Do Selectional Explanations Apply to "Individual-Level" Facts? Some Comments on E. Sober's Conception of Selectional Explanations

Elliott Sober (1984) has offered an appealing way of understanding the methodological distinctness of selectional explanations, which contrast with what he calls developmental explanations. He suggests that the distinction between these two styles of explanation can be understood in terms of a distinction between two kinds of explananda. Selectional explanations explain "population-level" explananda; developmental explanations explain "individual-level" explananda. Although developmental explanations primarily explain "individual-level" explananda, they can also explain "population-level" explananda although derivatively (by aggregation). In this, developmental explanations differ from selectional explanations which are capable of explaining "population-level" explananda but, Sober insists, *not* "individual-level" explananda — not even derivatively.

This thesis of Sober's has met with some resistance. Karen Neander (1988, 1995) has argued that while Sober is right about single-case selection, in which case indeed the selectional explanation does not explain why the selected individual has a certain trait, he is wrong about cumulative selection. In section 4, I argue that Sober's claim that selectional explanations are incapable of explaining "individual-level" facts is wrong even for single-case selection. What is notoriously hard to understand is how Sober can think that an explanans that explains why members of a population have a certain trait, fails to explain (even if only derivatively, cf. Brandon 1990) why an individual who is a member of the population has that trait. I would like

to suggest that Sober's resistance on this score can be explained by his particular way of understanding the nature of selectional explanations and selectional explananda in particular (section 1). I will argue, however, against this construal of selectional explananda (sections 2 and 3).

1. Selectional and Developmental Explanations

Sober notes that there are two ways of explaining why all individuals in a population have a certain feature. A developmental explanation proceeds by explaining why each individual member of the population developed a particular feature. The particular explanations of why each individual changed are then assembled to explain why the population (of which the individuals were members) changed. A selectional explanation proceeds very differently. It does not aggregate explanations why each individual changed, nor does it even suppose that the individuals have changed. It explains the presence of a common feature among the individuals in a population by showing that only individuals with it passed a certain selection criterion.

The distinction is by no means specific to biological contexts. Sober himself offers an ordinary example to illustrate it. He imagines a room where all children have a third-grade level reading proficiency. One (developmental) explanation-why is given by aggregating the psycholinguistic explanations of why each child has developed such a reading proficiency. The other (selectional) explanation proceeds by pointing out that only children with that specific reading proficiency were admitted to the room.

Sober attempts to explicate the distinction between the two different styles of explanation by reference to a distinction between their explananda. Although it may look as if each explanation explains the same "thing," it does not. He uses the insight that an appropriately

selected contrast class can make clear what question is being asked and what explanation sought. When the bank robber Willie Sutton answered a priest's question why he robbed banks with the revelation "This is where the money is," he was not giving the explanation wanted. For what the priest wanted to know is why Sutton robbed (rather than not), while Sutton explained why he robbed banks (rather than some other institutions). Sober claims that developmental and selectional explanations embed what seems like the same explanatory question in different contrastive contexts.

> Lamarck and Darwin both could have interested themselves in explaining why giraffes have long necks. Lamarck's developmental theory would have interpreted that problem as requiring that one show why existing giraffes have long necks rather than short ones. …Darwin took his question to have an irreducibly population-level character. …The explanatory question became one of saying why the giraffe population is composed of long-necked individuals rather than of *other* individuals who are not long-necked. The theory of natural selection created a new object of explanation by placing the population fact in a new contrastive context. (Sober 1984, p. 150, emphasis added)

A developmental explanandum contrasts one individual's having a property and *that same* individual's not having the property in question. We can think of the explanandum as a pair of two contrastive propositions:

$$<a \text{ is } F, a \text{ is not-}F>.$$

Selectional explananda differ in that they not only admit but, as Sober maintains, require reference to *different* individuals. Universal[1] selectional explananda have the form:

> $<$Population P is composed only of individuals (a_1, a_2, …, a_k) that are F, Population P is
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> composed only of individuals (other than a_1, a_2, …, a_k) that are not-$F>$.

Two features of such a construal of selectional explananda are noteworthy. First, the second contrastive proposition refers to individuals that are different from those referred to in the

first contrastive proposition. In this way, selectional explanations differ markedly from developmental explanations, which are about one individual. It is presumably in this sense that the developmental explanations explain *individual*-level facts (for both contrastive propositions refer to a single individual) while selectional explanations explain population-level facts (for the contrastive propositions do not refer to the same individuals but only to the same population). Second, the second contrastive proposition is universal rather than existential. It requires that *all* the individuals be not-*F* rather than requiring e.g. that some be not-*F*. I challenge each feature in the following two sections. I argue that the first feature is incompatible with the counterfactual force of selectional explanations (section 2), and that the second feature is not a general feature of selectional explanations – some selectional explanations exhibit it, while others do not.

