



(/jspui)

/ **Princeton University Doctoral Dissertations, 2011-2017** (/jspui/handle/88435/dsp01td96k251d)/ **Neuroscience** (/jspui/handle/88435/dsp016h440s48r)

Please use this identifier to cite or link to this item: <http://arks.princeton.edu/ark:/88435/dsp01vt150m51t>

Title:	Sensory-driven modulation of song structure and amplitude in Drosophila melanogaster
Authors:	Coen, Philip (/jspui/browse?type=author&value=Coen%2C+Philip)
Advisors:	Murthy, Mala (/jspui/browse?type=advisor&value=Murthy%2C+Mala) Tank, David W (/jspui/browse?type=advisor&value=Tank%2C+David++W)
Contributors:	Neuroscience Department
Keywords:	Acoustic (/jspui/browse?type=subject&value=Acoustic) Behavior (/jspui/browse?type=subject&value=Behavior) Courtship (/jspui/browse?type=subject&value=Courtship) Neroscience (/jspui/browse?type=subject&value=Neroscience) Sensory (/jspui/browse?type=subject&value=Sensory)
Subjects:	Neurosciences (/jspui/browse?type=subject&value=Neurosciences) Behavioral sciences (/jspui/browse?type=subject&value=Behavioral+sciences)
Issue Date:	2015
Publisher:	Princeton, NJ : Princeton University
Abstract:	A fundamental goal of neuroscience is to understand how sensory inputs are transformed into behavioral outputs. Mounting evidence suggests that brains are optimized to process naturalistic stimuli, but natural behaviors involving neural computations of interest are often challenging to accurately quantify. Acoustic communication is a natural behavior which exists throughout the animal kingdom, and can involve a dynamic signal which is both highly quantifiable and necessitates complex neural networks for generation and perception. Here, we use quantitative behavioral assays, computational modeling, and genetic manipulations to dissect the neural computations and circuits underlying this behavior in Drosophila melanogaster. Drosophila acoustic communication consists of a patterned courtship song produced by males to increase their chance of success with a female. Songs comprise of two modes-pulse and sine-and males alternate between these modes to produce patterns with high variability. Neural noise within pattern generating circuits is widely assumed to be the primary source of such variability. In contrast, we demonstrate that much of the pattern variability in Drosophila courtship song can be explained by taking into account the dynamic sensory experience of the male. Several organisms modulate the amplitude of their acoustic signal in accordance with target distance to optimize for receiver intensity and conserve energy. Previously, this sensorimotor transformation has not been identified in invertebrates. We not only demonstrate that male flies increase pulse amplitude with female distance, but that this sensorimotor transformation takes place within ~35ms. Further, through genetic and physical manipulations, we establish that amplitude modulation at large distances is exclusively mediated by vision, dependent on naturalistic stimuli, and implemented via the indirect flight muscles. These results demonstrate that detailed quantification and modeling can reveal unexpected neural complexity underlying seemingly "stereotyped" behaviors.
URI:	http://arks.princeton.edu/ark:/88435/dsp01vt150m51t (http://arks.princeton.edu/ark:/88435/dsp01vt150m51t)
Alternate format:	The Mudd Manuscript Library retains one bound copy of each dissertation. Search for these copies in the library's main catalog (http://catalog.princeton.edu)
Type of Material:	Academic dissertations (Ph.D.)
Language:	en
Appears in Collections:	Neuroscience (/jspui/handle/88435/dsp016h440s48r)

Files in This Item:

File	Description	Size	Format	
Coen_princeton_0181D_11251.pdf		19.74 MB	Adobe PDF	View/Download (/jspui/bitstream/88435/dsp01vt150m51t/1/Coen_prince

[Show full item record \(/jspui/handle/88435/dsp01vt150m51t?mode=full\)](#)

Items in Dataspace are protected by copyright, with all rights reserved, unless otherwise indicated.

Search

[Advanced Search \(/jspui/simple-search?location=88435/dsp016h440s48r\)](#)

Browse

Issue Date

Author

Academic Advisor

Subject