

A philosopher's perspective on the harnessing of stochasticity

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Abstract

Sir Anthony Kenny discusses Denis Noble's paper, 'The Interdependence of Order and Disorder: How complexity arises in the living and the inanimate universe', through the lens of philosophy. He begins by differentiating between the ideas of stochasticity and true randomness. The essay then continues with a criticism of Noble's assertions of how this harnessing of randomness resolves the problem of micro and macro-level explanations of choice.

In Denis Noble's fascinating paper there were many interesting points deserving a response. I wish to focus on just two of them: the harnessing of chance and the possibility of free agency. I find his discussion of the first point admirable, but I have reservations about his treatment of the second point.

Living organisms, Noble tells us, harness chance in order to solve the problems they encounter in environment. The chance he has in mind is not pure randomness but rather stochasticity, that is to say unpredictability. Stochasticity, unlike randomness, is an epistemological rather than a metaphysical notion: it is primarily concerned with what we can know, rather than what is the case at a fundamental level. If we are told something is unpredictable we can ask: unpredictable by what system of prediction? (If something is random it cannot be predicted by any system whatever). Molecular events are unpredictable by molecular physics; but they may be predictable on the basis of some other system. As Noble points out that an event that is unpredictable at one level – say the molecular – may be predictable at another, higher, level – say the cellular. That opens up the possibility that if so, then in addition to bottom up causation (the lower level causing events at the upper level) we have top-down causation (the upper level causing events at the lower level.) So far I find Noble's account highly illuminating.

However, I am not so persuaded when Noble applies his model to the reasoned actions of human beings. It is tempting to think of human choice as being the top level of causation, and to suggest that like physiology it exploits stochasticity at lower levels. I believe that this temptation should be resisted. A choice of action is not a form of causation, not even of top-down causation, and the psychological level is not above the physiological level but operates in parallel with it.

Of any tract of human life there are always two narratives to be told, the physiological and the psychological. The narratives are expressed in different languages, and the first step to understanding their relationship is to separate each language from the other without describing either of them in the other's vocabulary. In describing the physiological operation of the immune system, Noble says, "your immune system works out which random variations work in neutralising the invader. It then tells the immune system cells that succeed to reproduce". The expressions "work out" and "tell" belong to the psychological, not the physiological vocabulary. I would like to see these metaphorical terms replaced by expressions suitable for physiological causation.

Noble is undoubtedly right to reject the reductionist claim that our feeling of choice is an illusion. Many of our actions are free and undetermined. When I perform an action I enjoy freedom, provided only that I have both the ability and the opportunity to do something else instead. It is possible to discover whether I possess this ability and this opportunity without knowing anything about the physiological processes occurring in my body at the relevant time.

Suppose that I am sitting in an armchair. I look at my bookcase with its 500 books, get up and take down the poems of John Donne to check a quotation. In the course of this there will be causal processes linking my brain, central nervous system, muscles and so on. What is the relation between my action and these causal processes? Shall we say that the two narratives report the same events in different languages. Not so, because the way in which we identify and individuate an event may be different in the different languages.

Noble offers a parallel between my fetching the book and the creation of an antibody by the immune system. There can indeed be a similarity between the operation of the immune system and some conscious human choices, such as the choice of words in a sentence, and the choice of sentences to express a thought. Several different formulations may come into one's head before one chooses the right one and sets out to type it. But the similarity is far from being the exact parallel that Noble supposes.

“The immune system”, he says, “generates an unlimited number of DNA variations, your nervous system can harness chance to develop an unlimited repertoire of behaviour”. But a repertoire is not a set of actualities, but of possibilities. Besides my actual behaviour of taking down the Donne book there are 499 possible behaviours of taking down one of the other books. Possible behaviours, unlike antibodies, are not empirically detectable entities. There is no reason to think that they exist in actuality either psychologically or physiologically, either as conscious thoughts or as corporeal states.

Noble is right to reject the idea that human actions are subject to determinism. But the verb “determine” is ambiguous: it may mean “constrain” or “control”. Upward causation is constraining but not controlling: an example is physical causation. The laws of physics determine what I do by setting boundaries to my abilities : I cannot do anything that is physically impossible. But the laws do not control what I do: they do not settle which particular action I perform. The distinction between constraining and controlling may be illustrated by a comparison with the game of chess the rules of the game constrain what moves are possible, the players control what form an individual game takes.

Downward causation, unlike upward causation, may be controlling no less than constraining, as for instance when a cell reconfigures a DNA sequence. It is here that the notion of harnessed stochasticity is most appropriate. Earlier I objected to the use of metaphorical psychological terms such as “work out” in the description of physiological processes. However, the metaphor “harness” is unobjectionable because it fits both kinds of process. It brings out that stochasticity at a lower level is actually a necessary condition for teleology at

an upper level. If there was determinism at the molecular level there would be nothing for any upper level to harness – in terms of the metaphor, there would only be a runaway horse. Thus we see that teleology and stochasticity are not opposed but rather complementary.

At the upper levels of the biological ladder we find not only top-down harnessing of stochasticity, but also top-down creation of stochasticity. This already emerges at a level lower than the human, in species that indulge in play. Play is stochasticity that by definition is unharnessed, that is to say activity that is unpredictable and that serves no immediate purpose. Overall, of course, it serves a developmental purpose, since it enables an animal to experiment with different methods of achieving goals, and this in its turn is an evolutionary advantage.

At the human level play becomes organised into games, where stochasticity is not so much harnessed as confined – whether solely by rules, as in chess, or also physically as in billiards. In all but the most boring of games the actual moves or ploys are not predictable either from the rules or the constraints.

The relation then between the psychological and the physiological narrative of my taking the book from the shelf can be simply stated. The physiological story constrains the psychological one: all kind of physiological states and processes are necessary conditions if I am to be able to perform the action of grasping the volume of Donne. But the physiological story does not control the psychological story: no physiological state is a sufficient condition of the free choice that decides which volume is selected.¹

¹ Reproduced from *The Language of Symmetry* (Eds. Rattigan, Noble & Hatta), 2023