2. A Problem with Sober's Account of Selectional Explananda

Although Sober's proposal makes for a nice and crisp distinction between selectional and developmental explanations, it leads to a serious problem. Under his construal, the theory of natural selection loses much of its explanatory force by not being able to support important counterfactuals.

It should be uncontroversial that it is part and parcel of natural selection theory that it makes not only claims such as:

(t) The light-colored peppered moths living in the industrial environment did not survive (because they were exposed to increased predatory pressures vis à vis the dark-colored moths),

but also, and perhaps more importantly, claims such as:

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[1] I focus attention on universal selectional explananda, but the remarks carry through to probabilistic ones.

(T) *Were* these (dark) peppered moths living in the industrial environment light-colored, they *would* not have survived (because they *would* have been exposed to increased predatory pressures vis à vis the dark-colored moths).

Were evolutionary explanations to explain selectional explananda of the sort Sober seems to envisage, counterfactuals like (T) would not be supported. Sober's explananda are essentially geared to claims like (t). Let us see that it is so.

Let us name the light-colored moths mentioned in (t) $l_1, l_2, l_3, \ldots, l_m$, and their dark-colored counterparts $d_1, d_2, d_3, \ldots, d_n$. Following Sober, we should reconstruct the explanandum of an explanation-sketch like (t) as follows:

$\langle P$ includes moths $\{d_1, d_2, d_3, \ldots, d_n\}$ that are dark-colored, P includes moths $\{l_1, l_2, l_3, \ldots, l_m\}$ that are light-colored$\rangle$,

where $l_1, l_2, l_3, \ldots, l_m$ are individually distinct from $d_1, d_2, d_3, \ldots, d_n$.

The problem arises when one tries to reconstruct the explanandum of the explanation-sketch like (T) in these terms. Let us name the dark-colored moths mentioned in (T) $d_1, d_2, d_3, \ldots, d_n$, once again. The problem is that (T) is not really about any actual light-colored moths (like $l_1, l_2, l_3, \ldots, l_m$). It is about $d_1, d_2, d_3, \ldots, d_n$. This is true for both contrastive propositions: the first is about $d_1, d_2, d_3, \ldots, d_n$, as they actually are, the second is about $d_1, d_2, d_3, \ldots, d_n$ as *they would be were they* light-colored. The explanandum implicit in a statement like (T) is therefore closer to:

<P includes moths $\{d_1, d_2, d_3, \ldots, d_n\}$ that are dark-colored, P would include moths $\{d_1, d_2,$

$d_3, \ldots, d_n\}$ were they light-colored>.[2]

Of course, if we modified (T) to read:

> (T′) *Were* the peppered moths living in the industrial environment light-colored, (it is very likely
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> that) they *would* not have survived (because they would be exposed to increased predatory
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> pressures vis à vis the dark-colored moths),

the explanandum would have to be corrected accordingly (again, supposing that $l_1, l_2, l_3, \ldots, l_m$

are light-colored moths, and $d_1, d_2, d_3, \ldots, d_n$ are dark-colored moths):

> <P includes moths $\{d_1, d_2, d_3, \ldots, d_n\}$ that are dark-colored, P would include moths $\{l_1, l_2, l_3,$
>
> $\ldots, l_m, d_1, d_2, d_3, \ldots, d_n, \ldots\}$ were they light-colored>.

Counterfactuals like (T′) are applicable to *any* moths.

This shows that to the extent that Sober's reconstruction of selectional explananda

embodies the requirement that the contrastive propositions refer to different individuals, it can

only account for explananda of claims like (t), but not those of claims like (T) or (T′). For the

latter require that the sets of individuals mentioned in both contrastive propositions at least

overlap. A theory that explains Sober's explananda, explains why it is that a population includes

certain individuals that have some adaptive traits rather than those that do not have them; but it

does not explain why this population would not include the individuals had they not had these

adaptive traits. Whatever one thinks about such a theory, it should be clear that natural selection

theory is not it.

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[2] We do not mean to suggest this as the proper reconstruction of the selectional explanandum. We will see
in the next section that Sober's second requirement whose appropriateness we have not yet disputed is also
untenable (it is not even tenable for universal selectional explananda).

In short, Sober's requirement that contrastive propositions refer to *different* individuals is incompatible with the explanatory power of evolutionary theory (codified among others in counterfactuals like (T)). This is the more strange if we consider that Sober construes the theory of natural selection as a theory of *forces,* that he is aware, more than anyone else, of the counterfactual import of the theory of natural selection.

