

Dispositions: An Integrational Analysis

Daihyun Chung
Ewha Womans University¹

[1] The difficulties dispositionalism faces

What sort of difficulties are faced by Humean and dispositional accounts of causality? On the one hand, Humean accounts explain the relation of causality in terms of contiguity, temporal priority, constant conjunction, and contingency, denying any notion of modality in light of the fact that there is no experiential impression of necessity involved in causation. But this is not persuasive as it does not accord with ordinary intuitions. On the other hand, many dispositionalists interpret causality, not as a relation between objects or events, but as a relation between dispositional properties. Some go further and try to explain dispositional properties in terms of mutuality, contemporaneity, ubiquity, and holism. However, this sort of analysis is also counter-intuitive in a different dimension.

The difficulties that these dispositionalists face may be characterized in more concrete terms. Consider an ice cube's cooling of the lemonade and the lemonade's melting of the ice cube. Cooling and melting are manifestations of two powers, the "mutual" products of powers through interaction (William 2010: 31). Two playing cards standing, leaning together to remain upright, constitute a case of causal "contemporaneity" (Molar 2003: 192-193; Martin 2008: 185). One of the questions arising out of these cases is how the causality of mutuality and contemporaneity is possible. How can those various dispositional properties cooperate so as to produce an unified result of such complexity? This may be called "the problem of harmony".

¹ This work was supported by a grant from the National Research Foundation of Korea (NRF-2010-0589-2-5).

Another difficulty in the dispositional analysis of causality may be called "the problem of totality". C. B. Martin (2008: 181) thinks that dispositional causality is "ubiquitous," saying "The life of most honest dispositional states is spent mostly in the presence of other dispositional states whose manifestation is the prevention of those former states from having their manifestation. It is a busy world". All properties of things in the world, their dispositions, are related to each other in their manifestations as well as in their non-manifestations.

The problems of harmony and totality have been approached from at least three distinct perspectives. First, G. Molnar (2003: 223) and S. Mumford & R. L. Anjum (2011: 193) propose an idea of primitive modality, which is not analyzable. Then, appealing to the notion of necessity obtained thereby, they judge that truth is a form of modal primitiveness, and that dispositional powers are truth-makers. This primitivism is supported by a situation in which any causal analysis would fail—either because the analysis does not presuppose a modal disposition and turns out to be vacuous or because the analysis contains a modal notion but is therefore circular. The strategy of primitive modality seems to push the problems of harmony and totality one step back to the level of necessity, but the problems do not go away. Heil (2010: 69-70) is willing to identify qualities and powers in order to have access to the notion of necessity. But as it stands, the identification attempt seems to require more explanation.

Second, N. E. Williams (2010: 96-97) examines how semantic holism may explain the issues of harmony and totality involved in dispositionalism. The meaning of a belief in an individual's system depend on the meaning of all other beliefs in the system, and a change of one of her beliefs should affect the meanings of all her other beliefs. Likewise, the specific, determinate nature of each power depends on the specific, determinate nature of other powers with which it is arranged in a system of powers. This seems to be a promising start, although marred by an insufficient description of semantic holism. There must be something more, which would indicate how semantic holism itself works.

Third, Molnar (2003: 62-74) goes beyond F. Brentano's intentionality thesis and extends the notion of intentionality to the realm of physicals. He attempts to use the notion of intentionality to account for the role which dispositional properties play. The

present paper pursues this suggestion in an attempt to assess its plausibility.

[2] An integrationality thesis

A major claim in what follows is this: the intentionality of dispositions is the integrationality of those dispositions. An obvious merit of this hypothesis is that the notion of integrationality is rich enough to allow one to reject the traditional antithetic distinction between the mental and the physical while still acknowledging the complexity of the mental. The hypothesis may be expressed more precisely as follows.

Integrationality Thesis (IT): There is integrationality in any entity like dispositions, such that the integrationality is a power to realize the embedded objective of it in the context where it interacts with all others.²

What is it like to interpret intentionality in terms of integrationality? How can we understand the conceptual structure of the notion of integrationality so as to explain intentionality, which applies generally to all entities including dispositions? One can make distinctions in the notion of integrationality between its third-person and first-person use. The third-person use of integrationality is seen as static; it remains in harmony as it can be indicated in its predicate form “Integrated (e1, e2, . . . , en)”. But the first-person use of integrationality is more active, taking elements of one's own system and that of others out into a new system where those various elements are put into integration, as is seen in the predicate grammar “Integrating into ((e1, e2, . . . en)s1, (f1, f2, . . . fn)s2, s3)”. Of course, the integrator itself naturally tends to preserve its own system s1 intact. But through such a process of active integration the entity goes

