Sober and Elgin on Biological Laws: A Critique

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1. Introduction

There are good reasons for wanting our sciences to contain laws. Without them, it seems much harder to give successful explanations, ground predictions, and support causal claims. It is therefore no wonder that many in the special sciences, like biology, economics, and psychology, want some of their generalizations to count as laws. Here is an argument, implicitly supported in the literature, for why the generalizations made in the special sciences *should not* be construed as laws: (1) Generalizations made in the special sciences are contingent. (2) Whatever else a law is, it must be more than contingently true. (3) Therefore, generalizations made in the special sciences should not be construed as laws (Smart 1963; Schiffer 1991; Beatty 1995; Earman and Roberts 1999; Woodward 2000, 2001, 2002, and 2003). Some have disagreed with this conclusion, maintaining that these differences merely show that we need to have two categories of laws: *ceteris paribus* laws and strict laws, where the special sciences should only be seen to have the former (Fodor 1991; Hausman 1992; Pietroski and Rey 1995; Lange 2000, 2002). Still other philosophers have dismissed *ceteris paribus* formulations of laws as deeply problematic, but have nevertheless maintained that certain of the generalizations made in the special sciences should count as laws. Adherents to this last sort of view have either proposed that these laws need not be more than contingently true (Mitchell 1997, 2000, 2002, 2003), or they have attempted to reformulate their generalizations so that they are not contingent at all. Elliot Sober (1997) is an example of someone who has recently supported the latter sort of view, arguing that it is possible to reformulate certain biological generalizations in such a way as to eliminate their contingency and allow them to count as laws. Additionally, Mehmet Elgin (2006) follows this line, proposing that generalizations about Mendelian inheritance and metabolic scaling should count as biological laws.

In what follows, I aim to show that Sober and Elgin's attempts to reformulate biological generalizations so as to eliminate their contingency suffer from serious theoretical problems. Limiting my discussion to the specific domain of biology, I present the following arguments: (1) Sober and Elgin's view is problematic because it allows the possibility of formulating infinitely many laws describing any biological generality—or even any biological particular—whatsoever. And (2) On Sober and Elgin's view, any interesting contrast between so-called laws and obviously accidental generalizations collapses.

2. Biological Contingency and Sober and Elgin's Attempted Solution

One of the most forceful arguments against the possibility of there being laws in biology is the Evolutionary Contingency Thesis (ECT), given to us by John H. Beatty (1980, 1995). In his words, he argues:

> All generalizations about the living world are *either*:
>
> A. just mathematical, physical, or chemical generalizations (or deductive consequences of mathematical, physical, or chemical generalizations plus initial conditions),
>
> B. Or are distinctively biological, in which case they describe contingent outcomes of evolution. Whatever laws are, they are supposed to be more than just accidentally true. (Beatty 1995: 46-47)

On Beatty's view, generalizations in biology either amount to statements that are mathematical, physical, or chemical, in which case they are not distinctively about biology at all. Or they are distinctively about biology, in which case they are about contingent outcomes of evolution—and are, therefore, not laws.[1] In either case, we are led to the conclusion that there are no laws in biology.

Another way we might formulate Beatty's charge is as follows: if we think of any biological generalization of the form 'if *P* then *Q*,' we must acknowledge that any such biological generalization depends on initial conditions (I) that are contingent. If (I) is contingent, then any generalization (if *P* then *Q*) that is based on (I) seems to, itself, be contingent.

Elliot Sober (1997) disputes this conclusion. He tries to offer a way in which the contingent initial conditions on which biological generalizations depend can be built into the generalization itself, replacing a contingent generalization with one that is not contingent at all. He writes,

> Below is a schematic version of the ECT. A set (I) of contingent initial conditions obtains at one time (t_0); this causes a generalization to hold true during some later temporal period (from t_1 to t_2):

> (I)→[if *P* then *Q*]
> t_0 t_1 t_2
>
> Since the generalization is true only because (I) obtained, we may conclude that the generalization is contingent. However, there is *another* generalization that this scenario suggests, and it is far from clear that *this* generalization is contingent. This generalization will have the following logical form:
>
> (L) If (I) obtains at one time, then the generalization [if *P* then *Q*] will hold thereafter.[2]
>
> The fact that the generalization [if *P* then *Q*] is contingent on (I) does not show that proposition (L) is contingent on anything. (Sober 1997: 460)

In other words, as Sober has it, (I) can become the antecedent to a biological law—replacing a contingent generalization with one that is not. On this view, we can formulate biological generalizations of the form 'if (I), then if *P* then *Q'*. Since (I) is itself the antecedent of the biological generalization, no contingency remains.

