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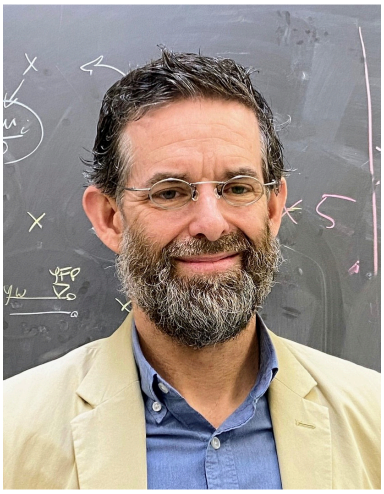

Daven Presgraves, Ph.D.

University Dean's Professor of Arts, Sciences, and Engineering

University of Rochester, New York

Born in 1970 in Saarbrücken, Germany

Studied Zoology at the University of Maryland and Ecology and Evolutionary Biology at the University of Rochester

PROJECT

Meiotic Drive as an Evolutionary Force

Mendel's law of segregation tells us that genetic transmission is fair: a parent's two alternative gene copies enjoy equal probabilities of being transmitted to progeny. But the genomes of most organisms host a menagerie of "selfish" genetic elements that subvert the rules of transmission to advance their own evolutionary interests. Among these, the meiotic drive elements bias transmission to gain excess representation among progeny. In doing so, however, meiotic drive elements often have negative effects on host reproductive fitness. The resulting conflicts of interest between meiotic drive elements and their hosts can precipitate tit-for-tat molecular evolutionary arms races. Recurrent episodes of conflict can in turn have unexpected and wide-ranging consequences for transmission genetics, genome evolution, sex chromosomes, recombination, gametogenesis, the genetic engineering of natural populations, and even the origins of new species. With the recent explosion of new genome sequence data, meiotic drive has enjoyed a new surge of discovery and appreciation. The time is therefore right for an assessment: Is meiotic drive an occasional evolutionary curiosity or an underappreciated evolutionary force? To answer this question, my project aims to synthesize the history, theory, incidence, biology, consequences, implications, and applications of meiotic drive.

Recommended Reading

Presgraves, Daven C. (2010). "The Molecular Evolutionary Basis of Species Formation." Nature Reviews Genetics 11: 175–180. https://doi.org/10.1038/nrg2718.

Meiklejohn, Colin D., Emily L. Landeen, Kathleen E. Gordon, Thomas Rzatkiewicz, Sarah B. Kingan, Anthony J. Geneva, Jeffrey P. Vedanayagam, et al. (2018). "Gene Flow Mediates the Role of Sex Chromosome Meiotic Drive during Complex Speciation." eLife 7: e35468. https://doi.org/10.7554/eLife.35468.

Muirhead, Christina A., and Daven C. Presgraves (2021). "Satellite DNA-Mediated Diversification of a Sex-Ratio Meiotic Drive Gene Family in Drosophila." Nature Ecology & Evolution 5: 1604–1612. https://doi.org/10.1038/s41559-021-01543-8.

COLLOQUIUM, 16.05.2023

The Darwinian Implications of Mendelism

Charles Darwin’s "On the Origin of Species" convinced the world of the historical fact of biological evolution. By the end of the 19th century, however, Darwin’s proposed mechanism of evolution – natural selection – was languishing, hobbled by profound ignorance and misguided speculation concerning genetics. The fundamental rules of genetics had been described by Gregor Mendel decades earlier, but in what must rank as one of the strangest episodes in the history of science, his work was neglected by a generation of biologists. The eventual “rediscovery” of Mendel was pivotal for the course of evolutionary thinking. In this seminar, I will review the interaction between Darwinism and Mendelism. In particular, I will describe how Mendelism rescued Darwinian natural selection, gave rise to a gene-centered view of evolution, and anticipated the discovery of so-called “selfish genes”. I will conclude by considering how Darwinism, in turn, explains the evolution of Mendelian inheritance itself.

PUBLICATIONS FROM THE FELLOW LIBRARY

Presgraves, Daven (Cambridge,2018)

Gene flow mediates the role of sex chromosome meiotic drive during complex speciation

https://kxp.k10plus.de/DB=9.663/PPNSET?PPN=181431329X

Presgraves, Daven (London,2018)

Molecular evolution at a meiosis gene mediates specivies differences in the rate and patterning of recombination

https://kxp.k10plus.de/DB=9.663/PPNSET?PPN=1814310630

Presgraves, Daven (1998)

Male eye span in stalk-eyed flies indicates genetic quality bymeiotic drive suppression

https://kxp.k10plus.de/DB=9.663/PPNSET?PPN=769117635