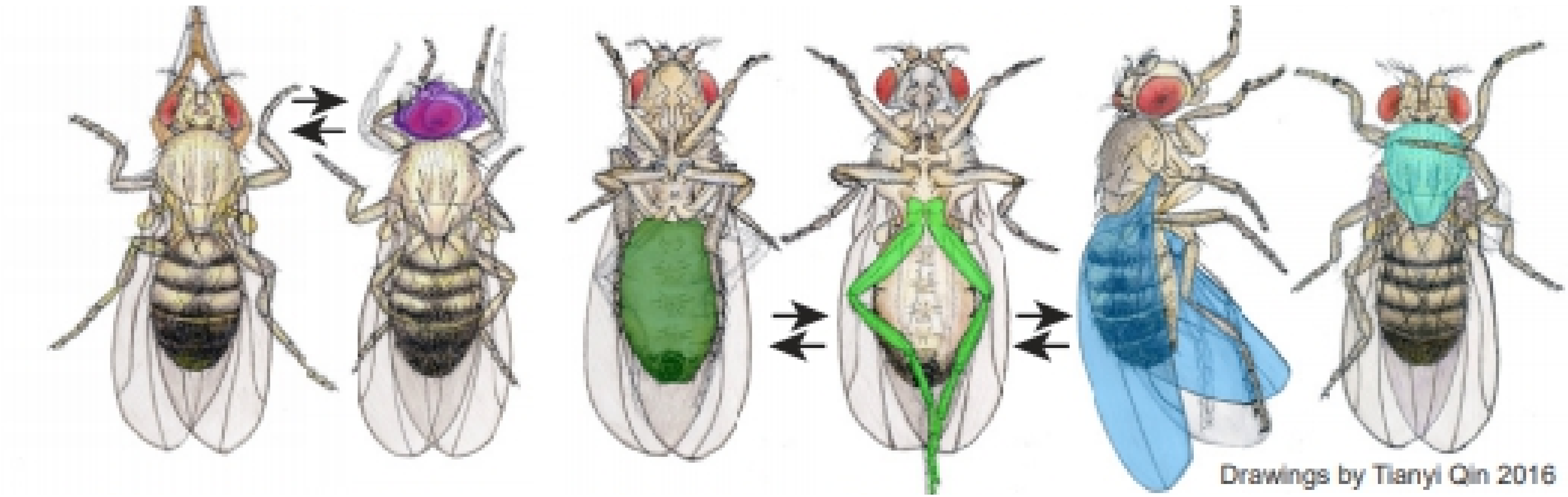
# Press report – March 2020






Bénédicte

**Key words:**
Drosophila evolution, left right asymmetry, drosophila courtship, drosophila genitalia, genitalia evolution, drosophila morphogenesis, drosophila bristle, drosophila pachea, glue, bio adhesive, 3D printing

**Journals:**
Cell, Nature, Science, PNAS, Development, Wiley Online library, BioRxiv...

# Press report – November 2019

- Evaluating the probability of CRISPR-based gene drive contaminating another species
Virginie Courtier-Orgogozo, Antoine Danchin, Pierre-Henri Gouyou, Christophe Boëte.
Evolutionnary applications
DOI : https://doi.org/10.1111/eva.12939

- The glue produced by *Drosophila melanogaster* for pupa adhesion is universal
Flora Borne, Alexander Kovalev, Stanislav Gorb, Virginie Courtier-Orgogozo. JEB
DOI : 10.1242/jeb.220608

# Press report – November 2019

**Evolution**

- Inversions shape the divergence of *Drosophila pseudoobscura* and *D. persimilis* on multiple timescales
K. Korunes et al., BioRxiv
DOI : https://doi.org/10.1101/842047

- *ebony* affects pigmentation divergence and cuticular hydrocarbons in *Drosophila americana* and *D. novamexicana*
A. M. Lamb et al, BioRxiv
DOI : https://doi.org/10.1101/2020.03.05.977009

- Natural selection and parallel clinal and seasonal changes in *Drosophila melanogaster*
M.F. Rodriguez et al., BioRxiv
DOI : https://doi.org/10.1101/2020.03.19.999011

- Evolution of wing pigmentation in *Drosophila* : Diversity, physiological regulation and cis-regulatory evolution
S. Koshikawa, Development, Growth & Differentiation
DOI : https://doi.org/10.1111/dgd.12661

- Transposable elements in individual genotypes of *Drosophila simulans*
S. Signor. Ecology and evolution
DOI : https://doi.org/10.1002/ece3.6134

# Press report – November 2019

**Evolution**

- Evolutionary conservation of transcription factors affecting longevity
G. Martinez Corrales, N. Alic. Trends in Genetics
DOI : https://doi.org/10.1016/j.tig.2020.02.003

- Olfactory receptor and circuit evolution promote host specialization
T. O. Auer et al., Nature
DOI : https://doi.org/10.1038/s41586-020-2073-7

- Stable species boundaries despite ten million years of hybridization in tropical eels
J. M. I. Barth et al., Nature communication
DOI : https://doi.org/10.1038/s41467-020-15099-x

- Evolution of genome structure in the *Drosophila simulans* complex
M. Chakraborty et al., BioRxiv
DOI :  https://doi.org/10.1101/2020.02.27.968743

- Sexually antagonistic coevolution between the sex chromosomes of *Drosophila melanogaster*
K. Lund-Hansen et al., BioRxiv
DOI : https://doi.org/10.1101/818146

# Press report – November 2019

**Reproductive behavior in *Drosophila* (or other species)**

- The complex genetic architecture of male mate choice evolution between *Drosophila* species
M. Shahandeh & T. Turner, Heredity
DOI :https://doi.org/10.1038/s41437-020-0309-9

- Males optimally balance selfish and kin-selected strategies of sexual competition in the guppy
M. J. Daniel and R. J. Williamson, Nature ecology and evolution
DOI : https://doi.org/10.1038/s41559-020-1152-3

- Multiple mating in the context of interspecific hybridization between two *Tetramorium* ant species
M. Cordonnier et al., Heredity
DOI : https://doi.org/10.1038/s41437-020-0310-3

**- Female copulation song is modulated by seminal fluid**
P. Kerwin, J. Yuan & A. C. von Philipsborn. Nature communication
DOI : https://doi.org/10.1038/s41467-020-15260-6

# Press report – November 2019

**Reproductive behavior in *Drosophila* (or other species)**

- Differences in post-mating transcriptional responses between conspecific matings in *Drosophila*
Y. H. Ahmed-Braimah et al., BioRxiv
DOI : https://doi.org/10.1101/2020.03.25.009068

