DAWES HICKS LECTURE

PRE-ESTABLISHED HARMONY *VERSUS* CONSTANT CONJUNCTION: A RECONSIDERATION OF THE DISTINCTION BETWEEN RATIONALISM AND EMPIRICISM[1]

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THE grouping of European philosophers of the seventeenth and eighteenth centuries into rationalists and empiricists seems to me to be unfortunate and unhelpful. It suggests that there are two self-contained mutually incompatible sets of views, which are clearly demarcated and based on opposing principles: one claiming that the source of all substantial truths about reality is reason; the other claiming that all knowledge derives from experience. To divide these thinkers into Continental rationalists and British empiricists is even more misleading. It suggests that the grouping of people with opposing sets of beliefs and theories coincided with their nationalities.

Not only did thinkers like Descartes, Spinoza, and Leibniz take great interest in the experimental sciences of their day, they also thought that the data we obtain from our senses played an important role in the formation of our knowledge of the world.[2] On the other hand, as J. MacIntosh has pointed out, Berkeley went so far as to write that intellect and reason are alone the sure guides to truth,[3] and even Locke, who proclaimed that all our knowledge comes ultimately from the senses, defended a theory of knowledge in which an indispensable role is played by elements which, as many have pointed out, cannot be derived

[1] In writing this paper I profited from comments on an earlier version made by David Wiggins and by my colleagues, Myles Burnyeat, John Watling, and Richard Wollheim.

[2] This has been argued in a convincing way by others. See, e.g., R. M. Blake, 'The role of experience in Descartes' Theory of Method', *Philosophical Review*, 38 (1929), and E. M. Curley, 'Experience in Spinoza's Theory of Knowledge', in *Spinoza*, ed. M. Grene, p. 25. For Berkeley's views on the importance of reason see J. J. MacIntosh, 'Leibniz and Berkeley', *Proceedings of the Aristotelian Society*, 1971. It can be seen, however, that I do not agree with much of what he says on Leibniz on causation.

[3] Berkeley, *Siris*, p. 264.

from sense–experience. We will see that the same can be said of Hume's theories.

What I would like to draw your attention to today is the view of causation developed by Leibniz, who is often thought to be the rationalist philosopher *par excellence*. His views on causation are widely misunderstood. A proper understanding of them will go against the received view of the contrast between rationalism and empiricism. Three points in particular will be important.

The first is the considerable similarity between Leibniz's theory of causation, namely the doctrine of pre-established harmony, and the opinion of Hume on this subject so familiar to the British philosophical public—in contrast, for example, to the views of Descartes or Locke. We shall see that the experiential evidence for pre-established harmony is not different from the experiential evidence for constant conjunction.

Second, by examining how Leibniz linked his views on causation with the concept of the nature of things and of force, we shall see, despite all their similarities, the ultimate difference between Leibniz's views and those of Hume. It is impossible, however, to do justice to this difference in terms of the ordinary stereotypes of rationalism and empiricism. It involves Leibniz's belief in the possibility of *a posteriori* knowledge of real essence, which Locke thought unknowable.

Third, it should become apparent how Leibniz's views compare with recent theories of causal explanation: especially theories related to counterfactual conditionals and nomological deductive theories. I hope that the comparison will suggest how misguided are the standard criticisms of Leibniz's account of causation.

1. *Hume and Leibniz*

It is well known that Leibniz denied the philosophical doctrine of causal interaction. It is seldom understood what it was that he was denying. Russell, for example, wrote, that, according to Leibniz, 'nothing really acts on anything else'.[1] But what is the difference between really acting on something and seeming to act on it? Many people seem to have thought that Leibniz's denial of causal interaction amounted to the claim that there was no connection between what happens to one thing and what happens to other things. If this were a correct interpretation, it would be a mystery that Leibniz was always interested in the investigation of the laws of dynamics and the correct mathematical

[1] *The Philosophy of Leibniz*, p. 93.

formulation of them. He wrote several treatises on dynamics. His disagreement with Descartes and with Newton about the laws of dynamics never concerned the question whether there exist laws stating the interconnection of material things. They related only to how the laws should be formulated. Noticing law-like regularities was what made nature comprehensible to men. As Leibniz writes, the central concept of dynamics was that 'there is always a perfect equivalence [by which he means equality of energy] between the full cause and the whole effect'.[1] Leibniz is far from denying the existence of conditions or events that are causes and conditions or events that are effects. Nor does he deny the importance of the causal explanation for macroscopic physical things. As far as macroscopic physical things were concerned his views were very much in the spirit of the mechanism of his time. As he says, 'But in phenomena everything is explained mechanically and so masses are understood to impel each other'.[2]

Some philosophers have said that Leibniz's denial of causal interaction concerns only monads, which were, strictly speaking, the only individual substances for Leibniz, and therefore has nothing to do with the causal explanation of physical events, which are according to Leibniz phenomena. It must be recalled, however, that Leibniz first expressed his denial of causal interaction in an article concerning the mind-body problem; and in his discussion on causation he repeatedly refers to the relationship between mind and body, as well as to that between the mind and phenomenal changes in the outer world. The body is an aggregate according to Leibniz—an infinite complex machine—and also something we identify as a spatial, extended thing, i.e. a phenomenon. Leibniz even wrote that his system of pre-established harmony has the advantage of conserving what he calls the 'great principle of physics', the inertial laws of bodies, in its full rigour and generality.[3] The scope of the doctrine is not as limited as these critics have supposed.

[1] Reply to Abbé Catelan in *Nouvelles de la République des Lettres*, Feb. 1687.

[2] Letter to de Volder, 1703. *G* II, p. 250; *L*, p. 529. (*G* is Gerhardt, *Philosophische Schriften*, vols. I–VII. *L* is *Leibniz's Philosophical Papers*, ed. Loemker, published by Reidel.)

[3] 'Consideration on Vital Principles and Plastic Natures', 1705. *G* VI, p. 541; *L*, p. 587. In a letter to Arnauld he reflects that his denial of causal interaction between corporeal substances may be even more surprising than his denial of causal interaction between monads, since action of the body on another may appear so undeniable. Letter to Arnauld, 14 July 1686. *G* II, p. 58; *L*, p. 338.

