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Restoring necessary connections: Lady Mary Shepherd on Hume and the early nineteenth-century debate on causality

In 1824, Lady Mary Shepherd published a pamphlet on Hume: *An Essay upon the Relation of Cause and Effect; controverting the Doctrine of Mr Hume, concerning the Nature of that Relation; with Observations upon the Opinions of Dr Brown and Mr Lawrence connected with the Same Subject*[1]. Not very much is known of Shepherd's life: she was born in 1777 near Edinburgh and she married Henry John Shepherd, son of an influential lawyer. She spent her life in Edinburgh and London, where she died in 1847[2]. She wrote about philosophy mostly between 1824 and 1832, also publishing a collection of essays on Berkeley and a reply to John Fearn on the extension of the soul[3]. Shepherd received no formal education, but was privately taught at home. Her insightful knowledge derived from the lively Edinburgh intellectual *milieu*: though not attending university classes, the Edinburgh audience could be informed about the academic debates regarding mathematics, natural philosophy, gnoseology, and economics through a number of public lectures, scientific demonstrations, and essays which appeared in the Edinburgh newspapers. The popularisation of science was strongly felt in Edinburgh, as confirmed by the efforts to build a public observatory and the close collaboration of academics such as Dugald Stewart, John Playfair, and Thomas Brown with the

[1] M. SHEPHERD, *An Essay upon the Relation of Cause and Effect; controverting the Doctrine of Mr Hume, concerning the Nature of that Relation; with Observations upon the Opinions of Dr Brown and Mr Lawrence connected with the Same Subject*, London, Hookman, 1824.

[2] For Shepherd's life, see the homonymous entry in the *Oxford Dictionary of National Biography*, edited by M.A. Perkins.

[3] M. SHEPHERD, *Essays on the Perception of an External Universe, and Other Subjects connected with the Doctrine of Causation*, London, Hatchard, 1827 and *Lady Mary Shepherd's Metaphysics*, "Frazer's Magazine for Town and Country", 30, 1832, pp. 697-708.

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popular press and the *Encyclopaedia Britannica*[4]. Moreover, the Shepherds' salon gathered important figures, such as Walter Scott and Charles Babbage; through them, she would certainly have been introduced to scientific and philosophical issues.

Shepherd's primary philosophical concern was causality: even when dealing with Berkeley's account of perception or facing the issue of the materiality of the soul, she discussed these in causal terms, understanding our perceptions as the effects of material objects[5]. The central role played by causality in Shepherd's philosophy can be placed within the context of two notorious controversies which flourished in Britain at the beginning of the nineteenth century.

Firstly, Shepherd's ideas were stimulated by the debate that arouse out of the Leslie affair: in 1805, John Leslie, candidate to the chair of mathematics at Edinburgh, was charged with atheism for quoting Hume in a footnote in his book on heat[6]. The Leslie affair revitalised the debate on Hume and Humean causality. Dugald Stewart, who officially defended Leslie, appealed to Thomas Reid's reading of Hume: Hume was substantially correct in describing physical causality as a temporal connection; he was wrong in extending it to moral actions. According to Stewart, Hume's account of causality is therefore harmless if limited to natural philosophy and presents an accurate definition of causality as a constant succession of events[7].

Thomas Brown, who also supported Leslie, was more radical and affirmed that the Humean definition of cause should be extended to morals and that we have no distinct idea of power. Thus, efficient action is just a *flatus vocis*, words with no precise meaning, and cause can only be a synonym of invariable temporal connection[8].

[4] On the popularisation of science in Edinburgh see especially R. YEO, *Encyclopaedic Visions. Scientific Dictionaries and Enlightenment Culture*, Cambridge, Cambridge University Press, 2001 and S. TROPEA, *Scienza e divulgazione a Edimburgo all'inizio dell'Ottocento*, in *Scienza, filosofia, politica nel Settecento britannico*, ed. by L. Turco, Padova, Il Poligrafo, 2003, pp. 441-457.

[5] The close connection between the discussion of causality and demonstration of the existence of the external world is stressed in M. ATHERTON, *Lady Mary Shepherd's Case against George Berkeley*, "British Journal for the History of Philosophy", 2, 1996, pp. 347-366.