² My conception of integrationality is indebted to at least three sources. The first is the Confucian notion of cheng(誠), the character of which consists of two elements of “言”(language, logos, principle) and “成”(realization, accomplishment, success)(Chung 2007). Secondly, Kwangse Lee suggested to me in one conversation that “cheng” may be translated as “integration.” The third is Seokheon Ham's “metaphysics of seeds(ssisal),” in which the notion of integration plays an important role(“The fundamental of all beliefs is the one that I and all others are one”, Sang-bong Kim 2009: 17). Some scholars have understood the Confucian “cheng” as something other than integrationality, which is my proposal in this paper. For example, Legge translated “cheng” into “sincerity,” which is ethical and human-centered rather than ontological and universal: James Legge, “Translator's Prolegomena” in Confucius, *Analects, The Great Learning and The Doctrine of the Mean*, Dover, 1971: 50-55.

through adaptation and growth. From the first-person point of view, integration is not a description of an objective state of affairs of an entity, but one's own involved activities. What we call "integrators" are ubiquitous, interacting with all other integrators. Descartes called this integrator "mind," limiting it to the mental power of humans only. But the IT allows any integrator to have the power of a mind. If this hypothesis is plausible, then "mind" refers, not to the ability of a single kind of entity like a human mind, but to that of all entities of any degree of complexity, from an atom or cell to a human or the cosmos.

The difference between the two positions is obvious. Cartesians think that they can make sense of the distinction between thought and matter. In their view, it is possible, to think that humans can exist without body but impossible to think that humans can exist without thinking; the body is contingent on the human, but thought is not. They apply this logic to other things to conclude that the human is a thinking being but other, non-human things are not. The result, of course, is dualism. But the Cartesian modal argument is flawed in that it is only in the actual world that an embodied person thinks. Is there any criterion of identity to distinguish between different incorporeal thinking beings? That is, if two distinct persons hold different views, one could distinguish between them in terms of their different mental contents. But if two persons have exactly the same thoughts, how can one distinguish between them? But the IT entertains an organic view of the world, holding a thesis of continuity between humans and all other things and a thesis of integration that physical and mental dispositions are integrated with each other. Integrationality is a power of the human mind, body, and also of all other things.

The continuity thesis is strengthened when evolutionary theory is presented as an option for the explanation of the origin of the species. Suppose that the theory is taken as a hypothesis. Then, one is forced to accept not only the evolution of our bodies but also that of our minds. We are in a position to see that human history is continuous with the histories of other entities: if evolution reflects a history of well-adapted species then history represents an evolution of intelligent and just life-forms.

Evolutionary theory is optimistic in the sense that it was developed from the view point of the survivors of that processes. Certainly, there have been struggles and

pains in the process of evolution. But the wholesome results of the evolutionary process in nature **are** such that survivors have become organically related with each other. When we come to see nature from this perspective, we cannot help but perceive an eventual harmony in it, perhaps a cosmic harmony. The notion of integrationality expresses such an internalistic optimism: the integrationality of an entity is realizing what can be the best in a given situation in which a subject is involved with its surroundings at the time.

The notion of integrationality does not exclude elements of conflicts; rather, it sometimes requires sharp changes or great earthquakes, freezing hatred or tragic wars, if necessary. And we know that care and compassion shorten the period it takes to reach the desirable stage of peace or harmony. I hope that the IT may be developed enough to be reasonable and persuasive.

In the remainder of this article I would like to offer three hypotheses that may add to the plausibility of IT: that intentionality is a modal element of dispositions; that information is integrational; and that fitting is a dispositional direction.

[3] Intentional dispositions

Mumford & Anjum (2010: 143-159) offer a threshold account for causation. They treat causes as dispositions toward effects and prefer a threshold approach to modal one. An effect occurs when its causes have accumulated to reach the requisite threshold. The threshold is here understood along the lines of causal powers. For they believe that causal powers are polygenic and pleiotropical. An effect is polygenic if it results from the inter-workings of more than one power, and a power is pleiotropical if it makes the same sort of contribution to manifestations other than the one that it causes. Their notion of threshold makes it explicit that causal powers consist of the addition as well as the subtraction of powers. When a match is struck for a light, it is lit by the addition of the flammable tip, the striking in the right way, the presence of oxygen, and so on, as well as by the subtraction of facing the wind, excessive humidity, and things of these sorts.