Many popular commentators have claimed to be puzzled by an analogy, which Leibniz made in the *Monadology* for a popular audience. He says that monads have no windows; they are like mirrors which reflect the rest of the universe. But there is no puzzle here. Leibniz does not use the contrast between the mirror without windows and a thing with windows to point to an esoteric fact hidden behind appearances. His concern is with a familiar recognizable truth. The analogy reminds the reader of something he should already know about if he is to think about the problems without preconceived ideas: viz. what is involved in causal explanation. When we think that a moving billiard ball causes another ball to move by impact, we do not need to suppose that something goes out of one ball and into another. The motion of one ball does affect the motion of the other ball. But it is the velocity, motion, and direction of *each* ball that changes. The denial that there is something literally transmitted in these causal transactions is the point of Leibniz's analogy of windowless monads. Whereas we do think of a reflection in a mirror as a typical case of a state caused by external events. Corresponding to the changes in the vicinity of the mirror, there will be changes in the image on the mirror—but not because a bit of the external world enters the mirror. The (intact) mirror by its (very) own nature, changes its state in a manner corresponding to the change outside. Of course, light waves of certain kinds travel to the surface of the mirror. But they do not go into it. If anything, Leibniz's analogy of the mirror shows not only that he believed in the existence of what we would now call causal relation; it shows that he thought it much more far-reaching than is normally assumed. Every entity has a causal relationship with everything else in the universe.

I therefore think it is misleading to write as many have done[1] that according to Leibniz there is no such thing as causal interaction since each substance is separately 'programmed' for the whole of its history. Each substance has its nature. Given that the substance finds itself in a universe with other things, this nature programmes its history. The nature of the substance is such that the substance will be affected by other things, in a specific way, and is such that the substance will affect other things in a particular manner. The nature of the monad also determines the nature of aggregates of which it is a constituent, and determines how the aggregate is affected by other aggregates. Leibniz writes, 'Who would deny that a substance is modified

[1] e.g. N. Rescher, *The Philosophy of Leibniz*, p. 83.

through the effect of another substance, for example, when a body is thrown back by an opposing obstacle?'[1] Leibniz goes on to say that we shall, therefore, have to use the concepts of *both* bodies in order to know distinctly the recoil of one of the bodies. He, nevertheless, is careful to add that the recoil is only a mode of that body—it is not as if something alien to the body has come into the body, like a disembodied force, as if from a window, to make it recoil. It was the very nature of that body, with its particular mass and elasticity, to recoil the way it did, given the impact of the other in those particular circumstances.

Now, although the physical objects which we perceive were, according to Leibniz, phenomena of aggregates, interacting with one another by collision and impact, Leibniz did say of monads, which make up these aggregates, that he did not 'admit any action of substances upon each other in the proper sense since no reason can be found for one monad influencing another'.[2] We must, however, give an interpretation of the denial of action 'in the proper sense' between substances, which is compatible with his theories of nomic regularities between phenomena of aggregates. A helpful way is to see what Leibniz was opposing.

The doctrine of causal interaction which Leibniz rejected is not a doctrine of what we today mean by cause and effect. It was a doctrine which was in traditional scholastic textbooks of his time and one which had slipped without much resistance into the vocabulary of the Cartesians and the new physicists: the doctrine of influx.[3] According to this view, when A interacts with B, a form or a quality or a mode which A has, passes from A to B. Thus, if a hot metal bar, A, heats a cold metal bar, B, the heat which was in A is said by the view Leibniz was attacking to move from A to B. If a moving object A collides with another object B, which is at rest and moves it, then the motion of A is said to be transferred from A to B. But Leibniz thought that this theory entailed an absurd idea—the idea that qualities can be detached from substances. Thus, in the passage of the *Monadology*,[4] where Leibniz asserts that monads have no windows

[1] Letters to de Volder, July 1701. *G* II. p. 226; *L*, p. 524; *Leibniz: Selections*, ed. Wiener, p. 169.

[2] Letter to de Volder, June 1703. *G* II, p. 251; *L*, p. 530.

[3] Suarez's definition of cause was 'what flows being into something else'. Suarez (1548–1617), *Disputationes Metaphysicae*. For Leibniz's fierce criticism of this view see Preface to an edition of Nizolius, 1670. *G* IV, p. 148; *L*, p. 126.

[4] *Monadology* § 7 *G* VI, p. 607; *L*, p. 643.

through which anything could enter or depart, he explains that this is so because 'accidents cannot be detached from substances and march about outside of substances as the sensible species of the Scholastics once did'. Leibniz is not saying that the Scholastics, nor his physicist contemporaries, put forward a doctrine of detached accidents. He is saying rather that the Scholastics' talk about the transfer of forms or the Cartesians' talk about the exchange of motion, if taken literally, commits them to such a doctrine. For example, Suarez has defined 'cause' as 'what flows being into something else'. But what is it to flow being? Leibniz remarks that even the [syntactical] construction of this phrase is inept since 'flow' (*influere*) is used by Suarez as a transitive verb, whereas we only understand its use as an intransitive verb. (What is it that does the flowing? And what is the 'being'? Is it another substance or an accident?) Leibniz concludes that this is a barbarous and obscure definition. For 'flow' is only to be understood metaphorically, and the definition is more obscure than the concept of cause which it defines.

But is Leibniz right? We do say, for example, when a physical body A collides with another body B, that there is a transfer of momentum. We must realize, however, that this is a metaphorical expression. What we mean by this is that there is a correlation between the decrease of momentum of body A and the increase of momentum of body B, and that a certain conservation principle is observed. We do not mean that any transfer really takes place.

What could transfer themselves? Are they substances or qualities? Let us follow Leibniz's query. If the mind and body are substances then 'it is impossible', Leibniz says, 'to conceive of material particles or of species or immaterial qualities which can pass from one of these substances into the other'.[1] How can a material particle get detached from the body and then pass into a mind which is not extended, or how could an immaterial quality—say intelligence—get detached from the mind and pass on to a material body? It is evident in the case of mind and body, which are supposed to be different categories, that nothing that belongs to one category, whether it be bits of the substance itself or the attributes peculiar to the substance, can transfer itself to the substance of another category. The difficulty remains, however, even between causes and effects, which are events belonging to the same category.

[1] 'Second Explanation of the New System', *G* IV, pp. 498–9; Wiener, p. 118.