[6] The Leslie affair is discussed by J.B. MORRELL, *The University of Edinburgh in the Late Eighteenth Century: Its Scientific Eminence and Academic Structure*, "Isis", 62, 1971, pp. 158-171 and J.P. WRIGHT, *The Scientific Reception of Hume's Theory of Causation: Establishing the Positivist Interpretation in Early Nineteenth-Century Scotland,* in *The Reception of David Hume in Europe*, ed. by P. Jones, London, Thoemmes Continuum, pp. 327-347.

[7] D. STEWART, *A Short Statement of Some Important Facts, relative to the Late Election of a Mathematical Professor in the University of Edinburgh*, Edinburgh, Creech, 1805.

[8] T. BROWN, *Observations on the Nature and Tendency of the Doctrine of Mr Hume*, Edinburgh, Mundell, 1805 (second edition enlarged, Edinburgh, Mundell, 1806; the third edition, further enlarged, was published with the title *Inquiry into the Relation of Cause and Effect*, Edinburgh, Constable, 1818).

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The Leslie affair concluded with Leslie's successful appointment to the chair of mathematics, a polemic on the Kirk's influence on the university administration, three editions of Brown's essay on causality, several articles appearing in the Edinburgh newspapers and various essays written by promising young readers, such as James Mill and Thomas Chalmers[9].

A serious setback for the moderate wing of the Kirk, which failed to appoint their favoured candidate, the Leslie affair was no minor or parochial episode. The notorious London physician Thomas Lawrence quoted Brown's interpretation of Hume in a note in his *Lectures on Physiology* published in 1819. Lawrence was engaged in a polemic on the principle of life and quoted Brown in order to ground medical theories in observable facts, rather than in seductive systems or unverified hypothesis. In spite of this reasonable methodological advice, Lawrence quoted Brown in order to maintain that vital functions are the effect of bodily structure, and also to support a materialistic view of medicine:

> The powers of sensation and contraction, and the properties of the capillary vessels, belong peculiarly and exclusively to living organic textures: they are eminently vital, and form the distinguishing character of living beings. We learn them by observation, as we learn the properties of dead matter; and we know nothing more than the fact, that certain vital manifestations are connected with certain organic structures. The only reason we have for asserting in any case that any property belongs to any substance, is the certainty or universality with which we find the substance and the property in question accompanying each other.[10]

Lawrence aimed to demonstrate that life is the sum of the actions of living bodies and tried to exclude any unobservable element from his medical theory. He was clearly committed to excluding the soul as cause of life, and Brown's relational definition of cause seemed to support the assumption that life can be explained by vital functions without recourse to an efficient power.

Lawrence's ideas were popular in London intellectual circles from the beginning of the century and also inspired Mary Shelley's *Frankenstein*. They received their ultimate condemnation in 1819, when the *Quarterly Review* included them within the "radical science", those supposedly scientific discoveries which aimed to subvert any moral and social order[11].

[9] T. Chalmers, *Observations on a Passage in Mr Playfair's Letter to the Lord Provost of Edinburgh, relative to the Mathematical Pretensions of the Scottish Clergy*, Cupar, Tullis, 1805 and J. Mill, *Enquiry respecting the Relation of Cause and Effect*, Edinburgh, Ballantyne, 1819.

[10] T. Lawrence, *Lectures on Physiology*, London, Callow, 1819, pp. 78-80.

[11] On *Frankenstein*'s scientific background and its political interpretations see M. Butler, *The Quarterly Review and Radical Science*, in M. Shelley, *Frankenstein, or the Modern Prometheus: the 1818 Text*, ed. by M. Butler, Oxford, Oxford University Press, 1998, pp. 229-250.

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It is not surprising that Shepherd was interested in Hume's theory of causality: Lawrence's appeal to Brown and Brown's interpretation of Hume placed Hume at the origin of a chain of thinkers who endeavoured to support materialism, atheism, and revolution with metaphysical arguments. Although atheism and infidelity was a common charge, Shepherd did not tackle the Humean explanation of the belief in miracles or the problem of the first cause. Her strategy was to put forward a strict metaphysical reasoning – rather than appealing to religion – and turned to Hume's epistemology.

