

## **Multilevel Selection Module; Assessments**

**Accompanies the article:**

**O'Brien, D. T. (2011). A modular approach to teaching multilevel selection. *EvoS Journal: The Journal of the Evolutionary Studies Consortium*, 3(1), 12-23.**

### **Multilevel Selection Homework Assignment**

### **Online Teaching Materials Short Paper on a Culture**

The following writing prompt is intended for an upper-level class, and is constructed to be applicable to any culture that the student chooses to write about. It was originally assigned as a 4-page (double-spaced) paper, a length that could easily be expanded.

#### **Writing Prompt**

Identify a moment in your culture's history that exemplifies between-group competition. Describe how between-group variation came to bear on the outcomes of this event.

OR

Describe a behavioral pattern in your culture that is driven by between-group competition.

In either case, frame your essay around multilevel selection, describing the sorts of traits that are being promoted by this between-group competition and if they would be adaptive to the individual otherwise.

This paper was originally assigned as a final assignment for Cultural Evolutionary Theory. It would probably be appropriate for few other courses, and its extensiveness makes it most suitable as a final paper. It places a large focus on multilevel selection, and could probably be manipulated to fit other situations.

**The Evolution of Social Norms and Their Maintenance:  
A Case-Study on (Insert Your Culture Here)**

**Empirical Foci:**

- In what ways is prosocial (i.e. positive social) behavior expressed in your culture? In what contexts do they cooperate, demonstrate social niceties, give, receive, or come together for collective action?
- Just as interesting, in what contexts do they *not* do these things? When is it acceptable to be a loner, to work for individual interests rather than the interests of a collective?
- What mechanisms exist to maintain these traditions? How are children educated in these manners and social expectations? How are transgressors (e.g. criminals, but *do not* limit your focus to this as it is a very small slice of the most extreme antisocial behaviors) punished? What are the consequences for violating these social norms?
- How is it done? What individuals are responsible for enacting such punishments, and when are punishments lifted? Or are the punishments one-shot in nature, like receiving a single fine?

**Theoretical Foci:**

- This should be interpreted using a cultural evolutionary perspective, which, in its most sophisticated form, requires the incorporation of multilevel selection.
- Make certain to describe how certain social norms were selected for by the local environment. How does prosociality in a particular context fit the “niche” that your culture is filling in its environment? Are other such traditions just maintained to create bonds that are useful in other contexts? The center of this will be to define at what scale (e.g. family, tribe, whole-society) and in what settings (e.g. hunting, building, etc.) prosociality is advantageous.
- It would be difficult to write that without a consideration for multilevel selection, however I’d like to make explicit that you should discuss how such behaviors could be costly to the actor if either, a) the norms are not enforced for others, or b) there is no benefit associated with such behaviors. Describe whether these norms require a large level of sacrifice in the process of being a member of society, or very little. What is the advantage derived from group function? Connect this back to both the natural and culturally-constructed environments (i.e. are we talking about whale hunters or sustenance farmers or leaders in world trade?).
- Finally, following that last statement, your cultural evolutionary perspective will necessarily have to be gene-culture coevolutionary. The field is generally agnostic as to whether prosociality is a genetic trait, or one that is primarily socially-learned. However, note that the culture is constructing a niche for survival that then interacts with the physical environment to make the selection pressures that will lead to social norms. This perspective should be both implicit and explicit throughout the paper.

**Official Considerations:**

- Papers should have a length in the range of 15 pages (~13-18).
- Citations will be in the format of *Evolution & Human Behavior*, as with all previous papers.

Below is a list of problems that evaluate understanding of multilevel selection. They include both more in-depth out-of-class pursuits, short answer, and multiple choice questions.

### **Homework**

1. Below is a list of pairs of traits that are evolving in competition with each other. For each, describe two scenarios: one in which the level of within- and between-group selection pressures favor trait A, and one in which they favor trait B. If there is no scenario in which A or B would be more successful, say so.
  - a) A: The trait is beneficial to the individual but offers no benefit or harm to the group; B: The trait is beneficial to the group but offers no benefit or harm to the individual.
  - b) A: The trait is beneficial to the individual and offers no harm or benefit to the group; B: The trait is beneficial to the individual, but less so than trait A. It is beneficial to the group.
2. Give two examples from the movie “Eternal Enemies” of each of the following:
  - a) Interactions that create selection of individuals.
  - b) Interactions that create selection of groups.
  - c) Effects on individuals that altered group fitness.
3. There are three main theories, apart from group selection, that intend to explain the presence of cooperative behavior in certain species.
  - a) Name them.
  - b) For each, describe the phenotypic plasticity you would expect in the development and expression of cooperative behavior if it were selected for by that specific pressure. For example: “If cooperative behavior were selected for by group selection, I would expect to see cooperative behavior develop/appear when...”

### **Short Answer**

- 1) From the movie *Eternal Enemies*, give an example of: i) Interactions selecting individuals; ii) Interactions selecting groups; iii) Effects to individuals that alter group fitness.
- 2) What two things are necessary for group selection to be a relevant force?
- 3) The following question discusses different types of selection theory.
  - a. What is meant by naïve group selection and why was it ignored for so long?
  - b. How did multilevel selection improve on naïve group selection and allow for a more sophisticated perspective on group selection?
  - c. Multilevel selection also includes gene selection. What do you think this is and how do you think it works?

### **Multiple Choice**

- 1) Which of the following describes a situation in which a trait benefiting the group at a cost to the individual would be MOST selected for?
  - a. Low between-group competition and low within-group competition
  - b. Low between-group competition and high within-group competition
  - c. High between-group competition and low within-group competition
  - d. High between-group competition and high within-group competition