- Chemical cues from competitors change the oviposition preference of *Drosophila suzukii*
H. Kidera, K. H. Takashi. Entomologia experimentalis et applicata
DOI : https://doi.org/10.1111/eea.12889

- G-protein signaling is required for increasing germline stem cell division frequency in response to mating in *Drosophila* males
M. S. Malpe et al., Scientific reports
DOI :https://doi.org/10.1038/s41598-020-60807-8

# Press report – November 2019

**Drosophila/fly behavior**

**- Spatial comparisons of mechanosensory information govern the grooming sequence in *Drosophila***
Neil Zhang et al., Current biology
DOI : https://doi.org/10.1016/j.cub.2020.01.045

- Characterization of copulatory courtship song in the Old World sand fly species *Phlebotomus argentipes*
A. Araki et al., Scientific reports
DOI : https://doi.org/10.1038/s41598-020-61867-6

- A neurodevelopmental origin of behavioral individuality in the *Drosophila* visual system
G. A. Linneweber et al., 2020, Science
DOI :10.1126/science.aaw7182

# Press report – November 2019

**Drosophila/fly behavior**

- CCAP regulates feeding behavior via the NPF pathway in *Drosophila* adults
M. J. Williams et al., 2020, PNAS
DOI : https://doi.org/10.1073/pnas.1914037117

- Does *Drosophila sechellia* escape parasitoid attack by feeding on a toxic ressource ?
L. Salazar-Jaramillo & B. Wertheim, BioRxiv
DOI : https://doi.org/10.1101/2020.02.06.937631

- **Social interaction and network structure in groups of *Drosophila* are shaped by prior social experience and group composition**
A. Bentzur et al., BioRxiv
DOI : https://doi.org/10.1101/2020.03.19.995837

# Press report – November 2019

**Drosophila development**

**- Quantitative analysis of 3D Tissue deformation reveals key cellular mechanism associated with initial heart looping**
Naofumi Kawahira et al., Cell Reports
DOI : https://doi.org/10.1016/j.celrep.2020.02.071

- Tissue-scale mechanical coupling reduces morphogenetic noise to ensure precision during epithelial folding
A.S. Eritano et al., Develomental Cell
DOI : https://doi.org/10.1016/j.devcel.2020.02.012

- Egfr signaling is a major regulator of ecdysone biosynthesis in the drosophila prothoracic gland
Cruz, Martin, Franch-Marro. Current biology
DOI : https://doi.org/10.1016/j.cub.2020.01.092

- Of cell shapes and motion: the physical basis of animal cell migration
D.L. Bodor et al., Developmental Cell
DOI : https://doi.org/10.1016/j.devcel.2020.02.013

# Press report – November 2019

**Drosophila development**

- *Drosophila suzukii* wing spot size is robust to developmental temperature
C. Varon-Gonzalez, A. Fraimout, V. Debat, Ecology and Evolution
DOI : https://doi.org/10.1002/ece3.5902

- Tissue mechanical properties modulate cell extrusion in the *Drosophila* abdominal epidermis
M. Michel & C. Dahmann, 2020, Development
DOI : 10.1242/dev.179606

# Press report – November 2019

**Gene drive**

- Population-level multiplexing : A promising strategy to manage the evolution of resistance against gene drives targeting a neutral locus
M.P. Edgington, T. Harvey-Samuel, L. Alphey. Evolutionnary applications
DOI : https://doi.org/10.1111/eva.12945

- Computational and experimental performance of CRISPR homing gene drive strategies with multiplexed gRNAs
S. E. Champer et al., 2020, ScienceAdvances
DOI : https://doi.org/10.1126/sciadv.aaz0525

**Glue & bio adhesives**

- **Rapid and continuous regulating adhesion strength by mechanical micro-vibration**
L. Shui et al., Nature communication
DOI : https://doi.org/10.1038/s41467-020-15447-x

- Strong adhesion of wet conducting polymers on diverse substrates
A. Inoue et al., 2020, Applied sciences and engineering
DOI : 10.1126/sciadv.aay5394

# Female copulation song is modulated by seminal fluid

P. Kerwin, J. Yuan & A. C. von Philipsborn. Nature communication
DOI : https://doi.org/10.1038/s41467-020-15260-6

In most animal species, males and females communicate during sexual behavior to negotiate reproductive investments. Pre-copulatory courtship may settle if copulation takes place, but often information exchange and decision-making continue beyond that point. Here, we show that female *Drosophila* sing by wing vibration in copula. This copulation song is distinct from male courtship song and requires neurons expressing the female sex determination factor DoublesexF. Copulation song depends on transfer of seminal fluid components of the male accessory gland. Hearing female copulation song increases the reproductive success of a male when he is challenged by competition, suggesting that auditory cues from the female modulate male ejaculate allocation. Our findings reveal an unexpected fine-tuning of reproductive decisions during a multimodal copulatory dialog. The discovery of a female-specific acoustic behavior sheds new light on *Drosophila* mating, sexual dimorphisms of neuronal circuits and the impact of seminal fluid molecules on nervous system and behavior.