There are then two quite distinct points Leibniz was making in his denial of the traditional doctrine. Leibniz's first point is that to think of free-floating attributes or forms moving from one thing to another is nonsense whether this be between things of different categories or of the same category. Secondly, he holds that to explain causation as *requiring* particles to move from one thing to another leads one to an infinite regress. Transfer of particles does often happen between aggregates. As we will see, Leibniz believed that parts of all bodies are changing continuously. Understanding the pattern of motion often makes us see why certain corresponding changes happen in bodies. But we cannot go on explaining *why* these constituent particles move, by further exchange of particles. (It may be pointed out that Quine, together with many contemporary physicists, has said that causality is the flow of energy. But again we must be careful what is meant by 'flow'. That the propagation of energy can be expressed by wave equations does not mean that we can say of the energy, which is said to flow, that it is the same energy which moves from one place to another, in the way in which we can talk of the same water flowing from one place to another. We are merely talking about the quantity of energy at each contiguous place.) And transfer must be excluded between the simplest entities. By definition, the simplest units, be they Leibniz's monads or the fundamental particles (if contemporary physics admits such ultimate fundamental elementary particles), are not made up of further particles. So not all nomic regularities —nor all of what we call cause and effect—can be explained in terms of exchange of constituent particles, if one accepts as Leibniz did that there are ultimate simple entities.

So much for what he was denying. What was he affirming? We believe we can understand many phenomena. We do give causal explanations of what happens and we predict what will happen, often successfully. Now, we may believe, as, for example, Professor Anscombe has done, that our concept of causation comes from that of derivation, which can be immediately grasped; i.e. that we often perceive that one thing causes another, by simply grasping that the latter derives from the former, prior to any idea of regularity or necessitation. Or we may believe that our causal notions are dependent on something else. Leibniz was of this view, despite the fact that he was quite clear that this something else was not 'influx'. It was, therefore, necessary for him to give an account of what we call cause and effect in a way which does not require exchange of particles

or qualities. In this way Leibniz arrives at a view which is very close in certain respects to that which David Hume was to express just over half a century later. Leibniz asserts that 'what we call causes are in metaphysical rigour only concomitant requisites'[1] (*quae causas dicimus esse tantum requisita comitantia in metaphysico rigore*). Compare Hume's claim in the *Treatise* that 'the relation of cause and effect totally depends on the constant conjunction of objects'.[2] Hume even goes so far as to define a cause in the *Enquiry* 'to be an object, followed by another, and where all the objects similar to the first are followed by objects similar to the second', or in other words where, if the first object had not been, the second never existed.[3] In this definition, which is *one* of at least two quite different definitions of causation which Hume gives in both the *Treatise* and the *Enquiry*, Hume is saying that a cause and effect are concomitances, and that the cause is a requisite for the effect: but that is exactly what Leibniz says. Notice that Hume's definition here (unlike his other definition) is not an epistemological one. He is not saying that constant conjunction of impressions constitutes causation, or that regular observation of conjunction of objects makes causation; he is not even saying that all the objects similar to the first have in the past been followed by objects similar to the second. Since causes and effects are said to be objects, they can exist even without being observed. What Hume is saying is that even when cause and effect *are* observed, no further necessary link between them can be observed.

Similarly, half a century before Hume, Leibniz had asserted that for causality the only thing one need require, and the only thing one can directly observe, is concomitance or the harmony itself. In other words, what one observes in observing a harmony is nothing other than the constant conjunction of which Hume was to speak. In a letter to the Dutch physicist de Volder, Leibniz recounts the reply he made to a French Jesuit, Tournemine, who approved of his doctrine of the pre-established harmony—as it explained well the agreement we perceive, for example, between the mind and the body—but said that he still wanted to know the reason for the union between the two. Tournemine claimed the union was different from the agreement. Leibniz replied that this metaphysical union '. . .which the

[1] 'First Truths', *c.* 1680–4. Couturat, *Opuscules et fragments inédits*, p. 521; *L*, p. 269.

[2] *Treatise of Human Nature* (Selby-Bigge edition), p. 173.

[3] *An Enquiry concerning Human Understanding*, Section VII, Part 2, p. 76.

scholastics assume in addition to their agreement, is not a phenomenon . . . there is no concept and therefore no knowledge of it'. It follows that no reason can be given for it.[1]

Leibniz criticized Locke's definitions of cause as well as the traditional view. According to Locke, cause is that which produces any simple or complex idea and the effect is that which is produced. Not only did Leibniz find in Locke's talk confusion between an idea and what it is an idea of; even if we allow cause to be what produces an event or a change in the object, the explanation is empty. As Leibniz writes, 'in saying that efficient cause is that which produces . . . you make use only of synonyms'.[2] This was a point that Hume was to raise, in almost the same words in his *Treatise*.[3] Leibniz then was not denying causation when he rejected the metaphysical doctrine of causal interaction. He tried to clarify what his denial amounts to and writes, 'Just as Copernican can talk truthfully of the rising of the sun . . . I believe it is very true to say that substances act upon one another, so long as one understands that one is the cause of the change in the other as a consequence of the laws of harmony'.[4]

Nothing which Leibniz says leads to the view that the cause has temporally to occur before the effect. It is even easier to establish regular concomitance between two kinds of contemporaneous events. Indeed, many of the examples of concomitances that Leibniz uses are contemporaneous ones. Thus, in so far as Hume was to insist on the temporal precedence of cause in his elaboration on causation, there is a difference between what Leibniz says on concomitance and what Hume was to say on constant conjunction.

We will see, however, that when events are not contemporaneous, Leibniz claimed that whatever is the cause must precede the effect. This is related to an important difference between Leibniz's view and that which Hume explicitly stated at least in the *Treatise*. And here I come to the second point of my lecture: by linking the concept of causation to the nature of objects and to the concept of energy Leibniz succeeds in giving an objective realist basis to the causal concept, despite the fact that he thinks that causality consists only of a certain kind of concomitance.

[1] Letter to de Volder, 19 Jan. 1706. *G* II, p. 281; *L*, pp. 538–9.
[2] *New Essays Concerning Human Understanding*, II, 26, § 1.
[3] *Treatise*, Part III, Section 4, p. 157.
[4] 'Explanation of the New System of the Communication of Substances', 1695. *G* IV, p. 495.