3. The Source of the Problem: The Wrong Contrast

We are now in a position to see that the problems stem from the fact that Sober takes a wrong contrast to be characteristic of selectional explanations. On Sober's view, a selectional explanation explains why a population includes individuals that are *F* rather than (other) individuals that are not-*F*. In other words, the contrast that is constitutive of a selectional explanandum is between selection for one feature (*F*) and selection for the opposite feature (not-*F*). The contrast is in effect between the presence of a selectional force for one feature and the presence of a selectional force for another feature.

While the explanation why *F*'s are favored rather than not-*F*'s are favored can be relevant to a selectional explanation, it is not central to a selectional explanation. The primary contrast for a (natural) selectional explanation is between situations where a population is subject to the force of natural selection and those where it is not. Natural selection explanations proceed by explaining what actually happened and contrasting it with what would have happened had the selectional force actually present not been present. The relevant contrast is between the *presence* of a selectional force for one feature and the *absence* of the selectional force for that feature. It is not, as Sober conjectures, the contrast between the presence of a selectional force for one feature and the presence of a selectional force for another feature.

To complicate matters, however, there *are* instances, where the contrast invoked by evolutionary explanations might *appear* to be of the form Sober envisages it to be — between one feature being selected for rather than another feature being selected for. But even then it is easy to see that this cannot be the primary contrast, that it is merely an instance of the contrast between the presence of natural selection for a certain feature and the absence of natural selection for this feature. Let us once again use the melanic moths example to illustrate these points.

The evolution of peppered moths might be thought to illustrate Sober's construal. The contrast there is between a situation where a population of peppered moths lives in an environment which is not yet polluted, and a situation where the population lives in a polluted environment. — If the trees were not sooted, their bark would be light in color, offering an advantage to the light-colored moths, as indeed was the case in the pre-industrial times. However, since the industrial pollutants have darkened the trees' bark, they have in effect given a differential advantage to dark-colored moths. Here, indeed, the first impression confirms Sober's suggestion: the contrast appears to be between selection for individuals that are dark-colored and selection for individuals that are light-colored.

But a closer look at the case reveals that it does not in fact confirm Sober's suggestion. For consider a variation on the example. Let us suppose that in pre-industrial times, a population of peppered moths lived in mixed forests — some of the trees' bark was very light, some was very dark. It is possible to imagine that the proportion was such that none of the forms, the light-colored or the dark-colored, was at a differential advantage (in other words, no selectional force for either of the forms was manifest). Until the industrial times. When most of the trees

darkened, the dark-colored moths were at a clear advantage. In this case, once again we offer a selectional explanation but one where the contrast is not between a selection for the dark-colored moths and selection for the light-colored moths. Rather, the contrast is between what actually happened (with the forces of selection for dark color present), and between what would have happened had the forces of selection actually present not been unleashed by the incidence of certain environmental factors (pollution).

In fact, this has been the contrast in the original case as well — except that there, before the pollution of the environment, the light-colored moths were at an advantage, were selected for. In both cases, the sides of the contrast are: the current state of the population with respect to a feature *F* (with the force of natural selection for *F* present) and the state of the population *were* the force of natural selection for *F* absent. In the first and in the second case, what actually happens is in the end the same: the dark-colored moths are selected and constitute the majority of the population. The cases differ with respect to the state of the population with which the current state is contrasted: a largely light-colored population (because of the selection for light-coloredness) and a mixed population. In both cases, the contrast is between the state of the population were the selectional force for dark color in moths absent. However, since we have supposed that the initial states of the populations differ in these two cases, it is not surprising that the cases in the end invoke different contrasts. In the first case, were the selectional force for dark color in moths not to take effect, the pre-industrial shape of the population would ceteris paribus continue: the light-colored moths would continue being selected-for. In the second case, once again the state of the population would be, ceteris paribus, that of the population before the onset of the selectional force for dark color. This time, however, neither selection for dark-

colored nor for light-colored moths would be manifest: they would continue living in some equilibrium.

We can conclude then that selectional explanations do not invoke the contrast that Sober wants. The contrast is not between selection for *F*'s and selection for not-*F*'s, but rather between the state of a population with respect to *F* after the force of selection for *F* has taken effect, and the state of the population with respect to *F* had the force of selection for *F* not taken effect (a good approximation to which is provided by the state of the population just prior to the onset of the selectional force for *F*). Let us also point out that this way of thinking about the contrast builds in the counterfactual nature of selectional explanations from the start.