1. *Reason and causality*

Against Hume, Shepherd intended to prove the following six points:

> FIRST, That reason, not fancy and "custom" leads us to the knowledge, That every thing which begins to exist must have a Cause.
> SECONDLY, That reason forces the mind to perceive, that similar causes must necessarily produce similar effects.
> THIRDLY, I shall thence establish a more philosophical definition of the relation of Cause and Effect.
> FOURTHLY, show, in what respects Mr. Hume's definition is faulty.
> FIFTHLY, proceed to prove that Nature cannot be supposed to alter her Course without a contradiction in terms;
> and, finally, show, that Custom and Habit alone are not our guides; but chiefly reason, for the regulation of our expectations in ordinary life.[12]

The emphasis on the role of reason in the definition of causality is striking. Shepherd was implicitly criticising the common-sense philosophers Thomas Reid and Dugald Stewart for their stressing the intuitive and immediate understanding of causality. Shepherd rather aimed to demonstrate that causality has a thoroughly rational explanation and she reacted against Hume's denial of the possibility that reason could account for causal relationships.

The key step of her demonstration is perhaps the second point, "that reason forces the mind to perceive, that similar causes must necessarily produce similar effects". In the *Treatise*, Hume notably refuted that reason might prove that future events will resemble past ones. As causality describes the course of past events only, reason is unfit to make predictions: the uniform course of nature is as probable as any of its variations, if custom and belief are not considered. On the contrary, Shepherd's own definition of cause is a sort of causal realism: causes are natural powers whose existence and action are discovered by reason.

[12] SHEPHERD, *An Essay upon the Relation of Cause and Effect*, pp. 27-28.

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> A cause, therefore, is such action of an object, as shall enable it, in conjunction with another, to form a new nature, capable of exhibiting qualities varying from those of either of the objects unconjoined. This is really to be a producer of new being.[13]

Unlike Reid and Stewart, Lady Shepherd maintained that effects *depend* on causes, that is that physical causes are powers and not merely the temporal antecedents of their effects. She was aware that we can seldom explain how causes produce effects or what causes are, but this is not important for scientific enquiry, as similar effects must be produced by similar qualities:

> it is immaterial to the definition of the relation of Cause and Effect, that we are not acquainted with the "secret powers" of natural objects, either before or after experience; for when we find, that in any distinct and given circumstances they put on certain qualities to the senses, their secret powers and properties must be qualified in all *like circumstances* to be the same, and are obliged to be so.[14]

Mary Shepherd thought of the physical world in a truly deterministic framework, in which a particular event can result from one and only one cause, whether simple or complex. Accordingly, the visible effect is the sign that a corresponding efficient cause has occurred: even though we cannot perceive any productive power with the senses, we can indeed infer its existence from the appearance of the effect. Shepherd was not afraid of Hume's sceptical argument according to which a known effect cannot be inferred from an unknown cause. She was instead eager to insist that, as causality is a necessary connection, the appearance of the effect cannot but imply that its cause produced it; the appearance of an altered effect means that a dissimilar cause occurred. As a matter of fact, Shepherd did not demonstrate that cause and effect are necessarily connected; she rather took a deterministic view of physical phenomena for granted, which allows us to affirm that similar events are produced in similar circumstances and that this is true in past as well as in future situations.

In her *Introduction* to the *Philosophical Works of Lady Mary Shepherd*, Jennifer McRobert places Shepherd's criticism of Hume within the context of British reactions to Kant in the late eighteenth century. McRobert affirms that "an interest in Kant, and in Kant's response to Hume, had immediately preceded the Leslie affair, and is likely to have shed new and sympathetic light on Hume and his quest for truth"[15]. Yet, while in the late eighteenth century Kant's philosophy was introduced into Britain by several reviews, essays and commentaries, it seems unlikely that the critical philosophy lent support to

[13] Ivi, p. 65.
[14] Ivi, p. 58.
[15] J. McRobert, Introd. to *Philosophical Works of Lady Mary Shepherd*, Bristol, Thoemmes, 2000, p. XI.

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Hume's theory of causality. As Giuseppe Micheli has demonstrated, Kant was mostly discussed for his political views on the French revolution and for the consequences of his philosophy on rational theology[16], and causality was not much analysed. Moreover, Hume was not generally supported in the early nineteenth century: common-sense philosophers and conservative thinkers charged him with scepticism and atheism, while radicals chose more appealing sources, such as Hartley's associationism or Bentham's utilitarianism. Thomas Brown, who defended Hume on causality and criticised Kant on the notion of space, was a quite isolated figure and did not deal with causality in his review of Kant[17].