2. *Concomitance and the nature of things*

Regularity or regular concomitance is what makes nature comprehensible. The necessity of this concomitance is not produced by any propensity of the mind such as that which comes from habit. The mind may well acquire such propensities and certain expectations, some of which may be right and some wrong. But the fact that certain perceptions follow each other is itself based on concomitance between changes in the external world and changes in one's perceptions. If the regularity of the changes in the external world have grounds at all, be they causes and effects or two different effects of the same cause, it comes from the nature of things in the external world. Change from night to day is due to the rotation of the earth. The fact that *we observe* night followed by day repeatedly is no ground for claiming that we will continue to have similar experiences. If we understand that the regular change in our perception comes from a regular change in the outside world, in this case the earth, and, if we understand that this rotation of the earth comes from its stable nature, then that is the basis for expecting our experiences to continue. Leibniz speculates on what he calls the great analogy between the earth and the magnet. And, just as magnetism depends on the nature of the matter of the magnet and the matter of the things attracted to it, so regularities in nature come from the nature of things.[1] Leibniz does not think that necessity is a quality of an object, or even a perceivable quality of a relation, any more than Hume did. But it is not something conjured up by the mind. It is a feature of certain regularities in nature, which is based in turn on the nature of things.

Think of the example mentioned above of two bars, one hot and one cold, standing adjacent to one another. Eventually, the bars would be of the same temperature. Even if the size of the bars and the initial temperature of the two bars were fixed, the time it would take for the two bars to become the same temperature would differ enormously if the bars were made of copper, or if they were made of porcelain. This entirely depends on the nature of copper or porcelain itself. If it were just a question of disembodied heat travelling from one bar to another, there would be no difference in the time required.

In one of his early works, Leibniz had defined the nature of a

[1] Letter to Huygens, Sept. 1692. *GM* II, pp. 141–6; *L.* p. 415.

thing as the cause in the thing itself, of its appearance.[1] When in 1682 Robert Boyle caused a controversy by writing an attack on what he called 'vulgarly received notions of nature', and suggested that the vague term 'nature' be replaced by the more precise term 'mechanism', Leibniz wrote a paper called 'On Nature itself, or on the inherent Force and Actions of created Things'.[2] According to Leibniz, any particular mechanism can be understood by something further—the inherent force which endures in the things that enter into mechanical laws. Thus, it is not correct to say that nature is the mechanism of bodies. The force of energy is in the bodies permanently, even when they are at rest. Force is not identical with the mass spoken of by his physicist contemporaries, which was something passive. Force is active in that it corresponds, Leibniz says, to the law which gives the series of states of the body in motion—given what is happening in the rest of the universe. There is no inconsistency in asserting that everything happens mechanically in nature: that is, according to certain mathematical laws that express a relation, which holds between a plurality of things, and saying at the same time that everything acts according to its own nature.

Let us remind ourselves of Leibniz's own formulation of the doctrine of pre-established harmony. He gave this name to his system of explanation comparatively late in life, and talks of this doctrine by this name only in connection with the mind–body problem where efficient causes and final causes seem to meet. Pre-established harmony is a system of explanation, which is applicable to all substances, however, and is based on his view, which he espoused very early, about what is involved in all causation, even that involving only efficient causes. (One may compare here the Cartesians, who expressed their doctrine of causal interaction only in connection with the mind-body problem, but never thought that causal interaction operated only between mind and body.) Leibniz says that the harmony or correspondence between the mind and body is not a perpetual miracle, but the effect of the nature of each of them, and is no more nor less miraculous than any regularity between the states of change of any natural thing. It is 'a perpetual wonder', he writes, but 'a perpetual wonder as many natural things are'.[3]

Thus, Leibniz claims that it is true not only of the soul, but of

[1] 'An Example of Demonstrations about the Nature of corporeal Things drawn from Phenomena', 1671. *L*, p. 142.

[2] 1698. *G* IV, pp. 504–16; *L*, pp. 498–508.

[3] Leibniz–Clarke Correspondence, Letter V. *G* VII, p. 412; *L*, p. 711.

every other real unity that '*everything in it must arise from its own nature by a perfect spontaneity with regard to itself, yet, by a perfect conformity to things without*'.[1] This he calls the doctrine of pre-established harmony. What does Leibniz mean? What would it be for a thing to lack spontaneity with regard to itself? What is added by 'spontaneity'? This is added in order to rid people of the notion that change could happen to things in ways quite unrelated to the nature of the things themselves. Every change, every event that occurs to a thing, expresses the nature of the thing. As Leibniz explained to Pierre Bayle, a thing continues to change when it changes 'always following a certain law . . . And this law of order which constitutes the individuality of each particular substance, is in exact agreement with what occurs to every other substance and throughout the universe.'[2] The acknowledgement of the pre-established harmony then is nothing other than the recognition that things are created with natures such that they behave in law-like regularity in the universe. Although the nature of each substance is different, many substantiating a different set of laws and each substance substantiating even the same laws in different ways, the laws themselves apply to all substances, and thus the concept of 'law' here does not become empty and trivial, as Russell feared.

Leibniz claims that to believe in the existence of the laws of nature is not to believe in the existence of laws disembodied. God cannot create disembodied laws. Substances and laws are fixed simultaneously. In creating a universe governed by law-like regularity, God does *not* carry out two distinct acts of creation. By establishing the laws, God does not merely give us a way of describing things by the extrinsic or contingent relational properties.[3] To say of God that he established laws is, Leibniz insists, to say that he conferred on things some imprint that endures within them. We should not, however, think of this in too pictorial a manner. The physical world with its mass has its laws of nature within it. And this is to say that each thing down to the simplest substance in it acts in accordance with the internal force and laws of its own nature. This is the only fact

[1] 'New System of the Nature and Communication of Substances', § 14, 1695. *G* IV, p. 484; *L*, p. 457.

[2] Clarification of the difficulties which M. Bayle has found in the new system. *G* IV, p. 518; *L*, p. 493.

[3] It is not that 'the law had bestowed upon things only an extrinsic denomination'. 'On Nature itself, or on the inherent Force and Actions of created Things', 1698. *G* IV, p. 507; *L*, p. 500.

which is common to things on the macroscopic level, i.e. aggregates, and to simple substances. As he writes, 'For me nothing is permanent in things except the law itself, which involves a continuous succession and which corresponds in individual things to that law which determines the whole world.'[1] In the case of a simple substance, *ex hypothesi* it has no structure. The only way we can specify its nature is to give the law which generates the events it partakes in, in aggregation with other simple substances.