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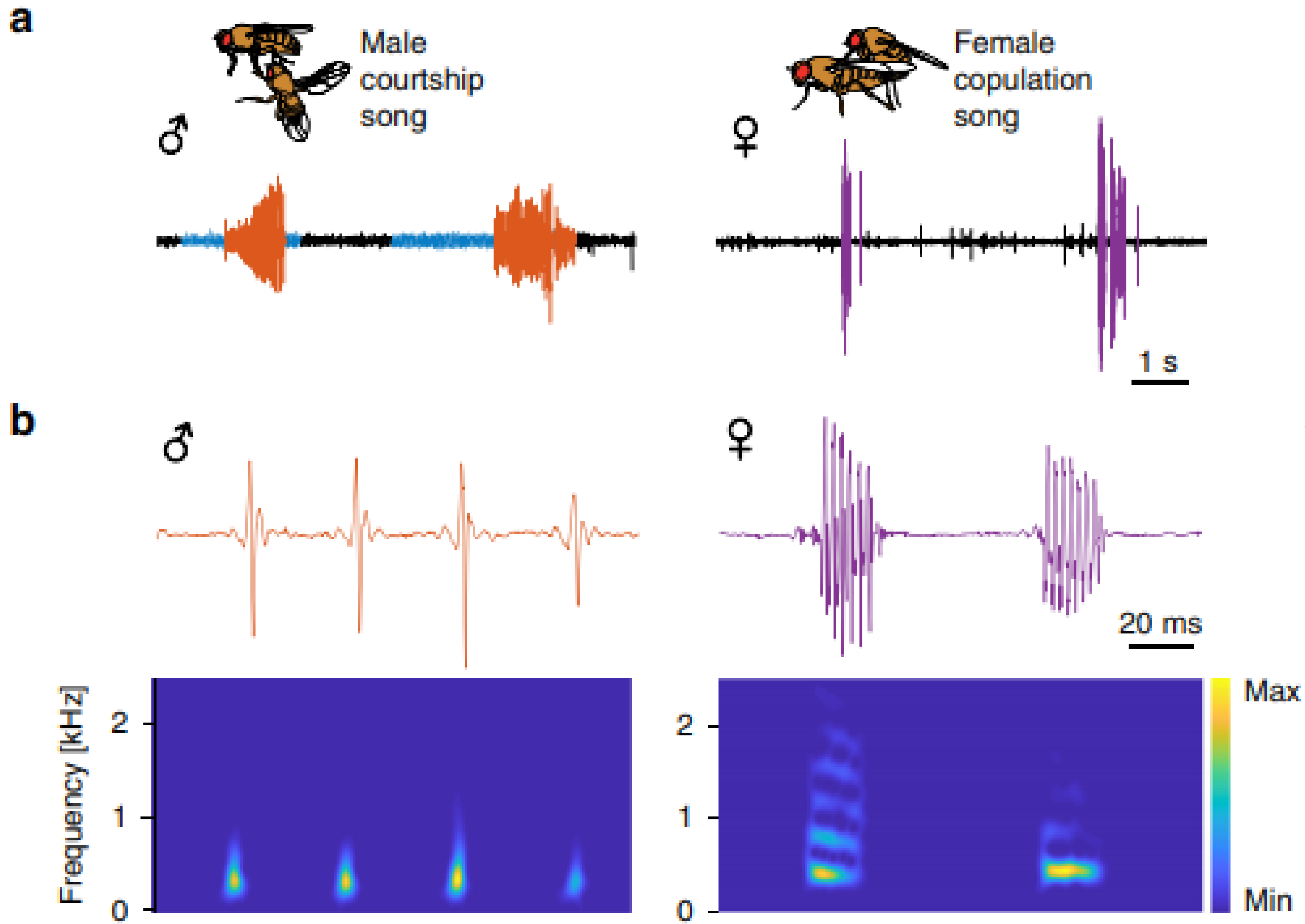


**Fig. 1 Female Drosophila sing during copulation.**
a Oscillograms of male pre-copulatory courtship song (pulse song in red, sine song in blue) and female copulation song (magenta), with typical postures during the behavior. b Male and female song pulses with spectrograms

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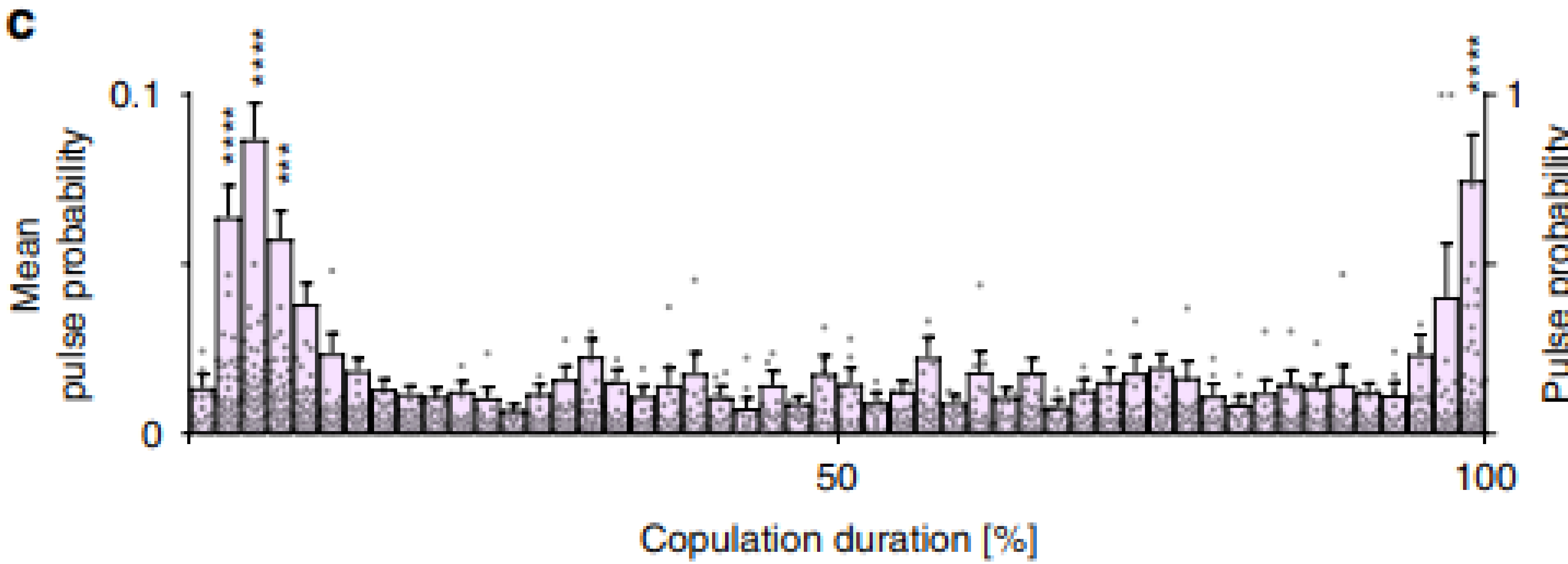


c Mean probability of female song pulses throughout copulation (magenta bars depicting 2% bins of total copulation duration, left y-axis), and pulse probability of individual flies in 2% bins of total copulation duration (gray data points, right y-axis). n = 92 copulations, each data point represents one fly, error bars indicate mean and s.e.m., ****p < 0.0001, ***p = 0.00015 permutation test (one-sided).