It should also be noted that Shepherd was reluctant to admit that causality is a psychological creation, more or less based on experience and reflection; therefore she seems not to have agreed with Kant on causality as a category or *lex mentis*. Moreover, Kant was mentioned in Stewart's *Dissertation*, where critical philosophy was understood through British eyes and was deemed as a contribution to the psychological explanation of human knowledge. Stewart compared Kant with Richard Price and Ralph Cudworth reaching the conclusion that while Kant's appeal to reason

> was new in Germany, it certainly could have no claim to the praise of originality, in the estimation of those at all acquainted with English literature [...] I do not know, that, in this anatomy of the mind, much progress has hitherto been made by the German metaphysicians. A great deal certainly has been accomplished by the late Dr. Reid; and something, perhaps, has been added to his labours by those of his successors.[18]

Shepherd was probably not very impressed by Stewart's account of Kant's philosophy, since it did not provide a sound alternative to Hume's scepticism. Writing about the notion of space, Shepherd affirmed that

> Kant imagines time and space to be only modes of the mind, which is mistaking the causes which determine a mode of the mind with effect, viz. the mode of the mind.[19]

[16] G. Micheli, *The Early Reception of Kant's Thought in England 1785-1805*, London, Routledge-Thoemmes, 1999.

[17] T. Brown, *Viller's Philosophy of Kant*, "Edinburgh Review", 2, 1803, pp. 253-280.

[18] D. Stewart, *Dissertation exhibiting a General View of the Progress of Metaphysical, Ethical, and Political Philosophy*, in *The Collected Works of Dugald Stewart*, ed. by W. Hamilton, 11 vols, Edinburgh, Constable, 1854 (reprinted by Gregg International Publisher, 1971), vol. I, pp. 400-401. For Kant's influence on Stewart see R. Wellek, *Immanuel Kant in England*, London, Routledge, 1999 and J. Friday, *Dugald Stewart on Reid, Kant and the Refutation of Idealism*, "British Journal for the History of Philosophy", 13, 2005, pp. 263-286.

[19] Shepherd, *That mathematical demonstration and physical induction are founded upon similar principles of evidence – against Mr. Dugald Stewart*, in *Essays on the Perception of an External Universe*, p. 59.

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For Shepherd, Kant's definition of space and time as pure mental forms corresponded to a psychological explanation of sensible experience. Her goal was conversely to ensure an objective foundation to human knowledge and to base it on the external world. Therefore, Kant's subjectivist account of causality was not of help in her criticism of Hume, as Kant was seen as a supporter of a psychological explanation, while she was trying to restore a realistic account. At the time Shepherd wrote her *Essay* on causality, Kant's philosophy was still mostly mediated by its empiricist British interpreters and it appeared as a reaction against Hume still appealing to human nature. Shepherd, however, aimed to show that causality is a real connection between events and felt uncomfortable with any explanations based on mental entities, such as custom, common-sense, or Kantian categories.

2. *Causality and mathematics*

Like some recent readers of Hume, Shepherd noted that Hume was not always coherent in defending the regularity view and in fact he employed the definition of causation as the action of a material power[20]. Far from suspecting that the common interpretation of Hume – put forward by Reid and Brown – might not be correct, Shepherd concluded that even Hume could not rely on the philosophy he had introduced. She explained this apparent inconsistency by appealing to the principle which even Hume could not escape, the mathematical axiom

> that where quantities, or diagrams, resemble each other, the relations which are true, with respect to ONE of each kind will be true with respect to all others of a like kind; ONLY because there is nothing else to make a difference among them.[21]

It is somewhat surprising to find that the uniformity of nature is a mathematical axiom rather than a principle of natural philosophy (as Newton defined it). Shepherd thought that confidence in the uniformity of nature is not an unjustified extension to the future of the laws we have verified in the past, nor is it the result of a wild analogy, by which uncertain conclusions are proved through a dubious similarity with known cases. The principle that similar causes must have similar effects is a variant of the axiom according to

[20] Shepherd noted that the regularity view was challenged by Hume himself when writing that the "secret powers of nature" are conjoined with sensible qualities (D. HUME, *Enquiry concerning Human Understanding*, ed. by T.L. Beauchamp, Oxford, Oxford University Press, 1999, p. 114). For similar comments see J.P. WRIGHT, *The Sceptical Realism of David Hume*, Manchester, Manchester University Press, 1983; G. STRAWSON, *The Secret Connexion: Causation, Realism, and David Hume*, Oxford, Clarendon Press, 1989; S. BUCKLE, *Hume's Enlightenment Tract*, Oxford, Oxford University Press, 2001.