It is worthwhile to examine carefully how Mumford & Anjum argue for their threshold perspective. When they describe the workings of causal powers in detail they do not allow one to ask further questions as to how those various powers cooperate with

each other so harmoniously and holistically. They also criticize Molnar's notion of physical intentionality. Whereas Molnar believes that physical intentionality provides a means of understanding how causal powers work, Mumford & Anjum (2011: 186, 188) think that intentionality must not explain a disposition and that it should be the other way around. They believe that the latter is a naturalistic way to go.

An important criticism of Molnar is revealed in the way in which Mumford & Anjum use the word "naturalistic". Their naturalism is not the naturalism into which Carnap tried to reduce dispositionality. Theirs is open enough to allow Molnar's naturalism to play a role, but they are not ready to accept Molnar's project to explain dispositions in terms of intentionality. It is clear that Mumford & Anjum think that it is naturalistic to explain intentionality in terms of dispositions while it is not naturalistic to account for dispositions in terms of intentionality. It appears that they presuppose a type of traditional dualism according to which intentionality is mental but dispositions are physical.

Mumford & Anjum went beyond Carnap's naturalism and are positive toward the relation between dispositions and intentionality, but they fail to face the issues of harmony and totality involved in dispositionalism. However, Molnar dares to explain causation in terms of dispositions in order to be inclusive of harmony and totality, thinking that intentionality is the mark of dispositions. He believes that the intentionality allows a structure whereas dispositions have directedness, ubiquity, and totality.

Molnar demonstrates such a structure of totality in his suggestions that intentionality is the mark of a disposition, and that the directedness of dispositions to their manifestation is the directedness of intentional properties (see Molnar 2003: 61, 81; Mumford & Anjum 2011: 185). But what is the nature of the relations between dispositional properties, not only in their manifestations, but also in their non-manifestations. A similar question surfaces when Molnar (2003: 43) admits the difference between two intentionalities (of the mental and the physical) after he tries to extend the notion of intentionality of the mental so that the physical may have the power of intentionality as well. Why are Molnar's arguments for the total scheme of dispositionalism not working as he wants them to?

What exactly is the problem with Molnar's strategy? When Molnar proposes that intentionality is the mark of dispositions, his argument for that view is based on an analogy between mental and physical intentionality. He wants to show that just as mental intentionality has the characteristic that its objects may be existent or non-existent, may be fuzzy, are directed, and may be referentially opaque, so too does physical intentionality have these properties (Molnar 2003: 63-66). But as he admits, the analogy is vulnerable and should not be pushed too far (Molnar 2003: 68).

The problem for Molnar lies not exactly with his arguments but rather with the bottom-up strategy he adopts. Any bottom-up strategy on this kind of issue would seem to require that the traditional distinction between the mental and the physical is to be maintained. But unfortunately this implicit requirement is not in accord with Molnar's explicit aim to be free from the distinction. Thus, one alternative to Molnar's account of intentionality is to take a top-down strategy while holding on to Molnar's thesis that intentionality is the mark of dispositions.

How could the top-down approach be justified? If evolutionary theory is a kind of top-down hypothesis, the dispositional theory of intentionality may take a similar stance on the basis of evidence that dispositions are ubiquitous and holistic, harmonious and total.

More seriously, Molnar's argument based on the analogy between the physical and the mental would suggest that his thesis that the intentionality is the mark of dispositions is only contingent. This does not seem to be sufficient for his thesis. In order to make Molnar's thesis stronger, it must be shown to be necessary. One suggestion for this purpose is the following: define "disposition" to be a power to manifestation; suppose that dispositions are not intentional; then, a disposition should be either a mysterious power or a power manipulated by an external subject of some sort; but these options are not acceptable since these imply that the disposition could not execute its power in terms of what we can understand, which is contrary to the definition; therefore it is not possible that dispositions are not intentional; and so dispositions must be intentional. Intentionality is a modal element of a disposition, and a top-down approach may be acceptable.

[4] Integrational information

There are at least two versions of the informational view of the world. One is that everything humans see and experience is a text to be interpreted. This may be called "an epistemic version"; it derives from ideas related to the Kantian transcendental theory of knowledge. The epistemic version requires a Copernican revolution in that the object depends on the subject in a sense that the object is constituted by the subject's grammar. On this view, no object is allowed to have its own autonomous ways of interacting with other objects. The other version of the information view is that anything which exists in the world, whether it be a rock, a plant, a bird, etc. constitutes a system which interacts informationally with systems of other things.³ A stone or a flower receives a variety of appropriate inputs from its surroundings and gives relevant outputs. This is "a processing version" that deserves attention, for I believe that this version offers insights as to how the IT works.