This means that we should not construe selectional explananda in the way which Sober envisages. As argued in section 2, we should not require that the two contrastive propositions refer to different individuals on pain of not being able to capture the counterfactual force of evolutionary explanations. As we have presently shown, we should not require that the second contrastive proposition be universal. This second requirement should simply be demoted from its status as a requirement: while the second contrastive proposition may be universal (as in the first case above where the selection for light-colored moths is in effect before the onset of the selectional force for dark color), it need not be (as in the second, modified, case).

Given the above points it seems reasonable to suggest that while one may agree with Sober about the form that a developmental explanandum takes, the selectional explanandum is better thought as having the form:

> <Population *P* is composed only of individuals that are *F*, Population *P* is not composed only of individuals that are *F*>.

Since such an explanandum does not carry with it the restriction that the two contrastive propositions refer to different individuals, it does not face the problem of accounting for the counterfactual force of selectional explanations. At the same time, this form of the selectional explanandum does not build in the requirement that the contrastive proposition in effect be about a selection for a different feature.

4. Do Selectional Explanations Apply to Individual-Level Facts?

As we have seen, one of the reasons for insisting that the contrastive propositions in a selectional explanandum refer to different individuals is that in this way the population-level character of such explanations is underscored. The two propositions constituting the contrastive explanandum are about different individuals, though they are about *one* population (to which the different individuals belong). Both propositions in a developmental explanandum, on the other hand, are about *one* individual. I argued in section 2 that such a construal of the selectional explanandum is inadequate. I will now proceed to show that Sober is wrong in thinking that selectional explanations do not apply to individual-level facts, even in cases of single-case selection.

1. Consider again Sober's example of the selectional explanation why all the children in a room have a third-grade level reading proficiency. The selectional explanation appealing to the fact that only those children that did have such a reading proficiency were admitted to the room presumably offers an explanation of a population-level fact. By contrast, the developmental explanation in terms of the children's psycholinguistic histories offers an explanation of individual-level facts.

Suppose that on one occasion the antechamber contains twenty children, ten of whom can read at the third-grade level, and are consequently admitted to the room. We have a population-level fact that all (ten) children in the room have a third-grade level reading proficiency, and we can explain it selectionally. But suppose that on another occasion, out of the twenty children in the antechamber only one child has the required reading proficiency, and only she is admitted to the room. Do we again have a population-level fact that all (one) child in the room has a third-grade level reading proficiency? It would be quite arbitrary to answer in the negative. But if so then it is not clear how this population-level fact is different from the individual-level fact that this child has a third-grade level reading proficiency. On the other hand, what does seem clear is that (on this occasion) the selectional explanation explains why *this child* has a third-grade level reading proficiency. The selectional explanation explains an individual-level fact.

2. Some of the force of this argument can be dispelled by pointing out that the proposition 'This child has a third-grade level reading proficiency' can be embedded in different contrasting contexts. The explanandum of the developmental explanation is <This child has a third-grade level reading proficiency, This child has a different level reading proficiency>, while the explanandum of the selectional explanation is <There is a child with a third-grade level reading proficiency in the room, There are children with different level reading proficiency in the room>. At this point we must agree that these are different explananda. If so, then it is not true that the selectional and the developmental explanation explain the same thing.

It ought to be noted, however, that to admit that the two kinds of explanations do not explain the same thing is *not* to say anything about the selectional explanation not being applicable at the individual level. Surely, given Sober's construction, we have to admit that the

two explanations explain different explananda. But nothing has been done so far to show that these different explananda are not *about an individual*. And if this is so, then it is not clear how one could claim that selectional explanations do not explain individual-level facts. They explain different things ("aspects") about individual-level facts than do developmental explanations, but individual-level facts explain they can.

3. In his response to Neander, Sober (1995) softens his stance on the failure of selectional explanations to apply to individual-level facts. He introduces the idea that an explanation with a general explanandum of the form "All *A*s are *B*" usually "distributes" to individual *A*s. To say that an explanation of the form "*E* explains why all *A*s are *B*" distributes to individual *A*s is to say that "each *A* is such that *E* explains why it is *B*" (Sober 1995, p. 393). So when the phenomenon of tides is explained by appeal to among others the gravitational force between the sea and the Moon, such an explanation does "distribute" to individual tides: the gravitational force of the Moon does explain each of the individual tides. However, Sober argues that while selectional explanations also "distribute" – they distribute differently. A selectional explanation why all *A*s are *B* proceeds by showing not that being *A* causes being *B* but rather that being not-*B* caused being not-*A*, and it accordingly distributes not to individual *A*s but to individual not-*B*s according to the following pattern "Each not-*B* is such that *E* explains why it is not-*A*" (p. 394). To use the artificial selection example again, appropriate selection explains why all the children in the room read at the third grade level. Sober claims, however, that selection does not explain for each child in this room why she reads at third grade level, rather it explains for each child that did not read at that grade level why he was excluded from that room.