Mehmet Elgin (2006), following Sober, proposes that generalizations about metabolic scaling and Mendelian genetics should count as biological laws. Regarding these laws, he writes,

> The form of such laws is as follows: given certain physical constraints *p* and under certain specifiable conditions *c*, all organisms exhibit behavior *b*. (Elgin 130)

So if we follow Sober and Elgin's strategy, can we see a possible way out of Beatty's ECT dilemma? It appears that we can. Specifically, it no longer seems to be the case that a distinctively biological generalization (referring to contingent outcomes of evolution) is itself contingent. Why?—because for any contingent biological generalization we can construct another that is not contingent. Therefore, at least some biological generalizations can be based on contingent evolutionary outcomes, yet not be contingent at all.

3. Is this Solution Satisfying?

In this section, I argue that adopting the above strategy for escaping Beatty's ECT dilemma leads to serious theoretical problems. The first of my arguments proceeds as follows:

1. Sober and Elgin's solution to the ECT contends that evolutionarily contingent initial conditions can be made to be antecedents to biological generalizations, making these generalizations laws.
2. Given (1), it becomes possible to describe any observable biological generality, or

indeed any biological particular, as a biological law by making its exact initial conditions the antecedent to the generalization.

3. Thus, Sober and Elgin's solution to Beatty's ECT entails the possibility of there being infinitely many biological laws governing any observable biological generality or particular.
3. Whatever laws are, we do not want there to be infinitely many describing any biological phenomenon whatsoever.
5. Therefore, Sober and Elgin's approach is unattractive.

I have already shown that Sober employs the strategy described in (1). I now attempt to motivate premises (2)-(4) in order to conclude (5).

Let us start with a hypothetical situation in which you are walking through an old-growth coastal redwood forest. The forest floor is covered with moss and ferns. A small stream bubbles along-side the dirt path. You can hear birds chirping and insects buzzing, and enormous trees tower above you. Now, pretend that you are a biologist whose task it is to compile all of the distinctively biological laws that govern this magnificent ecosystem. Having just read (and been convinced by) Sober and Elgin's solution to Beatty's ECT, you begin cataloging candidates for laws regardless of whether their initial conditions are contingent.

You begin by observing an ant colony living in large anthill. After poking their mound a few times with a stick, you notice that—whenever a breach is made in their hill—only the larger soldier ants emerge from the freshly excavated gouge. The smaller workers never emerge. You conclude that the generalization 'if a breach is made in an anthill, only soldier ants emerge,' is a biological law. In the back of your mind, however, it occurs to you that it is a *contingent* fact that only soldier ants emerge from an anthill breach. If evolution had proceeded differently and ants had evolved to deal with intruders in some other fashion, or indeed if ants had never come to exist at all, no such generalization would obtain. However, thanks to Sober and Elgin's response to Beatty, nothing stops you from formulating a biological law stating that, given the initial conditions of ant evolution, the generalization 'if a breach is made in an anthill, only soldier ants emerge,' is a biological law.

The next observation that you make, being a diligent and well-trained biologist, is that full-grown coastal redwood trees average 100 meters in height and live to an average of 500-700 yrs. Clearly, this is a contingent fact about redwood trees, one that might have been different if soils had been differently composed or if California had cracked off into the ocean in a catastrophic seismic event. Still, on Sober and Elgin's view, there is nothing stopping you from stating that, given the exact initial conditions preceding the growth of coastal redwood forests, there is a biological law that dictates full-grown coastal redwood trees average about 100 meters in height and live to about 500-700 yrs. Now, imagine you find one particularly tall redwood tree towering at 115 meters. Obviously, there were contingent circumstances leading to this one particular tree's abnormal height, but on Sober and Elgin's view, you could even formulate a biological law stating that—given the precise circumstances fostering this one tree's growth—all redwood trees grow to 115 meters.

These brief imaginings are meant to demonstrate what I take to be a disagreeable implication of Sober and Elgin's approach to Beatty's ECT. Namely, the very process of formulating laws by eliminating contingency from biological generalizations allows for there to be such laws about any biological phenomena whatsoever. If all that needs to be done to construct a biological law is to stipulate as antecedents to the generalization the exact initial conditions that preceded the phenomenon in question, then it would seem that any biological phenomenon is a viable candidate for law-hood. If, like me, you are unsettled by the thought that there could be infinitely many biological laws describing any biological generality or particular whatsoever, then there seems to be a good reason to reject Sober and Elgin's solution.

