phenomenon, even for a moment, an utter impossibility. Priority and sequence being essential to every idea we can have of time, even the smallest portion of it, and every thing in nature existing in timeso the relation of cause and effect, in a stable phenomenon, being between co-existencies, fall of necessity, in duration-but then this is true the relation itself and altogether, and not of its parts taken separately, as if each happened in different portions of duration, for between co-existencies this would be impossible." If I meet with a particular body which I know by experience to be a salt, composed for instance, of carbonic acid and lime-it is certain that the causes and effect are in that salt, at the moment I meet with it, co-existent. For the causes which give, and which continue the combination, have their full effect in the combination. There cannot be a doubt that if a cause be truly defined, or distinguished as prior to its effect-that it must be prior to it in all stages of that effect-they could never co-exist. So that such a salt having its causes in the carbonic acid and in the lime, would at the very moment of its formation, be again -

* The belief in the priority of a cause, is so rooted in the mind, that any other doctrine has but little chance of being read or listened to. This is the more to be wondered at, because the most subtle and powerful known agencies in nature, gravity, electricity, life, heat, light, &c., in all bodies in which they are found, proclaim an unequivocal co-existence of causes with their effects.

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decomposed; for the nature of time, which is successive, would not admit of its continuance.

If then, the cause be prior to its effect, it will be so at the commencement of a phenomenon; and its nature will be so far altered, as to be simultaneous with its effect at other times. Now how shall we determine this priority at the commencement? It is certain that it must be of one value or quantity in one motion or velocity, and of another value in a greater or less motion or velocity, as in light, sound, &c. And so by this. doctrine, the cause could not be, rigorously speak ing, "immediately and invariably prior to its effect"-for such priority in respect of the quantity of time, would vary according to the nature of the particular cause, as for instance it would vary according to a swift or slow motion. And so other influences might intervene to counteract the effect altogether; and the cause might not always, but only sometimes have an effect.

It is very requisite here to bear in mind the distinction between causes, and those elements or things, which may be said to contain the causes. The elements, say a and b, when put together, or acting on each other, constitute c; a and b, as elements, were prior to c, which depends not only on the particular constitutions of a and b, but also on their relative positions. That is, they were causes of c, precisely when they acted one on the other. If it be said that they were causes before such action, of what were they causes?

certainly not of c, for no one part of c can exist till a and b act on each other. In other words if they need not act on each other to be causes of c-they are causes of nothing-which surely is that they are not causes. The sun's light, for instance, did not in the beginning reach the earth for several minutes; during seven minutes it was not the cause of light on the earth, for there was no light; and when its light reached the earththat it might be diffused sufficiently, it was forced to obey those laws implanted in those bodies which compose our atmosphere. Thus the magnetic force in the magnet, and in the needle. The first inclination in the needle to approach to, or to recede from the magnet-will be the moment in which they begin to act the one on the other; that is, the first moment of cause and No other moment prior to this, can be effect. given, in which the magnet and the needle, would be in relation with each other. So also in a chemical combination, an acid or a salt, &c. The elements in such combinations, by a sort of mutual electrical attraction or disposition of their molecules towards each other, combine. The causes and the effect commence when that attraction or motion between the molecules commences, and so on. Therefore, in that identical portion of time in which the cause begins, its effect also begins.

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This is true universally, although such terms as the remote cause would seem to imply a prior existence to its effect—prior indeed to some other effect in an event, which event may have taken minutes, years, or ages, for its completion. Α remote cause has its natural remote effect, which is as different from another effect in the complex production, as the sensation of sweetness from the sugar which occasioned it-remote cause never could produce the whole effect, as sugar alone never could be the cause of tastc. In this, the correct sense of the remote efficient, it is simultaneous with its effect-otherwise there would be, as has been said, a cause without an effect, or the same thing would turn from cause into effect, by the lapse of moments. And if the remote efficient be applied to phenomena, as when it is said that electricity is the cause of lightning and of thunder, it is also to be understood, that these last are the natural effects of the laws of light and of sound. So also when it is said that a spark is the cause of the explosion of a magazine of gunpowder, or that the season of spring is the cause of the fruits in autumn, or the parent the cause of the man, the acorn the cause of the oak, &c.; in each of these and the like cases, an almost infinite series of successive causes, with their effects, in individual bodies, are bound up together, which we are apt to overlook, or to consider as if they constituted truly and merely one prolonged effect.

THE END.



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