In fact, Leibniz says the foundation of laws of nature is the principle of the conservation of active force or energy and he defended his view against Newton's spokesman, Clark. (Clark had claimed that when soft inelastic bodies collide there is no conservation of energy.) But how can the law of conservation of energy be embodied in individual things? Does this not lead to the view that the momentum of each body remains constant, which is obviously false? No. Leibniz is not committed to such a blatant mistake. What he says is that each thing embodies a law such that the thing acts in correspondence with other things so that *the totality of energy in the world is preserved.* This is not a correspondence by 'fluke', since for Leibniz each substance by its own nature also registers at each moment what is happening to the other things in the world. We can see that the concept of laws of nature is inseparable from the concept of energy. All that we perceive is magnitude, figure, and motion. But we can understand that the nature of matter is not merely extension, for instance, by perceiving that it is not the quantity of motion, which is constant. What we observe is a particular over-all relationship which holds for the plurality of things between direction and quantity of mass. At any instant we can measure the momentum of a thing. This is what Leibniz calls derivative force. By thinking about what we observe we obtain the concept of active force which resides in things. This is what Leibniz calls primitive force, or the nature of the thing, which is the law of the series of the changing momentum of the thing, given the states of the other things.

There are two trains of thought which lead Leibniz to his belief in the inherent active force of simple substance. First is his conviction that action must ultimately arise from something active. Anything that is merely passive, such as Descartes's matter whose essence is extension or a mere plenum, cannot bring about action. On the other hand, Leibniz believed that

[1] Letter to de Volder, Jan. 1704. *G* II, p. 263; *L*, p. 534.

inertia and impenetrability of matter was neither a primary property, nor a property derivable from the extension of matter, but needed to be explained by an active force in the thing itself.[1]

Second, Leibniz thought that the concept of extension was 'incomplete'.[2] In this context he understands by this what we mean by second order concept. Strictly speaking, this paper is not extended and white. It is extended paper that is white. Leibniz had said, as Frege was to say almost two centuries later, that number was a concept which depended on other concepts—sortal concepts. There must necessarily be something numbered. Nothing can be three and apples, though there may be three apples. Leibniz held that extension shares this feature with number and multitude. All extension is an extended something. Leibniz concludes, therefore, that what is extended is something prior to extension, something prior to plurality or repetition. This must be active force. Active force is ascribable even to a simple monad, which, on its own, has no extension.

Now, as is well known, Hume gave two quite different accounts for the necessity involved in causation. On one hand, he wanted to say that the necessary connection between objects, which is part of the idea of cause and effect is *nothing* but our propensity to pass from an object to the idea of its usual attendant.[3] On the other hand, he did say that causation depended entirely on the constant conjunction of objects, and not on the constant conjunction of our perceptions; and necessity seems to be ascribed to the relation of the objects themselves. This is most clear in the *Enquiry*, when in defining cause, he writes that 'if the first object had not been, the second never had existed'.[4] This is clearly a necessary relationship that exists between two objects, quite independent of whether anyone observes it or not. And *that* necessity cannot be explained just by the mind's propensity or custom or any psychological fact as Hume thought, even if it is also a psychological fact that we have an ability to recognize certain patterns and form certain expectations when we have repeatedly encountered causes and effects which hold between objects of certain types. Hume must have been influenced by his reading of Leibniz, when in one passage in the *Enquiry* he acknowledges that we can learn from the succession of our ideas only if there is agreement between our

[1] e.g. Letter to de Volder, Mar.–Apr. 1699. *G* II, pp. 169–70; *L*, p. 516.
[2] Ibid.
[3] *Treatise*, Part III, Section 14, p. 165.
[4] *An Enquiry concerning Human Understanding*, Section VII, Part 2, p. 76.

ideas and objects in nature, and says, 'here then, is a kind of pre-established harmony between the course of nature and the succession of our ideas'.[1]

It is Leibniz's strength to have explained causation in terms of concomitance or conjunction, and yet to have accounted for the necessity of the concomitance in the nature of the objects themselves. This also enabled him to link the concept of cause with the direction of time. He claimed quite clearly in at least one paper that, if one of two states which are not simultaneous involves a reason for the other, the former is held to be prior, the latter posterior.[2] Past states, unlike future states, can leave traces, or generate a process and thus affect future states. These traces or impressions remain in objects; processes go on in the external world, and not only in the mind of the observer. Thus, the temporal precedence of a cause is based on objective grounds pertaining to the external world, not merely on habits of the mind of observers.[3]

It might be thought that this difference between Leibniz and Hume is a simple reflection of the difference between rationalism and empiricism. One can perceive the repeated conjunctions, it may be said, but one cannot observe internal forces or past histories. The problem is not so simple, however. For one thing, Leibniz thought that there were observable differences between physical things, which acted out of the internal force which was enduring in them, and things which could be explained in terms of motion of passive matter. Our view about force is an assumption or a hypothesis, but it is based on our observation.

Leibniz thought that one could assess the probability of such hypotheses empirically. 'Some hypotheses can satisfy so many phenomena, and so easily, that they can be taken for certain . . . a hypothesis of this kind is like a cryptograph, and the simpler it is and the greater number of events that can be explained by it the more probable it is.'[4] There can be no empirical *proof* of a hypothesis for, as Leibniz goes on to say, the same phenomenon can always in principle be explained in several different ways, and, thus, no firm demonstration of the truth of a hypothesis can

[1] Ibid., Section V, Part 2, p. 54. This was pointed out to me by Dr. J. Watling.

[2] 'Metaphysical Foundations of Mathematics', *GM* VII, p. 17; *L*, p. 666.

[3] This claim of Leibniz does not by itself give us any adequate topological features of time. It is compatible with time being discontinuous. For him time is continuous because it is the order of all possible as well as actual states.

[4] 'An Introduction on the Value and Method of natural Science', *L*, p. 283.

be made from the success of a hypothesis. Nevertheless, according to him, empirical data do and must affect the way we accept or reject the hypothesis.

We must also notice that the ways we come to know the nature of macroscopic objects and the nature of simple monads are somewhat different.