Dretske ignores the ultimate difference between representations, artificial and natural. The former can be reduced to the latter which, he thinks, is basic. He is certain that human mental content is thus explained in naturalistic terms. This representation results from its dependence relationship⁴ with the state of affairs in which it is found. This natural representation will be seen in human physiology, which is what he calls a "proto-belief". His dependence relationship is ultimately to be found in the conception of environmental information, which means that two systems a and b are coupled in such a way that Fa is correlated to Gb, thus carrying for the informative agent the information that b is G (Floridi, 2010).

R.G. Millikan's strategy is evolutionary rather than causalistic (Millikan 1993). She thinks that proper functions (and their teleology) of biological beings have been determined. That is, when we humans think in the way we do what is involved in that thinking processes is determined evolutionarily rather than in some mysterious way. For

³ The idea of "it from bit" indicates that all physical things are informational, responding to type yes-no type questions. See Wheeler, J. A. "it from bit' as a guide in the search for links connecting physics, quantum and information", in *Complexity, Entropy, and the Physics of Information*, ed., W. H. Zureck, Redwood City, CA: Addison Wesley, 1990.

⁴ The dependence relation between a representation and states of affairs is not the relation between tokens c and f, but between types C and F. Thus, an occurrence of token c indicates a token f but this token indication is not necessary. The context may affect the indication relation and misrepresentation is allowed. Fred Dretske, *Explaining Behaviour: Reasons in a World of Causes* (MIT Press, 1988).

her, procedures to use representations are the same as ways to represent and to determine the representational contents.

D.J. Chalmers (1996) goes further than Dretske by suggesting some form of pan-psychism. Here rocks do not have a system of information processing and thus have neither consciousness nor experience. But **when rocks are inflated or deflated** they are in informational states which include a system of quasi-consciousness. These may not be phenomenal qualia but some proto-phenomenal qualia.

These three philosophers have distinct ways of formulating their own naturalism concerning mental content (Chung 2001: 169-240). While their versions of naturalism are not yet fully articulated, they share the belief that human intentionality is not a criterion by which one could distinguish humans from other animals. They are evolutionists, to varying degrees, in explaining the issue of human intentionality in a wider context, which I would characterize in terms of integrationality.

Dretske's proto-belief, Millikan's proper function, and Chalmer's proto-phenomenal qualia were all offered in order to naturalize some human representations. If the naturalization programs sketched by these three philosophers are plausible, then what their programs presuppose will have been vindicated. Physical dispositions alone integrate these views.

[5] Fitting as a dispositional direction

The notion of fitting appears to be a case in which the IT may be well expressed. Williams (2010: 84) seems to agree, for he thinks that dispositional powers must typically act in conjunction with one another to produce manifestations because they have the appropriate fit for one another. In his view, a harmonious manifestation through interactions of powers indicates a relation of fitting which displays reciprocity, intrinsicality, and essentialism (Williams 2010: 89).

Williams does not give any detailed analysis of the notion of fitting, but the partial description he does give suggests that fitting may be a three-place predicate: P fits Q with respect of R. Convex (prominence, ☐) fits concave (depression, ☐) with respect of their surface structure. This interpretation of fitting is in accord with our ordinary experience and our intuitive understanding of it, but it does not offer much

help in understanding the mystery of dispositions, for the interpretation of fitting as a three-place predicate, which Williams seems to favor, is a third-person rather than a first-person account of integration.

Fortunately, other philosophers have provided helpful suggestions toward a first-person account of fitting. L. Wittgenstein, for instance, used "fitting" in various ways. Perhaps the most important element in his idea of fitting may be the idea that fitting is prior to use. For example, when we want to know the subject of a sentence we ask "who or what?" Wittgenstein (1953: #137-#139) suggests that the connection between the question and the subject as an answer is determined not by uses but by fitting. N. Goodman rejected the idea that fitting is a physical notion or a formal one. He opted instead for the view that fitting is a linguistic notion, which is working among components in a language (Goodman 1978: 132, 138-140; Goodman & Elgin 1988: 46, 158). A. Goldman (1986: 151-154) thinks that the world does not come to us as a pre-categorized whole. Though truth is non-epistemic, he believes that we construct a criterion of fitting so that we know, for example, whether the clothes we are wearing fit us. Human epistemic endeavor starts in a world not yet conceptualized but ends in the world readily conceptualized.