What is so wrong with a view of the biological world in which infinitely many laws govern it? Certainly, there is nothing that, in theory, precludes such a possibility. That being said, however, it must be noted that the theoretical and pragmatic virtue of parsimony tell us that (all things being equal) we should favor scientific worldviews in which as few theoretical entities are postulated as are necessary. The picture of biology that arises when we consider Sober and Elgin's approach to laws, however, accommodates the existence of infinitely many theoretical entities: namely laws. If one has any realist leanings about such theoretical entities, claiming (for example) that the acceptance of a given theory entails a realist conception of all the theoretical entities postulated by that theory, it would seem that parsimony strongly favors Beatty's ECT over Sober and Elgin's attempted solution.

Furthermore, Sober and Elgin's approach allows us to formulate laws from biological generalizations that just do not seem law-like. Surely, even Sober and Elgin themselves would not want generalizations about how ants deal with intruders and the height of redwood trees to count as laws. Yet, on their view, they do count. This strikes me as a strong reason to favor Beatty's view over Sober and Elgin's.

4. Laws and Accidental Generalizations: A Collapse

My second argument against Sober and Elgin's solution to the ECT is as follows:

1. According to Sober and Elgin's solution to the ECT, we can reformulate obviously accidental generalizations into laws of biology.
2. If we can reformulate obviously accidental generalizations into laws, then no interesting or meaningful distinction between laws and obviously accidental generalizations obtains.
3. Whatever laws are, we want them to be distinct from obviously accidental generalizations.
4. Therefore, Sober and Elgin's approach is unattractive.

Philosophers normally distinguish a *law* from an *accidental generalization* on the basis that the former has some kind of modal force and the latter just happens to be true. Here, what is meant by modal force might best be thought of as some kind of necessity. Following David Lewis's (somewhat onerous) terminology, a statement is necessarily true only if it is true in all possible worlds.[3] If Lewis-style talk of possible worlds is unsettling, we can also follow Saul Kripke (1972) and talk about nomological necessity—where a statement is necessarily the case only if it is not possible for it to have been otherwise (in *this* world). Here, I should be clear that it does not matter to me which conception of necessity my reader chooses to employ. The upshot is that generalizations that happen accidentally to obtain are not laws.

In order to demonstrate what this means, it is instructive to focus on the following example: suppose I correctly declare, "every coin in my right-hand pants pocket is silver-colored." And compare this statement with another true declaration of mine, "all metals expand when heated." The relevant difference here is that the former generalization is obviously accidental, while the latter is necessary.[4] If the statement "all coins in my right pocket are silver-colored" *were* necessary, it would have to be true in all possible worlds. And it seems quite clear that possible worlds abound where my right hand pants pocket is heftily weighted down by pennies. However, the statement "all metals expand when heated" *is* necessary; in all possible worlds the constituent atoms of metals will become excited under heat—requiring more space.

As I argued in section 3, Sober and Elgin's solution to the ECT entails the possibility of formulating biological laws about any observable generality (or particular) in nature, regardless of contingency. If we adopt this strategy, we can fashion biological laws about all sorts of obviously accidental generalizations, generalizations with no more modal force than declaring I have all silver colored coins in my right hand pocket. On Sober and Elgin's view, the very modal status that makes something a law is sacrificed, leaving laws no different than any accidental truth. And if no such difference remains, then Sober and Elgin's view entails that any meaningful distinction between laws and obviously accidental generalizations collapses.

4. Conclusion

In this short discussion note, I have argued that Sober and Elgin's solution to Beatty's ECT trivializes our conception of laws and is thereby unacceptable. If sound, these arguments indicate that we may not be able to avoid the grips of Beatty's powerful Evolutionary Contingency Thesis, and our biological world may still be best understood to be lawless.

[1] Beatty does not offer an explicit set of criteria for something to be 'distinctively biological.' Elgrin, however, attempts to do so (125)—offering the following definition: "A law L is distinctively a law of some specific science S if and only if all non-S concepts that L contains are mathematical concepts, and L contains some S-concepts and these S-concepts in L are essential for the truth of L." For the purposes of this paper, I am willing to follow Elgrin's definition.

[2] Though Sober uses the term "thereafter" in his formulation of (L), I assume he means for this generalization only to obtain from a temporal period (from t_1 to t_2)—otherwise no biological generalizations would count—as all biological generalizations will fail to obtain at some time in the very distant future.

[3] Note: Lewis's famous paper on causality is only a treatment of *singular* causal claims; he makes sure not to extend his treatment to generalizations. What I'm doing is trying to apply Lewis's concept of necessity to my conception of law-like generalizations.

[4] It may turn out that the statement, "all metals expand when heated," is ultimately contingent as well. This would be true, for example, on Cartwright's view (1983). I offer this example because, if there are any necessary truths in science, it seems this is one of the strongest candidates. It does not affect my argument against Sober and Elgin even if there are no necessary truths (laws) at all.

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