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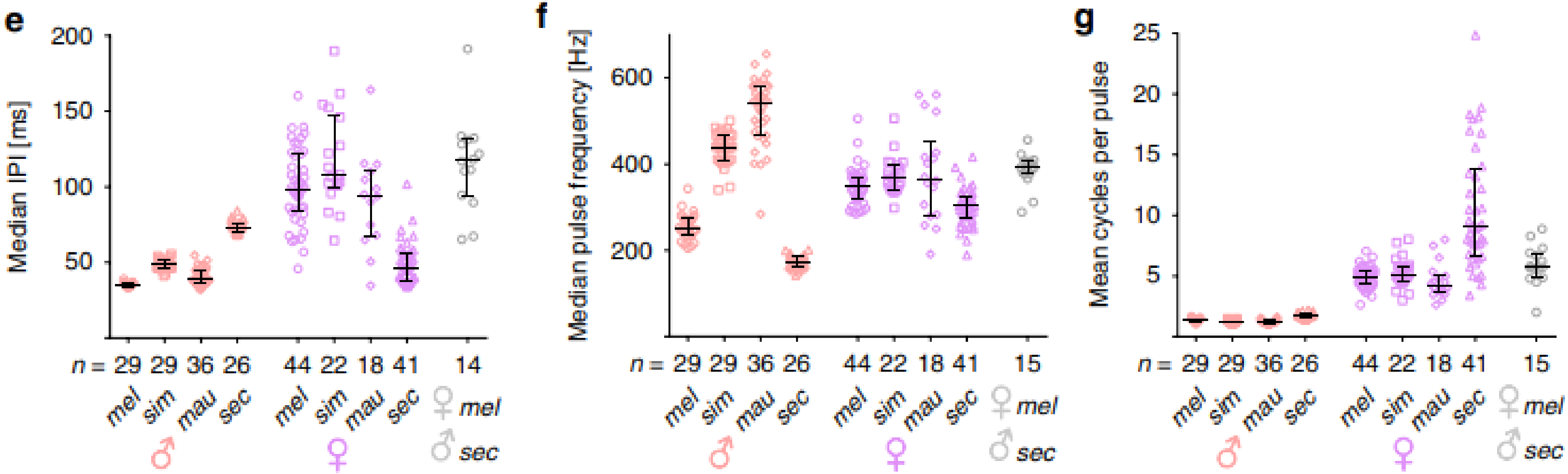
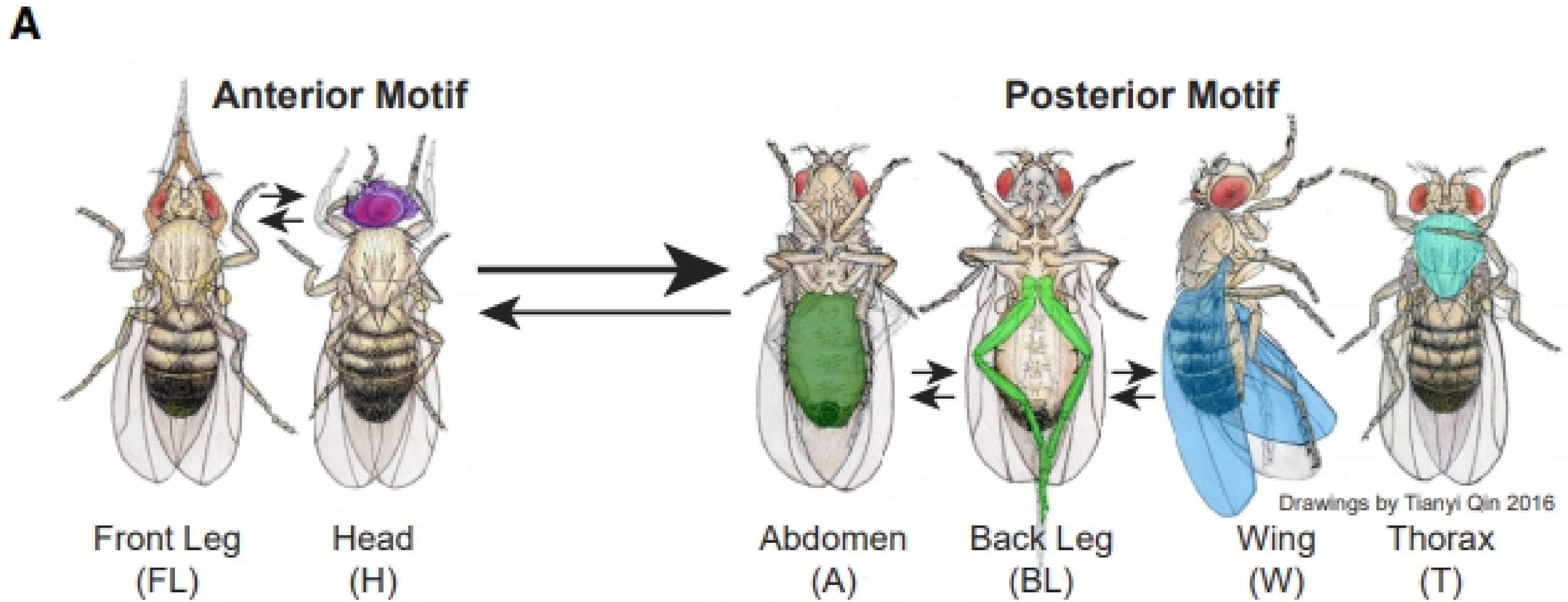



e–g Acoustic parameters of male and female pulse song for D. melanogaster (mel), D. simulans (sim), D. mauritiana (mau), D. sechellia (sec) and D. melanogaster females mating with D. sechellia males.

# Spatial comparisons of mechanosensory information govern the grooming sequence in *Drosophila*

N. Zhang, L. Guo, J. H. Simpson. Current biology
DOI : https://doi.org/10.1016/j.cub.2020.01.045




(A) Diagram of stereotyped, recognizable grooming movements observed in *Drosophila melangaster*. Arrows indicate most common transitions, and the colored body parts correspond to the movements quantified in subsequent ethograms.