These three philosophers share something in common. The ideas of Wittgenstein's discovery, Goodman's human invention, and Goldman's human conceptualization suggest that fitting is a 4-place predicate (P fits itself to Q with respect to R) [3-place predicate?]. One can say that Professor Goldman fits himself to what his son bought at the store for his birthday the other day with respect to wearing. Likewise, the orange juice's cooling fits itself to the ice cube's melting with respect to temperature balance (and vice-versa).

However, these three philosophers limited their notion of fitting to the level of human experience. One may take a wider notion of fitting from Williams and develop an integrational interpretation of the predicate. More specifically, one may look into the following three issues (one conceptual, the other two empirical) concerning how the integrational notion of fitting works concretely in the world.

First, note that the conception of property exemplification is puzzling. One may say "the property of being red is exemplified (instantiated, manifested) in this apple,"

but who is the subject and who does the work of exemplification? The candidates for the subject are this apple, the property of being red, or some other mysterious external agent. Then is it not reasonable to suppose that the property of being red is disposed to such a manifestation? When the property of being red exemplifies itself it does so in terms of fitting manifestation. Its manifestation should have some fitting grammar.

Second, let us ask how a primitive community could come to have its original language? Is it unreasonable to suppose that primitive languages may have emerged by the fitting of primitive expressions, which came out of people's basic needs and desires in their concrete forms of life? Are not forms of life related to phenomena like obtaining food, shelter, clothing, recognizing others and being recognized by others, and communicating with each other? Engaging in a form of life is a business not only of one particular mode of describing what is "true" but also of modes of totality; not only of intelligence, but also of wholesome relations. Those modes of total human experiences and relations are constructed within the structure of fitting, if not exclusively of truth.

Third, consider the recent advances in the biological sciences. Grice's notion of natural meaning needs to be studied seriously, perhaps in a way to allow a closer connection between natural and non-natural meaning rather than insisting on an exclusive distinction between the two. The notion of fitting as a dispositional direction may make it possible to connect Grice's two distinct meanings, allowing the two to share the same logic of fitting. Biological scientists talk about things such as the following: "the genetic coding for the amino acid sequences of protein molecules," "the symmetry of the informational relationship between genotypes and phenotypes", and "genetic programs such as programmed cell death." How could a philosopher understand these expressions? If one takes these expressions as a case of Gricean natural meaning, there is no difficulty in understanding them. However, if one wants to maintain continuity between the two types of meaning, those expressions need to be explained in terms of descriptions of the biological states involved rather than in terms of an analogy between the natural and non-natural.⁵

⁵ One could note the citation for the Nobel Prize for Physiology/Medicine in 1962 given to Watson, Crick and Wilkins: "for their discoveries concerning the molecular structure of nucleic acids and its significance for information transfer in living material" (Floridi 2010: 76). But Floridi himself abides by the accepted distinction between natural and non-natural meanings, saying that the concept of biological

The notion of fitting as a dispositional direction is one candidate to explain these expressions in terms of description. Once one allows those biologically dispositional properties to play the roles of fitting the expressions may turn out to be descriptive rather than analogical.

[5] Conclusion

This paper began by contrasting Humean and dispositional accounts of causality. But as one can see now the dispositional perspective is not exactly antithetical to the Humean account, for dispositionalism goes beyond Humean metaphysics. Dispositionalism tries to extend the notion of causality to have a wider and richer applicability. Toward this goal, it denies accepted notions of intentionality, the antithesis of mind and matter, standalone physical things, and so on.

I have tried in the foregoing to relate the views of various dispositionalists by offering the IT. My goal has been to provide a wholesome picture of some important notions in dispositionalism. If my view is plausible then reality is an integrated whole, and physicalism and dualism are forms of absolutization of some aspect of the present reality. As traditional notions of causality and intentionality are in need of revision in the face of developments of new theories of empirical sciences, a new sort of naturalism emerges from the perspective of integration.⁶

August 31, 2012

chungdhn@ewha.ac.kr

Bibliography

Bird, Alexander.(2012) "Dispositional Expressions", *The Routledge Companion to Philosophy of Language*, eds., G. Russell and D. G. Fara, Routledge: 728-740.

information is more metaphorical than empirical (Floridi 2010: 79-81).
⁶ A draft of this paper was read at the Disposition and Mind Workshop, Gyunghee University, May 30-31. Encouragements and helps were given to improve the draft and I am grateful for the participants in the workshop, especially, Professors Kai-Yuan Cheng, Sungho Choi, John Heil, and John Michael McGuire.