(a) Complex objects

Everything that is extended and has parts, be it a clock or an atom of contemporary physics, is a complex aggregate. Leibniz writes that material bodies are almost like a river which always changes water or like the ship of Theseus which the Athenians were always repairing.[1]

In the case of complex objects, Leibniz did think that we can come to an understanding of how force operates by coming to know the structure (or 'contexture') of the object itself and of the changes that are occurring in it. For example, he writes that by coming to know a particular structure of a clock, whether it moves by spring or by wheels, we can understand why a hammer of a clock strikes when a given time elapses.[2] For even if we do not observe any force transferring itself out of the wheels and into the cog, because there is none, we can see how the equal quantity of motion in one is made to correspond to the equal quantity of motion in the other. (We can similarly see how certain electric phenomena correspond to the flow of electrons within a bigger conglomerate of atoms.) Leibniz was not persuaded by Locke that the real essence or real constitution of physical things is unknowable to us.[3] We are, as a matter of fact, ignorant about the constitution of many physical things, just as we have vague confused ideas about the qualities of many objects. But just as we may come to have empirical knowledge of the constitution of the clocks, we may come to have empirical knowledge of the constitution of more minute things. For example, he says, 'it is possible that bodies which are exceedingly subtle and cannot be caught or perceived by sense in one substance can be caught in another'.[4]

Locke had said not only that the real essences of things 'are unknown to us. We cannot discover so much as that size, figure

[1] *New Essays*, Bk. II, Ch. 27, § 4.

[2] Ibid., Bk. III, Ch. 6, § 39; Bk. IV, Ch. 6, § 7.

[3] Locke, *Essays Concerning Human Understanding*, III, p. 17.

[4] 'On a Method of arriving at a true Analysis of Bodies and the Causes of natural Things.' *G* VII, p. 267; *L*, p. 174.

and texture of their minute and active parts, which is really in them, much less the different motions and impulses made in and upon them by bodies from without.'[1] He went on to claim that such consideration should put an end to all our hopes of ever having the ideas of real essences. In so far as Locke admits the existence of these real essences—for which he, unlike Leibniz, thinks there is no possibility of empirical knowledge—he is the one who breaks the so-called canons of empiricism.

As will have been clear from what has gone before, Leibniz did not believe that we always *know that we know* the real constitution when we do. But having arguments of his own against the idea that *to know is to know that one knows*, he does not rule out knowledge of the structure of things by which we can comprehend the workings of their inner force.

In aggregates, which are complex processes of simple substances for Leibniz, there are exchanges of entities at all sorts of levels. We will understand the processes better by tracing the exchanges. However, it is not always the case that nomic regularities between complex objects at one level have to be explained by the movement and exchange of entities of a less complex level. What happens when a billiard ball hits another is not like what happens when the nucleus of an atom is split in a synchrotron and an isotope is made. It is not necessary, according to Leibniz, to account for the impact of the billiard ball by the transfer of particles. As I mentioned before, what is standardly called transfer of momentum is not literally a transfer of anything. A billiard ball A's motion does affect the motion of a billiard ball B, but it is the velocity and direction of each ball that changes.

(b) Simple substances

If there were ultimate elementary particles with no parts then we cannot have structural knowledge of them, and causes and effects between events concerning these particles could not be explained by further constituent particles going out of one elementary particle and going into another. We only observe the structure of the aggregate—an atom or molecule or aggregates of atoms—and we observe the corresponding motions of elementary particles within the structures. The same can be said of Leibniz's simple substance. By definition it has no parts and no further constituents. Leibniz concludes, 'Thus the action of one substance on another is not the emission or transplantation of an

[1] *Essays*, IV, Ch. 12.

entity as is commonly conceived'.[1] The possibility of fission of atoms only shows that atoms are not the elementary, or simple, substances in Leibniz's sense. Leibniz's arguments against explaining causation by emission of particles, unlike his arguments against detached properties, depend on his belief in the existence of simple, indivisible substances or ultimate particles (i.e. belief in a kind of axiom of regularity).

3. *Pre-established harmony and counterfactual truths*

I come now to the third and last point I would like to make today. It is to examine Leibniz's doctrine in the light of recent views on nomological explanation and on counterfactual analysis of causation, and try to defend Leibniz's view on the pre-established harmony from some traditional attacks. We will then try to see if in any sense we can say that Leibniz's doctrine is a rationalist view of causation as opposed to an empiricist one.

As we have seen, many philosophers have taken Leibniz's denial of the metaphysical doctrine of causal interaction and his doctrine of the pre-established harmony as saying that even if things *seem* to interact according to dynamic laws, they do so, as it were, by fluke, each substance acting out a pre-fixed programme, quite independently of whatever happens to other things. Leibniz is partly responsible for this, since he gives bad analogies to illustrate his doctrine (like that of the two clocks which always give the same time because they were set and wound up in the right way in the beginning. The difficulty about this analogy lies in the fact that one of the clocks can very well break down, or begin to lose time, without the other doing so); he also talks misleadingly about good and bad reasons for God's actions. Nevertheless, such an interpretation is odd because our talk of laws of dynamics is normally taken to entail the truth of certain counterfactuals. To say that the motion of object A after collision with object B can be explained by the laws of dynamics is to say, amongst other things, that had the mass of B or the direction or the velocity of the motion of B at the time of its collision with A been different then A's motion after the collision might not have been what it was. Leibniz thought in the same way. Far from believing that one object would behave in a fixed way, no matter what happened to other things, Leibniz thought that any difference in the state of other things would bring about a change to the object. (It seems to me that, if he errs, he errs in the opposite direction.) He was quite

[1] 'New System of Nature', § 17, 1695. *G* IV, p. 486; *L*, p. 459.

clear about the truths of many counterfactual conditionals, which followed from his commitment to the laws of nature or the pre-established harmony. He writes, '. . . in reality, because of the interconnection of things, the entire universe with all of its parts would be wholly different, and would have been another world altogether from its very commencement, if the least thing in it happened otherwise than it has'.[1]

What then is fixed in an individual when a harmony is pre-established? What is pre-fixed is the nature in each substance to act in accordance with other things, or to act and react to other things not at random but with mutual lawlikeness, whether individually, or in aggregates. In his words, it is 'this mutual agreement, regulated in advance in every substance of the universe'.[2] The pre-fixed nature of magnets and of iron is such that when iron is in the vicinity of a magnet it is drawn to it out of its very own nature in response to the nature of the magnet. Leibniz's own favourite example is perception. The nature of mind (which is a simple substance) is such that spontaneously, by its own nature, it perceives things external to it corresponding to the change in the person's body, which in turn corresponds to change in external phenomena (which are aggregates). This entails the truth of the counterfactual: 'Had the states and changes in the external world been different the perceptual states of the mind would also have been different'.