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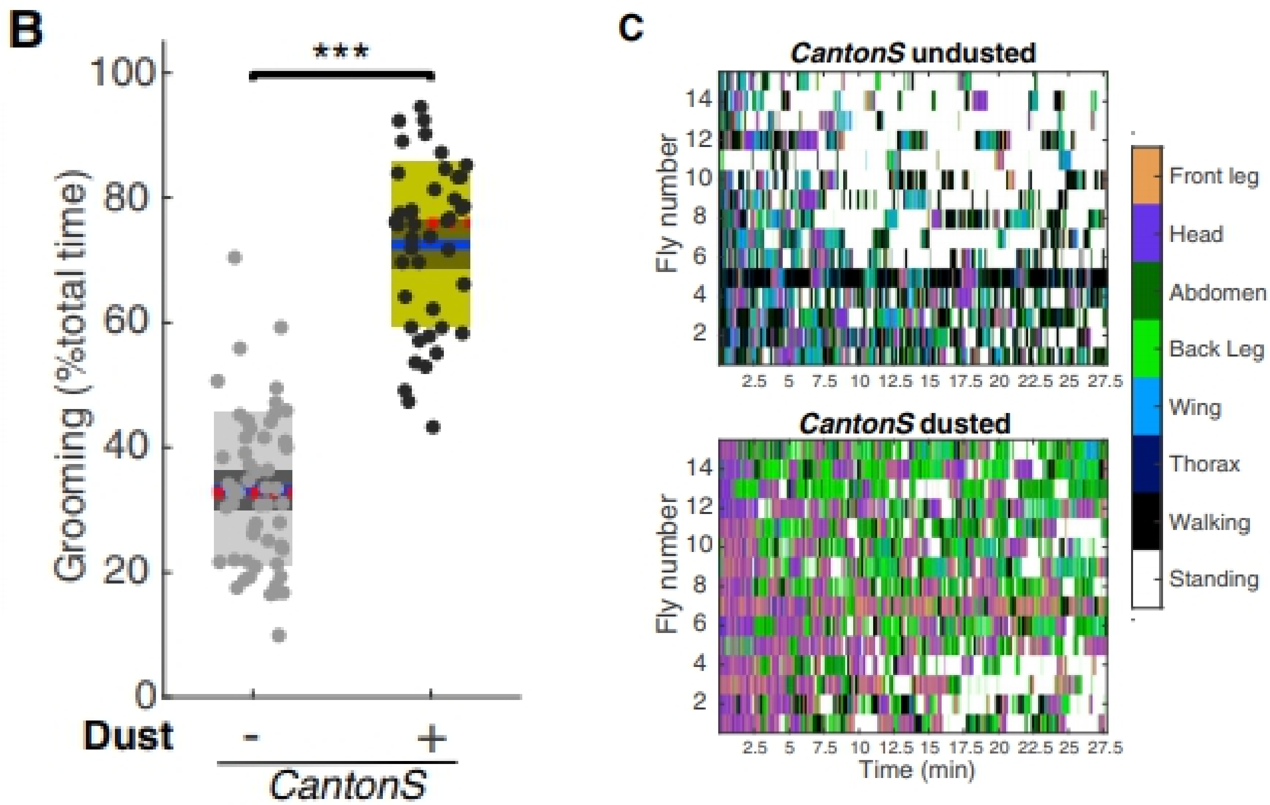


(B) The percent of time that undusted or dusted flies perform grooming behavior within 27.7 min total assay time (n R 44). The mean is shown as a blue line; 95% confidence intervals for the mean are showed as dark shades. The median is shown as a dotted red line. One standard deviation is shown as light color shade.
(C) Example ethograms of 15 individual Canton S flies in response to being shaken without or with dust generated by Automatic Behavior Recognition System (ABRS) classifier [15]. Each line is one individual. The color bar on the right stands for the color code used in the ethogram visualization.

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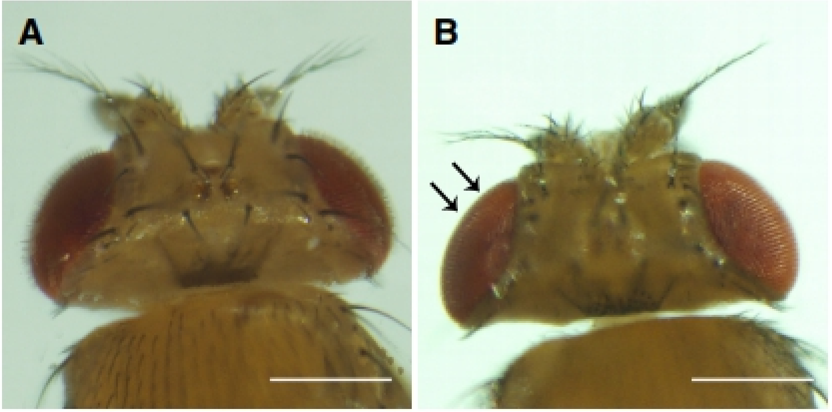


(A–D) Interommatidial bristles are visible in wild-type Canton S eyes (A) but are absent in the P[sev-wg; w] mutant, as indicated by arrows (B).

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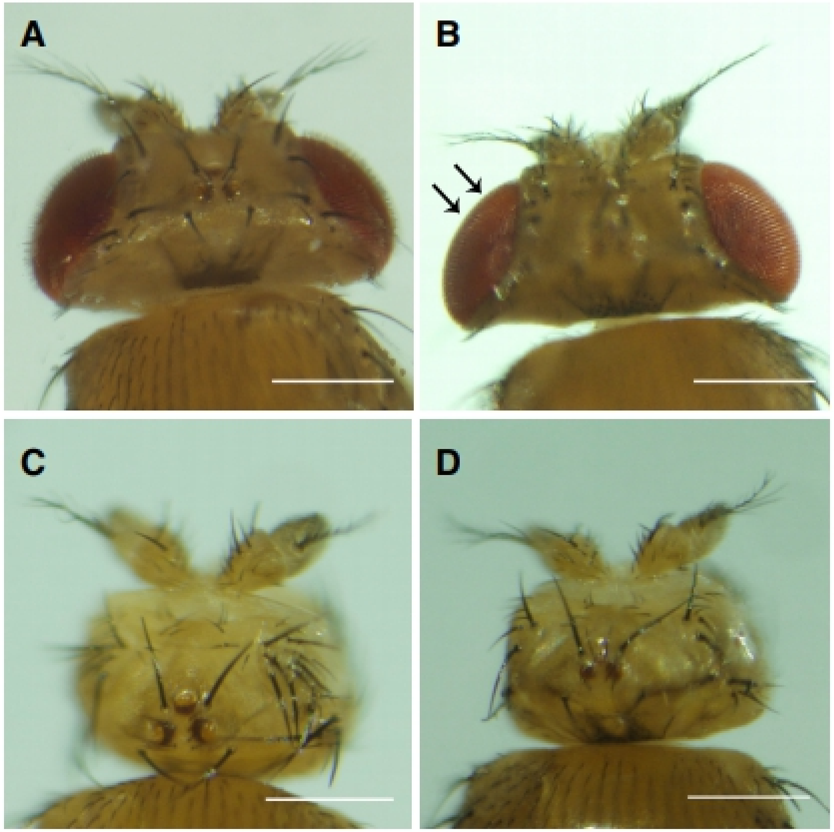


(A–D) Interommatidial bristles are visible in wild-type Canton S eyes (A) but are absent in the P[sev-wg; w] mutant, as indicated by arrows (B). The eya2 (C) and soD (D) mutants lack eyes entirely. Scale bars, 250 mm.

