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### PROJECT

## Does Crime Pay? The Benefits of Cheating, the Costs of Being Cheated, and the Persistence of Interspecific Cooperation

How can cooperation persist in the face of a persistent, ubiquitous temptation to cheat? While at the Wissenschaftskolleg, I intend to critically examine evidence for our current interpretation of the conflicts that underlie interspecific cooperation (mutualism). Taking a broad conceptual perspective developed over thirty years of studying the ecology and evolution of mutualism, I will synthesize, for the first time, widely dispersed empirical evidence surrounding three critical issues. (1) Do individuals with options to either cheat or cooperate choose to cheat when they can? (2) Does "crime pay" - that is, does cheating confer fitness benefits to individuals that could alternatively cooperate? (3) Is it indeed costly to be cheated by one's partner? Current cooperation theory is built on the belief that the answer to all three questions is yes. However, there is plenty of evidence to suggest that this assumption is fundamentally flawed. My research program intersects with the broader goals of Michael Wade's Focus Group about Syngenomics: to create new evolutionary theory designed to advance our understanding of how cooperation can persist in the face of conflict. This is one of the central mysteries in biology today. It is one whose solution holds the promise of helping us to envision and perhaps even design more smoothly functioning human societies.

### Recommended Reading

Barker, J. L., J. L. Bronstein, M. L. Friesen, E. I. Jones, H. K. Reeve, A. G. Zink, and M. E. Frederickson (2017).

"Synthesizing perspectives on the evolution of cooperation within and between species." *Evolution* 71: 814-825.

Díaz-Muñoz, S., A. Boddy, G. Dantas, C. Waters, and J. L. Bronstein (2016). "Contextual organismality: Beyond pattern to process in the emergence of organisms." *Evolution* 70: 2669-2677.

Jones, E. I., M. E. Afkhami, E. Akcay, J. L. Bronstein, R. Bshary, M. E. Frederickson, K. D. Heath, J. Hoeksema, J. H. Ness, S. Pankey, S. S. Porter, J. L. Sachs, K. Scharnagl, and M. L. Friesen (2015). "Cheaters must prosper: reconciling theoretical and empirical perspectives on cheating in mutualism." *Ecology Letters* 18: 1270-1284.

## Mutualism: What Do We Know, and Where Do We Go From Here?

In this talk, I review the history of the study of mutualism, a field that has only coalesced in the past twenty years. I will identify six major research directions on mutualism ecology. I will then present our own recent work on one hawkmoth pollination mutualism to show how these directions can be integrated to move our understanding forward. This is a particularly intriguing mutualism because it appears to be exceedingly costly (the offspring of the pollinator moths are voracious herbivores on the same plants), making it an ideal test case for testing our understanding of how mutualisms arise and when they can persist. I conclude by discussing a few pressing issues surrounding mutualism that are likely to drive the field in the coming years.

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### PUBLICATIONS FROM THE FELLOW LIBRARY

Bronstein, Judith (Washington, DC, 2025)

Mutualism and division of labour : a mutual expansion of concepts

<https://kxp.k1oplus.de/DB=9.663/PPNSET?PPN=1925489264>

Bronstein, Judith (London, 2024)

Connecting and integrating cooperation within and between species

<https://kxp.k1oplus.de/DB=9.663/PPNSET?PPN=1914977491>

Bronstein, Judith (Lausanne, 2022)

Flight-Fecundity trade-offs : a possible mechanistic link in plant-herbivore-pollinator systems

<https://kxp.k1oplus.de/DB=9.663/PPNSET?PPN=1827020091>

Bronstein, Judith (Thousand Oaks, Calif. [u.a.], 2018)

The promise of the organizational ecosystem metaphor : an argument for biological rigor

<https://kxp.k1oplus.de/DB=9.663/PPNSET?PPN=1812804067>

Bronstein, Judith (Oxford, 2017)

Synthesizing perspectives on the evolution of cooperation within and between species

<https://kxp.k1oplus.de/DB=9.663/PPNSET?PPN=1017835756>

Bronstein, Judith (2016)

Contextual organismality : beyond pattern to process in the emergence of organisms

<https://kxp.k1oplus.de/DB=9.663/PPNSET?PPN=1017835357>

Bronstein, Judith (Oxford, 2015)

Mutualism

<https://kxp.k1oplus.de/DB=9.663/PPNSET?PPN=1616446137>

Bronstein, Judith (Oxford, 2015)

Cheaters must prosper : reconciling theoretical and empirical perspectives on cheating in mutualism

<https://kxp.k1oplus.de/DB=9.663/PPNSET?PPN=1042049777>

Bronstein, Judith (New York, NY, 2012)

The value of a metaphor : organizations and ecosystems

<https://kxp.k1oplus.de/DB=9.663/PPNSET?PPN=1666716367>