The introduction of the talk of the pre-established harmony, or pre-fixed nature, allows us, therefore, to give truth-values to certain counterfactuals. This is something which the observation, however repeated, of concomitance does not allow us to do. It does *not*, therefore, make each aggregate and each substance behave independently of other things. On the contrary, it is an attempt to explain each thing as causally dependent on other things *by the very nature it has*. It commits us to accepting the necessity of certain universally quantified conditional propositions in this world, *given the laws of nature that we do have*. A Leibnizian view thus leads to the acceptance of a nomological deductive theory explanation for all cases which do not involve human action (which is said to be inclined by prior states involving reasons and desires but not necessitated). Given a set of antecedent conditions, which is the state of the world at a given

[1] 'Remarques sur la lettre de M. Arnauld touchant ma proposition: que la notion individuelle de chaque personne enferme une fois pour toutes ce que luy arrivera.' *G* II, p. 42.

[2] 'New System of Nature', § 14. *G* IV, pp. 484–5; *L*, p. 458.

time, plus all its history up to that time, one can, in principle, deduce the consequent state, by reference to the laws of nature. As in all such theories, Leibniz's doctrine does not enable one to distinguish causes from antecedent conditions or from other effects of the same cause in any clear-cut way. Leibniz would probably not have minded this. What was important for him was not so much to pick out a cause for every condition or state, but to show how comprehensibility was linked with the stable natures of things and the way they change in correspondence with changes in others. This expressed itself as a functional relationship between the state of one thing and the contemporaneous and ulterior states of other things.

An important point about Leibniz's scheme of explanation is, however, that the identification of antecedent conditions cannot be made independently of the identification of the laws of nature. Laws of nature cannot, as we have seen, exist disembodied. For example, the specification of what kind of things exist, carries with it the laws of nature in virtue of which we can distinguish one kind of thing from another. Thus, in creating a world, God does not carry out two distinct acts of creating substances and their aggregates, and creating the laws of nature. To create substances and their aggregates with natures of certain kinds is to create the laws of nature. We must also notice that there is nothing in what Leibniz says that makes it impossible for the laws to be probabilistic or statistical ones. Nor is there anything that prohibits antecedent conditions from including specifications of whether the subject finds itself within a certain vicinity of certain objects, thereby determining their position in what physicists would now call fields.

As I have said, Hume himself unwittingly committed himself also to objective necessity when he realized that his definition of cause as 'an object followed by another, and where *all* the objects similar to the first are followed by objects similar to the second' leads to the acceptance of a counterfactual, which he formulates as 'if the first object had not been, the second never had existed'. But it is Hume who was to fail to give an empirical justification of his *own* concept of cause, at least in the case of open classes of events or objects. For, as many have pointed out since Kant, our propensity to infer in a certain way after repeated observation of conjunction of events in no way justifies the universality of the conjunction.

Leibniz tried to give an intelligible account of the uniformity of the constant conjunction by linking it to the structure of

things (which are phenomena of aggregates), this structure being in principle empirically accessible; and to the active force in things.[1] The existence of this force is postulated because it makes sense of observable phenomena. He was very clear that one cannot ask for further links to explain every conjunction. It was not in his opinion an accidental defect on our part as observers that we fail to perceive such links. It was a conceptual or metaphysical impossibility to explain all regularities between objects by further exchange of particles; and it was conceptual confusion ever to explain anything in terms of transference of detached qualities or modes. But this does not lead to the claim that further investigation of the structure of complex objects, or a hypothesis about the nature of simple objects, can never give the grounds for the regularities.

Now, as has often been pointed out, Leibniz writes in many places of the importance of intelligible realms as distinct from sensible realms. But these two realms are not composed of distinct entities which exist side by side. The two realms correspond to what is given to the senses and what, in perceiving the same reality, is understood by using concepts and theories. We cannot have the concept of justice, which belongs to the intelligible realm, without perceiving the needs and desires of men. We cannot have the concept of active force, which pertains to the intelligible realm, without perceiving motion, rest, and direction. As a matter of fact it is not Locke, but the Cartesians, whom Leibniz attacks for being 'content to stop where the sense perceptions stopped'.[2] He believed that they mistakenly thought that extension was the essential attribute of matter and that the quantity of motion is conserved, because they had not tried to understand clearly enough what they perceived.

The realm of the intelligible in reality is not something one can have access to independently of our senses. It corresponds to the way we draw conclusions from and correctly understand

[1] Bas Van Fraassen has raised the following interesting question. Consider two worlds α and β. Exactly the same thing happens in them; but in α they happen in accordance with laws of nature, while in β there are no laws of nature nor any physical necessity, but as a matter of fact things behave exactly as in α. Are they really distinct worlds? Now, for Leibniz, these would only be distinct worlds if in β things behave the way they do because God or some external power is constantly making the things behave the way they do. If not, then β is the same world as α since to assert that the laws of nature exist is nothing more than to say that things behave in a regular way of themselves and β is a world in which *ex hypothesi* things do so behave.

[2] Letter to de Volder, 30 June 1704. *G* II, p. 269; *L*, pp. 536–7.

what we observe. We do not depend on any one sense to obtain information about the external world. Against Locke, Leibniz does insist that it is possible for a blind man to understand what colour is, even if he has no visual data, and hence does not know what it is to experience perceiving colours. But, in so far as we are bodily people and not angels, what we understand about the external world is not independent of what we perceive. For one thing, Leibniz believed, as did Spinoza, that the mind always represents all changes in the body. Thus, if there is any change in the retina or the ear-drums due to the changes in the light waves or sound waves that reach them, these corresponding in turn to changes in objects further away, then the states of the mind change accordingly.[1] We cannot ignore what we perceive. We can merely make better and better theories to fit in to greater and greater numbers of our perceptions.