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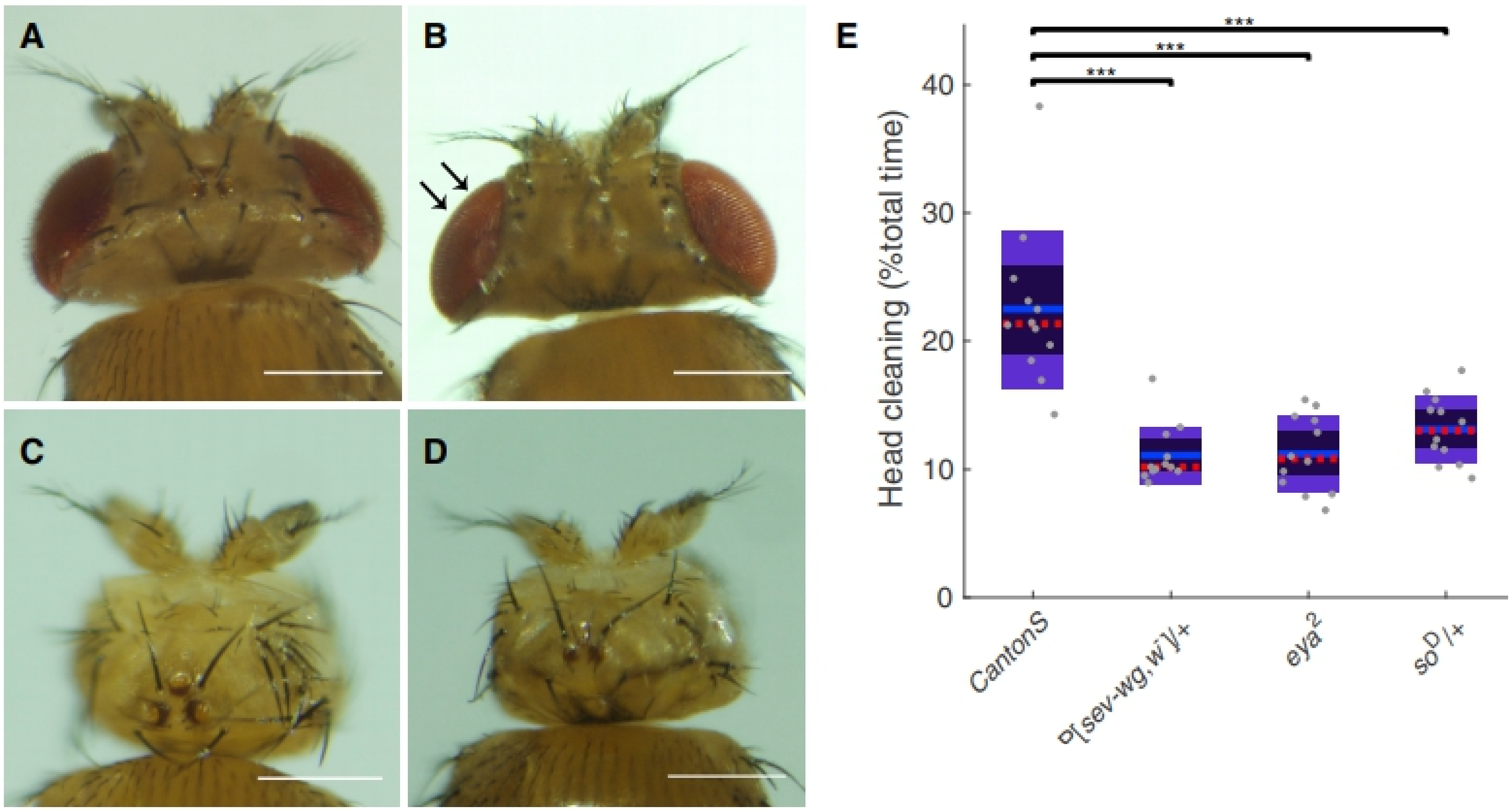


(A–D) Interommatidial bristles are visible in wild-type Canton S eyes (A) but are absent in the P[sev-wg; w] mutant, as indicated by arrows (B). The eya2 (C) and soD (D) mutants lack eyes entirely. Scale bars, 250 mm. (E) These mutants show reduced head grooming, as indicated by the percent of time dusted flies spent in head grooming within 27.7 min (n = 12)

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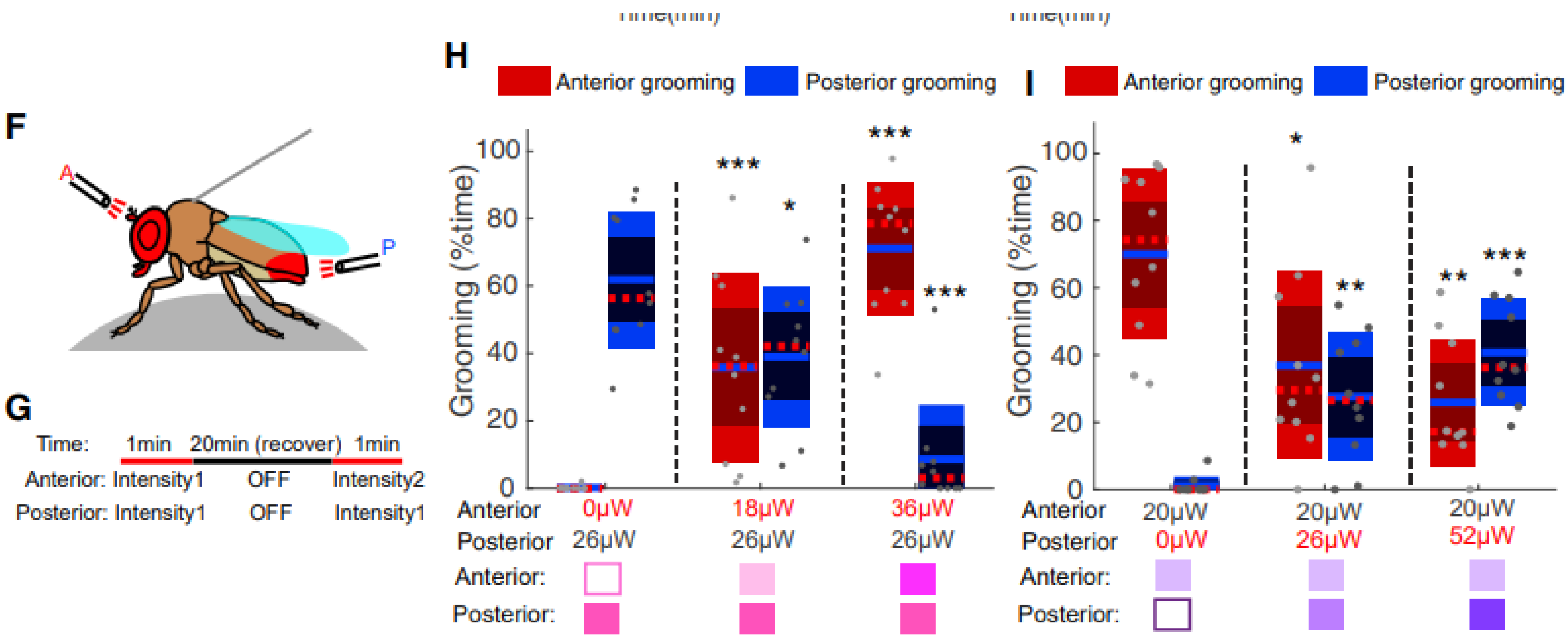