[21] SHEPHERD, *An Essay upon the Relation of Cause and Effect*, p. 77.

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which the properties of a diagram can be extended to any other diagram of the same kind. Therefore, empirical knowledge is not based on analogy, but on the classification of natural phenomena into *genera* and the discovery of the properties of each class; it is obvious – and requires no demonstration – that all the elements of the class share the same properties.

Shepherd's words suggest that she was quite familiar with mathematics and that she thought that it could successfully be applied to empirical enquiry. These thoughts were alien to Hume and were instead suggested by the discussion on induction and mathematics which flourished in Britain in the early 1820s. As little is known about Shepherd's education, it is difficult to assess precisely her familiarity with mathematics. Although there is no record of the books she had read, it is possible to infer her acquaintance with mathematics from some published essays. In particular, Shepherd may well be familiar with the essays of the Scot Matthew Stewart, John Playfair, John Leslie and John Robison, whose works were also debated outside the University. Their popularity was mostly due to their political opinions and interpretations of the connections of science and the French revolution: Robison was praised among *Tories* for defending sound British science against the contamination of the French doctrines. Science was used as an argument against Revolution and was therefore largely present in the popular press. Robison himself wrote the scientific entries of the third edition of the *Encyclopaedia Britannica*, compiling readable essays and also reporting some recent discoveries[22]. Although this scientific discussion was not technical, Shepherd could have found it attractive for its political value and appealing due to its connections with sound knowledge and firm evidence.

In particular, in an essay published in 1827, Shepherd proudly affirmed that she agreed with the eminent mathematician Laplace in thinking that Newton's method for discovering the law of gravity and the method employed for the binomial theorem were exactly the same[23]. On the contrary, Dugald Stewart had lamented that Laplace overlooked that mathematics and natural philosophy could not be investigated following the same method, as mathematicians seek universal and necessary truths, while natural philoso-

[22] On Robison's political ideas and his role in the Scottish science see J. MORRELL, *Professor Robison and Playfair, and the Theophobia Gallica. Natural Philosophy, Religion and Politics in Edinburgh 1789-1815*, "Notes and Records of the Royal Society of London", 26, 1971, pp. 43-63 and J.L. HEILBRON, *Electricity in the 17th and 18th Centuries*, Dover, New York, Dover Publication, 1999, pp. 465-468.

[23] "Que la marche de Newton dans sa découverte de la gravitation universelle a été exactement la même que dans celle de la formule de binome" (passage quoted by Stewart in *Elements of the Philosophy of the Human Mind*, in *The Collected Works*, vol. III, p. 319). Laplace's astronomy and mathematics were discussed by John Playfair in his review of the *Traité de mécanique céleste*, published in the "Edinburgh Review" in 1808. On the spread of Laplace's ideas in Scotland see N. GUICCIARDINI, *The Development of Newtonian Calculus in Britain*, Cambridge, Cambridge University Press, 1989, pp. 95-107.

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phers aim to extend general laws. Stewart did not mean that physical facts can change suddenly and deviate from their ordinary course – he truly believed that nature is immutable – but, like Reid, Stewart insisted that God *may* change the course of nature. In fact, as the natural order derives from God, it is logically possible to conceive that nature will alter its laws precisely because they are not necessary, but contingently set by God. In contrast, mathematical truths are universal and necessary, since any exceptions imply a logical contradiction[24].

Diverging from this belief, Shepherd thought that mathematical reasoning and physical induction share the same axioms and are both based on the principle

> that, *when objects are formed the same upon one occasion as another, their qualities, properties, and effects, will be similar*. It is this proposition on which mathematical demonstration, and physical induction equally, and only, rest for their truth. There is no difference; objects are what their formations render them, whether in the shape of mathematical diagrams, or other aggregates in nature.[25]

The strong affinity between mathematics and natural philosophy reveals that Shepherd did not agree on the Baconian definition of induction as the collection of observable facts and the generalization of their common properties. She rather thought of induction as the extension of knowledge through mathematical tools. This account could have been suggested by the mathematician Charles Babbage, Shepherd's personal friend and correspondent since 1823. In a paper on induction, Babbage contrasted the old Baconian account with the new mathematical interpretation:

> The term induction when employed in mathematics is not to be understood in precisely the same acceptation as it is used by the followers of Bacon; in enquiries in natural philosophy it implies the detection of the physical cause of some phenomena by examining where it is attended with different circumstances, those which are not concerned in inducing the effect are gradually excluded and the efficient cause becomes apparent. [...]
> In mathematical enquiries the method of induction is said to be made use of when by examining a few particular cases of a theorem we conclude the truth of some general law.[26]

Induction is here meant as a means of scientific discovery. While Bacon chiefly understood induction as knowledge of the world achieved *a posteriori*, through the direct observation of phenomena, Babbage used induction to

[24] Stewart, *Elements of the Philosophy of the Human Mind*, pp. 318-321.
[25] Shepherd, *Mathematical demonstration*, p. 279.
[26] C. Babbage, *Of Induction*, British Library, Add. 37202, p. 56.

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expand our knowledge of the world to spheres and cases that would remain unnoticed. Thus, the role played by mathematics was not only to formalize the knowledge gained through observation and experiment, but also the discovery of new applications of scientific laws.

Mathematical induction could not deal with contingent truths: its results should be as necessary as any other product of mathematical reasoning. Therefore, to understand causality in mathematical terms seemed to restore the necessity of causal relations, despite the sceptical doubts Hume had raised.

3. *Causality and time*

Shepherd's mathematical view of causality had other important implications. Firstly, Shepherd affirms, unlike Hume, that the notion of causality is not provided by the experience of several similar cases, but the observation of a single case affords proof of the necessary connection between cause and effect:

> Long observation of the invariableness of antecedency, and subsequency, is not wanted; many trials are not wanted, to generate the notion of producing power.
> One trial is enough, in such circumstances, as will bring the mind to the following reasoning.
> Here is a new quality, which appears to my senses: But it could not arise of itself; nor could any surrounding objects, but one (or more) effect it; therefore that one (or more) have occasioned it, for there is nothing else to make a difference; and a difference could not "begin of itself".[27]

Shepherd was evidently criticizing Hume on custom as the origin of the notion of cause; her emphasis on the possibility of inferring causality from a single case also aimed to show that the collection of various cases is not a threat to our established beliefs about causality. In fact, while Hume considered future events capable of contradicting our expectations and proving them to be wrong, Shepherd thought that future events do not contradict causal inferences, as similar causes could not be supposed to produce different effects in the future and unexpected effects can result only from different, yet unknown causes: the possibility to conceive that causes will not produce their effects does not prove that causation is not a necessary connection. On the contrary, it proves merely that our knowledge is still inaccurate and we have failed to understand correctly the true necessary connections among events. According to Shepherd, Hume's mental experiment on the possible

[27] SHEPHERD, *Mathematical demonstration*, pp. 43-44.

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loose occurrence of causes and effects shows that a different combination of causes may prevent the production of the effect, but it cannot be inferred that causes and effects are not necessarily conjoined.

Secondly, according to Shepherd, time is not the key element in our notion of causality: effects are not the events appearing *after* their cause, but depend on causes for their existence. Shepherd suggests that causes and effects should be seen as synchronous events, as the effects result from qualities still existing after the production of the effect:

> The objects whose union is necessary to a given result, must certainly exist, antecedent to such an union. But it is in their UNION, there exists those newly formed objects, or masses of qualities called Effects, which are therefore identical with the similar cause; for in this union, Cause and Effect are synchronous, and they are but different words for the same Essence. Fire and wood must be antecedent to combustion, no doubt; but in the union of Fire and Wood, there exists immediately combustion as a new event in nature; also in this union exists the similar cause allowed by the data, whilst combustion is also termed the Effect of the union of Fire and Wood.[28]

Shepherd thought of cause as a combination of material qualities, while Hume often defined it as an event preceding the effect. Hume's emblematic example of causality was the black billiard ball striking the white one. The motion of the two balls are here distinct events; when the second ball begins its motion, the first one is at rest and it is hard to say that cause and effect are synchronous. On the contrary, Shepherd mostly offered examples borrowed from chemistry, suggesting that effects depend on the continuous action of the cause:

> It becomes therefore part of the definition of fire to burn certain bodies, to melt others; of bread to nourish the human body; of snow to be cold, and white; and these qualities they must have, in order to compose that entire enumeration of qualities, for which appropriate names have been formed, and to the exhibition of which similar and efficient causes have been in action.[29]

Therefore, the productive qualities (or chemical properties) need to perform their power for the whole time the effect exists: the constant priority of the cause is a somewhat misleading criterion, as the disappearance of the cause also produces the cessation of the effect.