Is there any point at all in the traditional labels of rationalist and empiricist? (In the account of mathematical knowledge or of ethics there may be important relevant differences which I will not discuss.) So far as our knowledge and theories relating to the external world are concerned, all philosophers traditionally put under either of these labels seem to have thought that experience was necessary but not sufficient. Thus, if empiricism is supposed to be the doctrine that all knowledge of the world comes entirely from sense perception and rationalism to mean the doctrine that knowledge of reality comes from our understanding independently of the data of our senses, both are positions held by no one and better forgotten. Nor do the traditional labels of nominalism and realism help us. Leibniz considered himself a nominalist, and he was undoubtedly a nominalist in the sense of the medieval dispute—i.e. one who does not believe that universals exist in reality independently of things that instantiate them.

There is, however, a different kind of contrast which we can perhaps make to characterize the kind of difference we have found obtaining between Leibniz's and Hume's account of causation. This is the contrast between the attitude of thinkers who believe that, even if ultimately one can only *describe* the concomitant changes which occur within the structure, the understanding of the global structure of things adds to our understanding of the processes or movements of things in it, and thinkers who want to stick to the case-by-case description of the

[1] See, e.g., Letter to de Volder, Mar.–Apr. 1699. *G* II, pp. 171–2; *L*, p. 517.

concomitances. In this sense Descartes, Spinoza, and Leibniz as well as Locke all belonged to the former group whereas Hume and Berkeley seem to belong to the latter.

It is interesting to notice that in eighteenth-century Japan when there was a great debate between medical doctors who followed the tradition developed in China and Japan on one hand and those who wanted to develop the European medicine introduced by the Dutch in the seventeenth century, the traditionalists described themselves as empirical, and as upholding medicine based on experience against the medical doctrine of the Europeans. The traditionalists claimed that medicine must proceed, and can only proceed, by establishing by repeated observation that certain sets of symptoms and certain sufferings can be cured and men made healthy by the taking of certain herbs or the application of certain ointments.

One of the Japanese physicians who defended European medicine in the eighteenth century, Sugita Genpaku, argued that the strength of the European practice of that time lay in the fact that, by a search for the understanding of the anatomical structures and workings of the body as well as of the material components of the medicines, one comes to understand why a particular medicine has a particular effect on a patient and how the cure comes about.[1] I am not saying that he is necessarily right about what European medical science actually does even at the present day. It may also, to a great extent, be based on case-by-case observations of cures and alleviations rather than on any further understanding of the reasons. What is interesting though is that, in so far as Sugita believed that a holistic structural knowledge leads to understanding of the reason why, and holds the view that however descriptive it may be only global knowledge can give real understanding, he reflects the ideas held by Leibniz and others hitherto labelled rationalist.[2] The traditional oriental doctors were much closer in spirit to Hume.

[1] Genpaku, Sugita, *Words of a Mad Physician*, 1775. Sugita did not deny that the traditional Chinese physicians had views about the structure of the body. He nevertheless thought that their views on the matter were very inexact, and that this came about from their failure to link the understanding of particular ailments with the understanding of the exact structure of the body.

[2] The affinity between Sugita's view and that of Leibniz is remarkable. Leibniz even found himself defending the importance of anatomy against the noted physician and chemist of his time, Stahl. The latter failed to attach proper importance to the study of anatomy.

Let us then reconsider the widely accepted distinction between rationalism and empiricism. In recent decades we have seen much discussion about the status of observation terms and theoretical terms. It is now a commonplace to point out that there are no theory-free descriptions of observation, nor any statements of theory that are free of words with meanings impinging on observable phenomena. If we accept this (and I do), the contrast drawn in the traditional manner between rationalism and empiricism becomes even emptier. In its place there is a real contrast to be drawn among philosophers as well as scientists between two types of thinkers: those who believe that the concepts which they use to explain one type of regularity can be understood only by placing the regularity in the context of a general picture of the structure of the universe, and those who merely express and predict particular types of regularity in what is observed and who avoid or reject linking it to any general concept of reality. The latter are interested in the question whether the particular equations work. To characterize this contrast, as is so often done, in terms of a distinction between realism and operationalism is as misleading as are the labels rationalism and empiricism when applied to the seventeenth and eighteenth century. For even the so-called operationalist presumably believes that the equations express a certain correlation between the commonly observable phenomena or measurements of an external world, which *exists* independently of us even if the measurements are relative to our methods of obtaining them.

The important problem here is whether, without a theory or hypothesis about the whole, one refuses to be satisfied by equations or descriptions of particular types of regularities of observable data, or holds that one should be content with piecemeal descriptions and the mathematical expression of different kinds of regularities. This is not a difference of attitude about quantities of information but about the nature of concepts: about how globally concepts need be or need not be interconnected.

Global theories, like conspiracy theories, perhaps need to be resisted. Precisely because of the temptation we have to build models to explain away whatever we observe, there is a purist satisfaction we feel in refraining from going beyond codifying regularities of particular kinds. (From the original Buddhists who stuck to the description of the suchness of concrete things and their law-like changes, to Paul Valéry who wrote that 'the problem of the totality of things . . . comes from the most naïve

of intentions',[1] we see the mind of people anxious to avoid the self-deceiving solace which the appeal to hidden meanings and global theories often bring.) We have seen that Leibniz likened a theorist to a cryptographer. But when people claim to see everywhere signs, clues, and confirmation of their own facilely built models and weary us with their self-indulgence and banality we cannot help but be drawn to the dry elegance of self-imposed particularism.

Perhaps only those who are interested by temperament in a wide variety of particular areas of observation, and are rigorous in developing theories to explain the data in each particular area, can allow themselves the luxury of the attempt to make a global theory. Leibniz not only denied that his philosophy constituted a unitary system, he developed and interested himself in many theories for their own sake, not *because* they linked up with his philosophical doctrines or other areas of investigation.[2] The doctrine of pre-established harmony (like Leibniz's other theories on probability, or on infinitesimals) is the creation of a mind insatiably interested also in *a posteriori* knowledge of various phenomena. It is a theory in which the concepts of laws of nature, of the nature of individual substances, of force, and of the direction of time are all intricately linked; it is a global theory but one which tries to account in a unified way for the nature of particular explanatory theories, carefully worked out, which are based on observation.

[1] Paul Valéry, 'Au Sujet d'Eureka' in *Variété*, p. 137.

[2] Think of his invention of differential calculus, his interest in probability theory, palaeography, the building of computer machines, hydraulics, law, deontic logic, educational reform, etymology, etc.