(H and I) The change of grooming hierarchy as a result of varied sensory inputs (n = 10). (H) In tethered R74C07 > ChrimsonR flies, posterior light stimulus was kept constant while anterior light stimulus was increased in different experiments. An increased ratio of anterior to posterior grooming was observed. (I) When the anterior light stimulation level was held constant and the competing posterior light levels were increased, a decreased ratio of anterior to posterior grooming was observed. See also Figures S5 and S6. Wilcoxon rank-sum test was used for (D), (H), and (I). For (H) and (I), grooming time induced by each light condition was compared with posterior light only (H) or anterior light only (I) group. Asterisks represent the following p values: $^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$.

# Social interaction and network structure in groups of *Drosophila* are shaped by prior social experience and group composition

A. Bentzur, S. Ben-Shaanan, J. Benishou, E. Costi, A. Ilany, G. Shoat-Ophir.

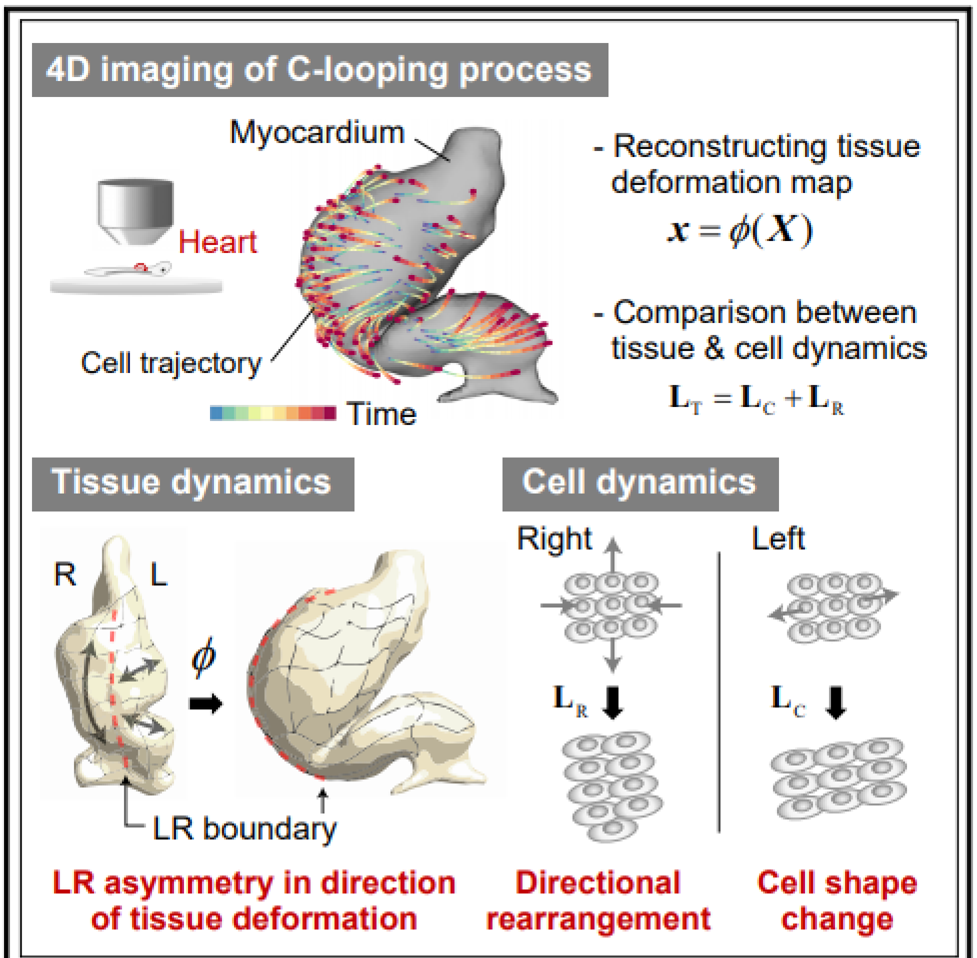
BioRxiv
DOI : https://doi.org/10.1101/2020.03.19.995837

Living in a group creates a complex and dynamic environment in which the behavior of the individual is influenced by and affects the behavior of others. […]. Here we present a practical framework for studying the interplay between social experience and group interaction in *Drosophila melanogaster* and show that the structure of social networks and group interactions are sensitive to group composition and individuals' social history. We simplified the complexity of interaction in a group using a series of experiments in which we controlled the social experience and motivational states of individuals to dissect patterns that represent distinct structures and behavioral responses of groups under different social conditions. Using high-resolution data capture, machine learning and graph theory, we analyzed 60 distinct behavioral and social network features, generating a comprehensive representation ("group signature") for each condition. [...]. Using environmental and genetic manipulations, we show that this structure requires visual and pheromonal cues. Particularly, the male specific pheromone cVA and Or65a sensory neurons are necessary for the expression of different aspects of social interaction in a group. Finally, we explored social interactions in heterogenous groups and identified clusters of features that are sensitive to increasing ratios of aggressive flies, some of which reveal that inter-individual synchronization depends on group composition. Our results demonstrate that fruit flies exhibit complex and dynamic social structures that are modulated by the experience and composition of different individuals within the group. This paves the path for using simple model organisms to dissect the neurobiology of behavior in complex environments associated with living in a group.

