

Economics, Science and the Spandrels of San Marco
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How is knowledge produced? In discussing the topic, we can focus our discussions on driving processes — processes that lead to or drive our production of knowledge — alternatively, we can focus our discussion on the constraints within which such processes are allowed to take place (some of which may also be processes, but constraining processes rather than driving processes). Let's take an example. In her recent book about *How Economics Shapes Science* (Harvard University Press), Paula Stephan discusses the myriads of ways economics affects science and scientific research (2012). While she is concerned with the natural sciences, the book can be read more broadly about economics and the production of knowledge more generally. This latter is what I am interested in.

What particularly piqued my interest was her focus on driving processes; the processes by which funding is allocated, the processes by which monetary gains are had, the processes by which faculty salaries are determined and, in turn, determine the kind of candidates that apply for positions. But, driving processes are only one side of any story; the other side is the constraint within which such processes are allowed to take place. This reminded me of the debate that occurred in evolutionary theory in the 1980 between adaptationists and their opponents. In this short piece, I want to springboard of Stephan's book to ask the broader question about where the balance should be between processes and constraints when we discuss knowledge production generally (I'll reserve the term *processes* for driving processes and the term *constraints* to mean anything, including processes, that restrict the scope of driving processes). I also want to question whether we sometimes fall foul of the adaptationists' bias for process in such discussions.

Economics and Knowledge Production

Few would doubt that economic forces play an important role in dictating the course scientific research takes. Some obvious examples are costs and the need for collaboration on expensive projects — think the Large Hadron Collider — which individual groups or countries are not capable of funding on their own, or the possibility of financial returns in pushing for specific research programs, such as pharmaceuticals. A large part of Stephan's book is concerned with just how such economic forces interact with science and the production of research. For example, Stephan devotes a chapter to money where she considers its role “as a reward to doing science”, for example salaries, patents, start-ups and consulting. She weaves a great story about the relationship between various factors at play and the processes by which these interact in the production of research. As an economist, Stephan is largely concerned with incentives and efficiency in what can be thought of as knowledge production. Indeed, she suggests we need to look at our process (especially our incentives structures) and restructure them so as to allocate resources more efficiently. This would require an agreed-upon view of what counts as “efficiency” in knowledge production, but this latter point about consensus is not my concern here. My concern is that by thinking about knowledge production in terms of “efficiency”, we only paint half a picture; we give more weight to the processes for arriving at outcomes over the constraints within which these processes occur, and that may lead us to a poorer understanding of the world in which knowledge is produced.

Process vs Constraint in Evolutionary Theory

The distinction between processes and constraints is best exemplified in the evolutionary theory debate over adaptationism. It is well accepted that there are numerous routes evolution can take. These include the well known *natural selection* — the proportional increase of genes that maximize fitness for a given population in a given environment; *genetic drift* — something like sampling error, with certain genes being over represented in successive generations; *gene hitchhiking* — when genes with no special significance attach themselves to genes that are selected for through other routes; and *genetics flow* or *gene migration* — the result of gene exchange across population and between species. Adaptationism is the view that the main (of not only) process in evolution is natural selection. The critique levelled at adaptationists is that they overstate the importance of natural selection to the expense of others. Natural selection, like much of economic forces described by Stephan, are driving processes in evolution, but the capacity for these processes to determine the outcome is limited by the constraint in which those processes operate.

The Spandrel of San Marco

Gould and Lewontin famously used the analogy of the spandrels of San Marco in Venice (1979). In architecture, spandrels (the space between two arches or between an arch its rectangular frame) are often used to magnificent effect by decorating them using their geometry, giving the viewer the impression that the spandrels were an intention of design. In fact, spandrels are an inescapable architectural by-product which is put to good effect by the artists. Let's be clear, it is not for the sake of the specific decoration that the architect incorporated spandrels; it is because of the shape of the spandrels that the decoration is designed as it is. The spandrels are the constraints within which decorator operates, and in evolutionary theory, genetic drift, gene hitchhiking, gene flow, etc. are the constraints within which natural selection operates.

Social Epistemology, Knowledge Production and Process vs Constraints

A similar issue can be raised about the discussion over knowledge production. Stephan, for example, spent much time discussing the economic processes by which knowledge is produced, but economic forces are also constraints and there are also constraints within which the driving economic processes can operate. This made me think that the bias for processes over constraints is likely to be more wide spread in discussion of knowledge production more generally. Indeed, by asking “How should the pursuit of knowledge be organized” and “How [should] this social dimension should be conceived and structured”, Fuller and Goldman (respectively) both place process at the very core of social epistemology (Fuller, 1987; Goldman, 1987). Processes are absolutely important, and, as they are active, make for compelling narratives, which may be why we favour them. But constraints are just as important if we want a full picture of the world. If we want our stories about knowledge production to be as complete as possible, and I think we should, then we need to be wary of a likely bias for processes over constraints when discussing said knowledge production.

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