- Chalmers, David.(1996) "Physically realized information", *The Conscious Mind*, Oxford U. P.
- Chen, Kai-Yuan(2009), "Semantic Dispositionalism, Idealization, and Ceteris Paribus Clauses", *Minds and Machines*, 19(3): 407-419.
- Choi, Sungho(2009), "The Conditional Analysis of Dispositions and the Intrinsic Dispositions Thesis". *Philosophy and Phenomenological Research*, 78, pp. 563-590.
- Chung, Daihyun.(2007) "Intentionality of Cheng: Toward an Organic View", *Philosophy and Culture: Vol. 2 Metaphysics*. Korean Philosophical Association: 33-40.
- Chung, Daihyun.(2001) *Embodied Mental Content*. Seoul: Acanet (In Korean).
- Chung, Daihyun.(1997) *Philosophy of Fitting: Toward the Notion of Truth and Meaning*. Ewha Womans University Press (In Korean).
- Confucius.(1893) *Analects, The Great Learning and The Doctrine of the Mean*, tr. James Legge, Dover, 1971, Clarendon.
- Clarke, Randolph (2010), "Opposing Powers", *Philosophical Studies*, 149: 153-160.
- Davidson, Donald.(1980) "Causal Relations", 149-162; "Mental Events", 207-224; both in *Essays on Actions and Events*, Oxford: Clarendon Press.
- Dretske, Fred.(1988) *Explaining Behaviour: Reasons in a World of Causes*, MIT Press
- Floridi, Luciano.(2010) *Information: A Very Short Introduction*, Oxford University Press.
- Floridi, Luciano.(2004) ed., *Philosophy of Computing and Information*, Blackwell.
- Goldman, Alvin.(1986) *Epistemology and Cognition*, Harvard University Press.
- Goodman, Nelson.(1978) *Ways of Worldmaking*, Indiananapolis: Hackett.
- Goodman, Nelson and Catherine Z. Elgin.(1988) *Reconceptions in Philosophy*, Hackett.
- Heil, John.(2010) "Powerful Qualities", *The Mmmetaphysics of Powers*, ed. Anna Mamodoro, Routledge: 58-72.
- Kim, Jaegwon.(1966) "On the Psycho-Physical Identity Theory", *American Philosophical Quarterly*, 3.
- Kim, Sang-bong(2009), "Ham Seokheon and the Idea of the Philosophy of Ssial", *Philosophical Studies*, Korean Philosophical Society, 109(2009.02): 1-28(In

Korean).

- Legge, James.(1893) "Translator's Prolegomena" in Confucius,*Analects, The Great Learning and The Doctrine of the Mean*, Dover, 1971(Clarendon, 1893): 50-55.
- Martin, C. B.(2008) "Power for Realists", *Ontology, Causality, and Mind: Essays in Honour of D. M. Armstrong*, ed. J. B. Bacon, K. Campbell, and L. Reinhardt, Cambridge University Press: 175-185.
- Millikan, Ruth Garrett.(1993) *White Queen Psychology and Other Essays for Alice*, MIT Press.
- Molnar, George.(2003) "Directedness", *Powers-A Study in Metaphysics*, Oxford U. P.: 60-81.
- Mumford, S. & Anjum, R. L.(2011) *Getting Causes from Powers*, Oxford U.P.
- Mumford, S. & Anjum, R. L.(2010) "A Powerful Theory of Causation", *The Metaphysics of Powers*, ed., Anna Marmodoro, Routledge: 143-159.
- Searle, John & John Perry.(1994) "Intentionality", *A Companion to the Philosophy of Mind*, ed., S. Guttenplan, Blackwell.
- Shannon, C. E.(1998) *The Mathematical Theory of Communication*, Urbana: University of Illinois Press, (1949).
- Wheeler, J. A.(1990) "Information, Physics, Quantum: The Search for Links", in *Complexity, Entrophy, and the Physics of Information*, ed., W. H. Zureck, Redwood City, CA: Addison Wesley.
- Williams, Neil E.(2010) "Puzzling Powers-The Problem of Fit", *The Metaphysics of Powers*, ed., Anna Marmodoro, Routledge: 84-105.
- Wittgenstein, Ludwig.(1958) *Philosophical Investigation*, New York: Macmillan, (1953).