# Quantitative analysis of 3D Tissue deformation reveals key cellular mechanism associated with initial heart looping

N. Kawahira, D. Ohtsuka, N. Kida, K. Hironaka, Y. Morishita. Cell Reports
DOI : https://doi.org/10.1016/j.celrep.2020.02.071

Graphical Abstract




## Highlights

- Quantifying tissue and/or cell dynamics is essential for revealing morphogenetic mechanisms
- Initial heart looping is achieved by left-right asymmetry in the direction of tissue deformation
- The tissue-scale asymmetry is caused by right-specific directional cell rearrangement
- The directional cell rearrangement occurs in a F-actin-dependent manner

# Quantitative analysis of 3D Tissue deformation reveals key cellular  mechanism associated with initial heart looping

N. Kawahira, D. Ohtsuka, N. Kida, K. Hironaka, Y. Morishita. Cell Reports
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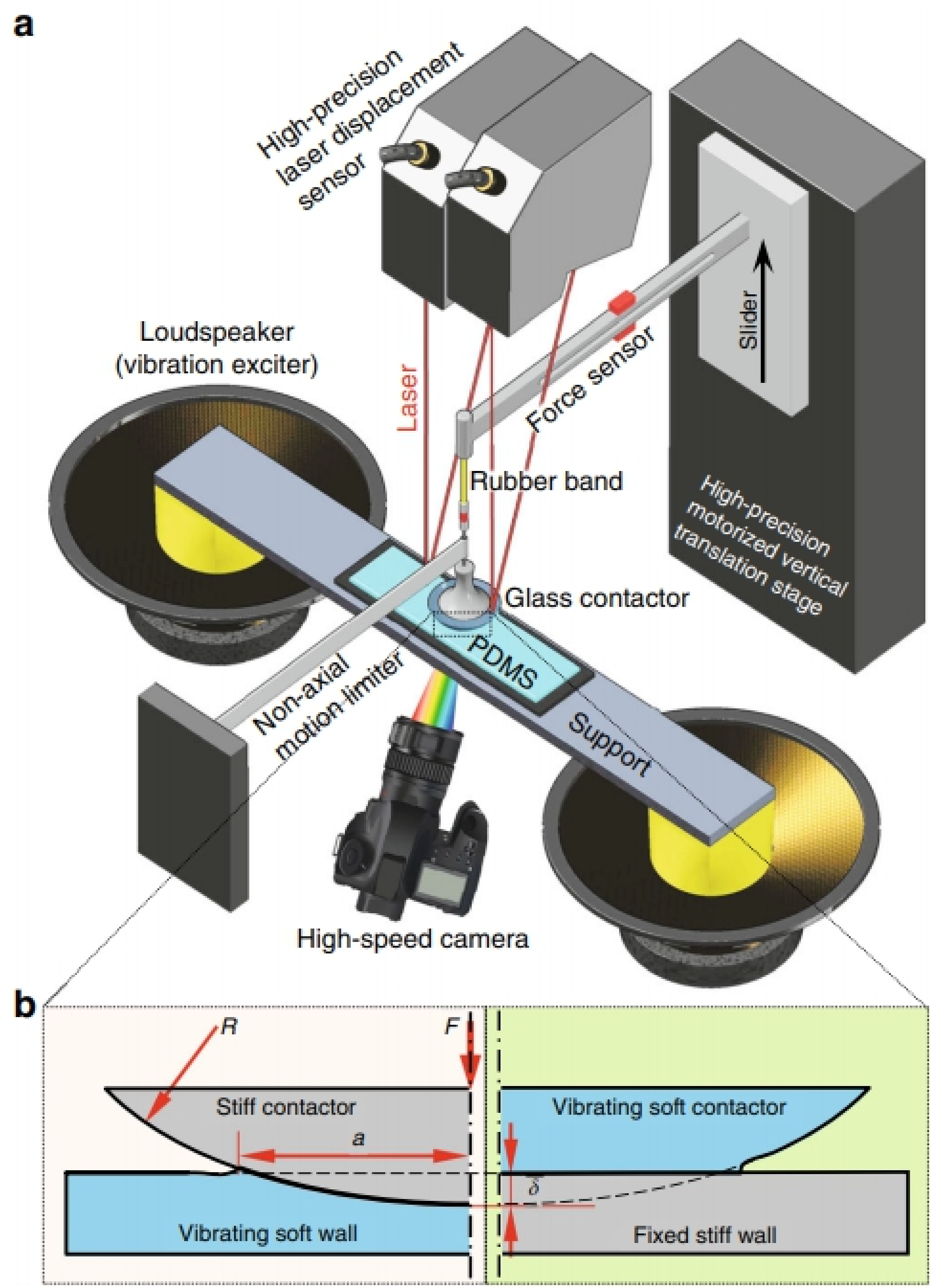
Despite extensive study, the morphogenetic mechanisms of heart looping remain controversial because of a lack of information concerning precise tissue level deformation and the quantitative relationship between tissue and cellular dynamics; this lack of information causes difficulties in evaluating previously proposed models. To overcome these limitations, we perform four-dimensional (4D) high-resolution imaging to reconstruct a tissue deformation map, which reveals that, at the tissue scale, initial heart looping is achieved by left-right (LR) asymmetry in the direction of deformation within the myocardial tube. We further identify F-actin-dependent directional cell rearrangement in the right myocardium as a major contributor to LR asymmetric tissue deformation. Our findings demonstrate that heart looping involves dynamic and intrinsic cellular behaviors within the tubular tissue and provide a significantly different viewpoint from current models that are based on LR asymmetry of growth and/or stress at the tube boundaries. Finally, we propose a minimally sufficient model for initial heart looping that is also supported by mechanical simulations.

# Rapid and continuous regulating adhesion strength by mechanical micro-vibration

L. Shui, L. Jia, H. Li, J. Guo, Z. Guo, Y. Liu, Z. Liu, X. Chen. Nature communication
DOI : https://doi.org/10.1038/s41467-020-1544



# Rapid and continuous regulating adhesion strength by mechanical micro-vibration

L. Shui, L. Jia, H. Li, J. Guo, Z. Guo, Y. Liu, Z. Liu, X. Chen. Nature communication
DOI : https://doi.org/10.1038/s41467-020-15447-x

Controlled tuning of interface adhesion is crucial to a broad range of applications, such as space technology, micro-fabrication, flexible electronics, robotics, and bio-integrated devices. Here, we show a robust and predictable method to continuously regulate interface adhesion by exciting the mechanical micro-vibration in the adhesive system perpendicular to the contact plane. An analytic model reveals the underlying mechanism of adhesion hysteresis and dynamic instability. For a typical PDMS-glass adhesion system, the apparent adhesion strength can be enhanced by 77 times or weakened to 0. Notably, the resulting adhesion switching timescale is comparable to that of geckos (15 ms), and such rapid adhesion switching can be repeated for more than $2\times10^7$ vibration cycles without any noticeable degradation in the adhesion performance. Our method is independent of surface micro-structures and does not require a preload, representing a simple and practical way to design and control surface adhesion in relevant applications.