

# The Biology of Cooperation

## Instructor

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## Overview

Birds do it. Bees do it. Microbes do it, and people do it. Throughout nature, organisms cooperate with each other. Humans have always been deeply attracted to the idea of cooperation – yet, we regularly succumb to the temptation to cheat. Why cooperate at all, when it's so easy to gain what we need by cheating and subterfuge? In this seminar, we will see what we can learn about this fundamental dilemma by looking at species other than our own. We will dive into the spectacular natural history of cooperation across the natural world, from microbes to mammals, both within and between species. Taking ecological and evolutionary approaches, we will explore the costs and benefits of cooperation, the forces that act to stabilize it, and the forces that lead it to break down. Finally, we will ask if a deeper knowledge of natural systems can be leveraged to design incentives to help cooperation thrive in our own species.

## Schedule

Mondays 10 am – noon (Arizona time)

March 14, 21, and 28, and April 4 and 11, 2022

## General Plan

Each class will be broken up as follows: there will be 40 minutes of lecture, 10 minutes of questions and discussion, then a 10-minute break, followed by 40 minutes of lecture and a final 20-minute discussion period.

There are no materials to purchase for this course. One to three readings (posted as PDFs) and some video clips will be provided in advance of each class. It is not necessary to have gone through this material in order to understand the lectures. It will, however, provide food for thought, and is likely to generate interesting questions and lively discussion!

Here is a short overview of the lectures.

### **Session 1, March 14**

*Introduction to cooperation between and within species*

Some great natural history to start us off

The big questions about cooperation

Introduction/refresher on evolutionary thinking

Some great natural history to wrap up

Key takeaways from this lecture:

- Organisms can help themselves - but not always! - by helping others
- There are costs, not only benefits, to cooperating
- We can learn about ourselves from studying other species

### **Session 2, March 21**

#### *Within-species cooperation*

Some great local natural history to start us off

Who is cooperated with, and why? Kin selection and reciprocal altruism

What experiments are telling us about human cooperation

Some great natural history to wrap up

Key takeaways from this lecture:

- Most but not all forms of human cooperation have analogues in other species
- Cooperation doesn't require foresight, a moral system, or policing
- Cooperation persists only as long as it is mutually beneficial

### **Session 3, March 28**

#### *Cooperation between species (mutualism)*

Some great local natural history to start us off

The benefits and costs of cooperating with species very different from yourself

Is domestication mutualism? Review of conflicts of interest

Some great natural history to wrap up

Key takeaways from this lecture:

- Mutualisms make otherwise inaccessible resources available to species
- Mutualisms range widely in specificity and evolutionary history
- Mutualisms structure ecosystems, and are under many threats

### **Session 4, April 4**

#### *The problem of cheating*

Some great local natural history to start us off

How cooperation is enforced (and cheating punished) in humans and other species

Game theory as a tool to understand cooperation and cheating

Some great natural history to wrap up

Key takeaways from this lecture:

- Cheating is everywhere
- Humans have some unique control mechanisms but most of them are seen in other species too
- Rampant cheating should drive cooperation extinct – but doesn't seem to!

### **Session 5, April 11**

#### *Cooperation as a unified phenomenon*

Some great natural history to start us off

Cooperation within and between species: similarities and differences

Internal and external risks to the persistence of cooperation

Three reasons why we should care about fostering cooperation

Key takeaways from this course