SCREENING-OFF AND THE LEVELS OF SELECTION

ABSTRACT. In ‘The Levels of Selection’ (Brandon, 1984), Robert Brandon provides a suggestive but ultimately unsuccessful attempt to use the probabilistic notion of screening off in providing a schema for dealing with an aspect of the “units of selection” question in the philosophy of biology. I characterize that failure, and suggest a revision and expansion of Brandon’s account which addresses its key shortcoming.

1. BRANDON ON THE LEVELS OF SELECTION

In moving away from simplistic reductionism, the philosophy of the sciences has run up against a recurring and general set of questions about the relationships between explanations of complex systems at different levels of organization. In discussions of genic, organismic, and group selection in evolutionary biology; individualism and holism in the social sciences (see, e.g., Sober, 1984); and connectionist and cognitivist models in computational psychology (see, e.g., Clark, 1991), we must confront the general problem of picking out the “preferred” level of organization for the explanation of particular effects.

In his paper ‘The Levels of Selection’, Robert Brandon rightly sees the units of selection controversy as one particular case of this general problem. But his attempt to use the probabilistic notion of screening off in providing a kind of schema for answering an aspect of the “units of selection” question in the philosophy of biology is, although suggestive, ultimately unsuccessful. In what follows, I’ll say why I think his account fails, and suggest how we might avoid its problems.

Screening off is a fairly intuitive idea: A screens off B from C iff the assumption of A makes B probabilistically irrelevant with respect to C, but not vice versa. That is: A screens off B from C iff

\[ P(C/A&B) = P(C/A) \neq P(C/B) \]

Or to put it in a more intuitive but slightly less precise way: A screens off B from C just in case all the correlation between B and C is in virtue of their correlations with A.

It has been widely noted (see, e.g., Salmon, 1984) that the screening
off relation captures some aspects of the direction and proximity of causation: First, common causes screen off common effects from one another; e.g., atmospheric pressure screens off barometer readings from inclement weather. Fix the pressure, and any variation in barometer reading will not further correlate with a varying likelihood of stormy weather. And second, more proximal causes in a chain screen off more distal ones from their common effects – e.g., gas pedal pressure and throttle position are both correlated with engine speed; but fix the throttle position, and variations in gas pedal pressure no longer will correlate with changes in engine speed.

Brandon's suggestion is that screening off should be taken as a mark of the level of organization that is directly causally responsible for particular effects of a complex system. Roughly, entities or properties at the level of organization directly responsible for some particular effects should screen off entities or properties at other levels of organization from those effects. That is to say, stabilities and variations of the properties $L_1$ at the “preferred” level of organization screen off the connection of properties $L_2$ at each other level of organization of that structure or event from effect $E$ – i.e., fixing $L_1$ leaves $L_2$ and $E$ probabilistically independent; symbolically, that

$$P(E/L_1) = P(E/L_1 \& L_2)$$

Intuitively, again, it's to say that the correlation between $L_2$ and $E$ is in virtue of their links to $L_1$.

The key illustration given of this is the case of phenotypes screening off genotypes from the reproductive success of the individual organism: Fix the phenotypical properties of the organism, and variations in the genotype no longer correlate with reproductive success. In this way, “... screening off provides us with the means for answering the question 'At what level does the causal machinery of organismic selection really act?'” (Brandon, 1984, p. 135)

2. PROXIMITY AND IDENTITY

But there is a clear limitation on this use of screening off. It might well be only accidentally correlated with the question of preferred levels of organization in the genotype/phenotype case. We can, after all, simply subsume the genotype/phenotype example under the general case of more proximal causes screening off more distal ones. Phenotypical