[28] Ivi, p. 57.
[29] Ivi, p. 55.

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4. *Conclusion: Shepherd and Victorian science*

Shepherd's daughter reported that her mother's philosophy was praised by Charles Lyell who defined her an unanswerable logician, and by William Whewell who used one of her works as a textbook at Cambridge. Moreover, Shepherd's philosophy was mentioned in Robert Blakey's *History of the Philosophy of the Mind* – an extensive catalogue of the theories of knowledge from Greek philosophy to the nineteenth century – and Samuel Taylor Coleridge too praised Shepherd's metaphysics in one of his notebooks[30].

These sympathetic reactions are slightly surprising, as Shepherd cannot be easily placed within the mainstream of Positivist science. In fact, she forcibly denied that physical causality is just a uniform correlation of events, and her causal realism does not seem to be supported or shared by nineteenth-century scientists who felt themselves more comfortable with the less ambitious definition of causality as a temporal relationship.

Shepherd's reading of Hume failed to catch the most valuable and long lasting contribution of Hume's philosophy to Positivist science, the warning against searching for the active powers of nature. As Richard Olson famously affirmed, nineteenth-century science was deeply indebted to the reading of Hume given by common-sense philosophers: Hume discovered the account of causality today known as the regularity view; in spite of his irreligious conclusions, his account of causality was accepted, insofar as it provided a fruitful and reliable understanding of physical causation[31]. Diverging from the standard view, Shepherd did not acknowledge that physical causality is a temporal correlation of events and therefore did not share the admiration for Hume as its discoverer.

However, Mary Shepherd was not completely extraneous to Victorian science and Whewell's praise may help to understand her role in nineteenth-century philosophy. Whewell notably tried to introduce Kantian philosophy at Cambridge and Shepherd's books were perhaps not the best means to achieve this goal. There are striking differences between Shepherd and Kant on causality: the most obvious is that Shepherd thought that causes are real powers within objects, while Kant affirmed that causality is a mental law applied to empirical knowledge. Nevertheless, Shepherd reaffirmed the role of reason in understanding causal connections and reintroduced strong, mathematical necessity in causal reasoning. Without mentioning Shepherd,

[30] R. Blakey, *History of the Philosophy of the Mind*, 4 vols, London, Saunders, 1848, vol. IV, pp. 39-46 and S.T. Coleridge, *Notebook Q*, in *The Notebooks of Samuel Taylor Coleridge. Volume 5: 1827-1834*, ed. by K. Coburn, A.J. Harding, Princeton, Princeton University Press, 2002, p. 981.

[31] R. Olson, *Scottish Philosophy and British Physics. 1750-1880*, Princeton, Princeton University Press, 1975.

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Whewell wrote that custom, belief, or instinct should be rejected as sources of our notion of causality given that

> The relation of cause and effect, being of the same kind as the necessary relations of figure and number, is not properly spoken of as established in our minds by a special law of our constitution: for we reject that loose and inappropriate phraseology which speaks of the relations of figure and number as "determined by the laws of belief".[32]

Whewell could have borrowed from Shepherd the assumption that causal necessity is akin to mathematical necessity. This clear comparison gave to Whewell further arguments to deny that causality is based on non-rational elements and allowed him to turn more resolutely to Kant's rationalism. Moreover, Shepherd's philosophy also had other important consequences: her mathematical view of causality contributed to rejecting Hume's distinction between the demonstrative evidence – proper to mathematics – and the probable conclusions attained in the physical and practical sciences. Shepherd sought to prove that Hume's choice to give a peculiar epistemological status to mathematics – the science dealing with relation of ideas alone – actually ranked physics as a less certain science. On the contrary, Shepherd and nineteenth-century readers of Hume endeavoured to give physics the same degree of certainty attributed to mathematics. To restore necessary connection was one of the possible ways – perhaps also the most controversial – to pursue this goal.

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[32] W. Whewell, *The Philosophy of Inductive Sciences*, 2 vols, London, Partner, 1847, vol. I, p. 175.