I fail to see, however, why one should not take this suggestion of Sober's as an argument that selectional explanations never in fact explain why all *A*s are *B* but rather that they explain only why all not-*B*s are not-*A*. Of course, the statements "All *A*s are *B*" and "All not-*B*s are *A*" are logically equivalent but 'explains' is not an extensional verb. After all, to explain why all elm trees are leafless in December (by appealing to the occurrence of cold weather before December) is not yet to *explain* why everything that is not leafless in December is not an elm tree.

We reach a crucial point. Sober's claim that selectional explanations why all *A*s are *B* distribute to not-*B*s rather than to *A*s betrays the fact that he wants to accommodate selectional explanations among causal explanations. Indeed, it is true that any selectional explanation why all *A*s are *B* will include a causal component of the sort that Sober envisages (where being not-*B* will causally contribute to being not-*A*) but the causal story is not all there is to selectional explanation. Sober's mistake lies in thinking that for a selectional explanation why all *A*s are *B* to distribute to individual *A*s would involve thinking that being *A* causes being *B*. This would indeed be absurd — being a child in the room does not causally contribute to having a third-grade level reading proficiency. But why should we think that it does unless we make the implicit assumption that a selectional explanation "distributes" as if it were a causal explanation. Surely it does not. Being a child in the room is not *causally* relevant to having a third-grade level reading proficiency, but this is not to say that being a child in the room is not otherwise relevant to having a third-grade level reading proficiency. How? Well, it is selectionally relevant – here we need to invoke the selectional explanation of how only children with that that grade level reading proficiency were selected to enter the room. We can have two answers to the question

why Johnny, who is in the classroom, has a third-grade level reading proficiency. One answer will be the familiar developmental one. The other answer will go as follows: "Well, Johnny is one of the group of children who were selected to enter the classroom on the basis of his third-grade level reading proficiency." At this point it is also quite clear that selectional explanations of individual-level facts are derivative from the selectional explanation of population-level facts.

Sober is, I believe, right in thinking that while the developmental explanations are geared toward individual-level facts, selectional explanations are geared toward population-level facts. He is also right in thinking that developmental explanations do, though derivatively, explain population-level facts (by aggregation). However, he is wrong in thinking that selectional explanations cannot, not even derivatively, explain individual-level facts. Selectional explanations do explain individual-level facts, though derivatively. However, it is because developmental explanations are geared toward individual-level facts that they are so salient at that level. It is hard for us to imagine a case when we would be satisfied by a selectional rather than a developmental explanation for an individual-level fact. Though it is hard, it is not impossible. Here is one scenario (when something goes wrong in the selection process) when the focus is shifted in a way that makes it natural for us *not* to expect a developmental explanation of an individual-level fact.

Imagine the following selection process. Suppose that only individuals that have 2 balls in their pockets are chosen to enter a room (as a result of which it is true that all individuals in the room have 2 balls in their pockets). At 3pm, however, the selection criterion is supposed to change – only individuals that have 3 balls will be let in. Suppose that it is 3:01 pm, John has 2 balls in his pocket and is let in. Surely, we can wonder why John, who is in the room, has 2 balls,

not 3 balls, in his pocket. Moreover, we will not be satisfied by an etiological explanation of how John came to acquire 2 rather than 3 balls. Rather we will want to know why the selection mechanism didn't work *for John*.

In sum, I have acknowledged that Sober is right about the fact that selectional and developmental explanations will have different explananda. I have argued, however, that he is wrong in insisting that the contrastive propositions in a selectional explanandum refer to different individuals (section 2) and that the second contrastive proposition be universal (section 3). The criticized features of Sober's conception of selectional explananda were at least part of the reason for his insistence that selectional explanations do not explain individual-level facts, not even derivatively. I have argued that Sober does not provide convincing reasons for this claim (section 4). Properly understood selectional explanations (even single-case selectional explanations) *do* apply to individual-level facts, though derivatively — Sober is right in thinking that selectional explanations are geared toward explaining population-level facts. Moreover, I have warned that the claim that selectional explanations apply to individual-level facts should not be confused with the claim that they compete with developmental explanations of individual-level facts. In fact, Sober's construal of the difference between selectional and developmental explananda allows us to understand how these explanations can explain different aspects of individual-level facts.

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