The *Drosophila* Species Stock Center at UC San Diego

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Research Scientist
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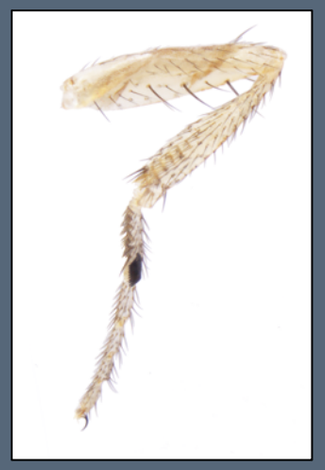
DSSC - Overview

- Began ~60 years ago at UT Austin
- Maintain, curate, and distribute living cultures of *Drosophila* species
- Ship 1500+ cultures per year
- Funded by the NSF and user fees



DSSC - History

- 1921 - Alfred Sturtevant published *The North American Species of Drosophila*

- 1950s - W. Stone & J. T. Patterson (University of Texas, Austin)

- 1980 – collection moved to Bowling Green, Ohio – NSF support began

- 2000 – moved to University of Arizona

- 2008 – moved to UC San Diego

DSSC - Mission

Stock Center Mission: To serve as a central biological resource whose core activities are to receive, maintain, and distribute living cultures of *Drosophila* species; to provide technical expertise and services; and to provide educational resources in the areas of husbandry, natural history, systematics, evolution, and ecology.

DSSC - Vision

Stock Center Vision: To be the trusted leader in the dissemination of living stocks and associated information for Drosophilidae species for academic researchers, educators, government institutions, and corporations, and be widely recognized for comprehensive service and intellectual capability.

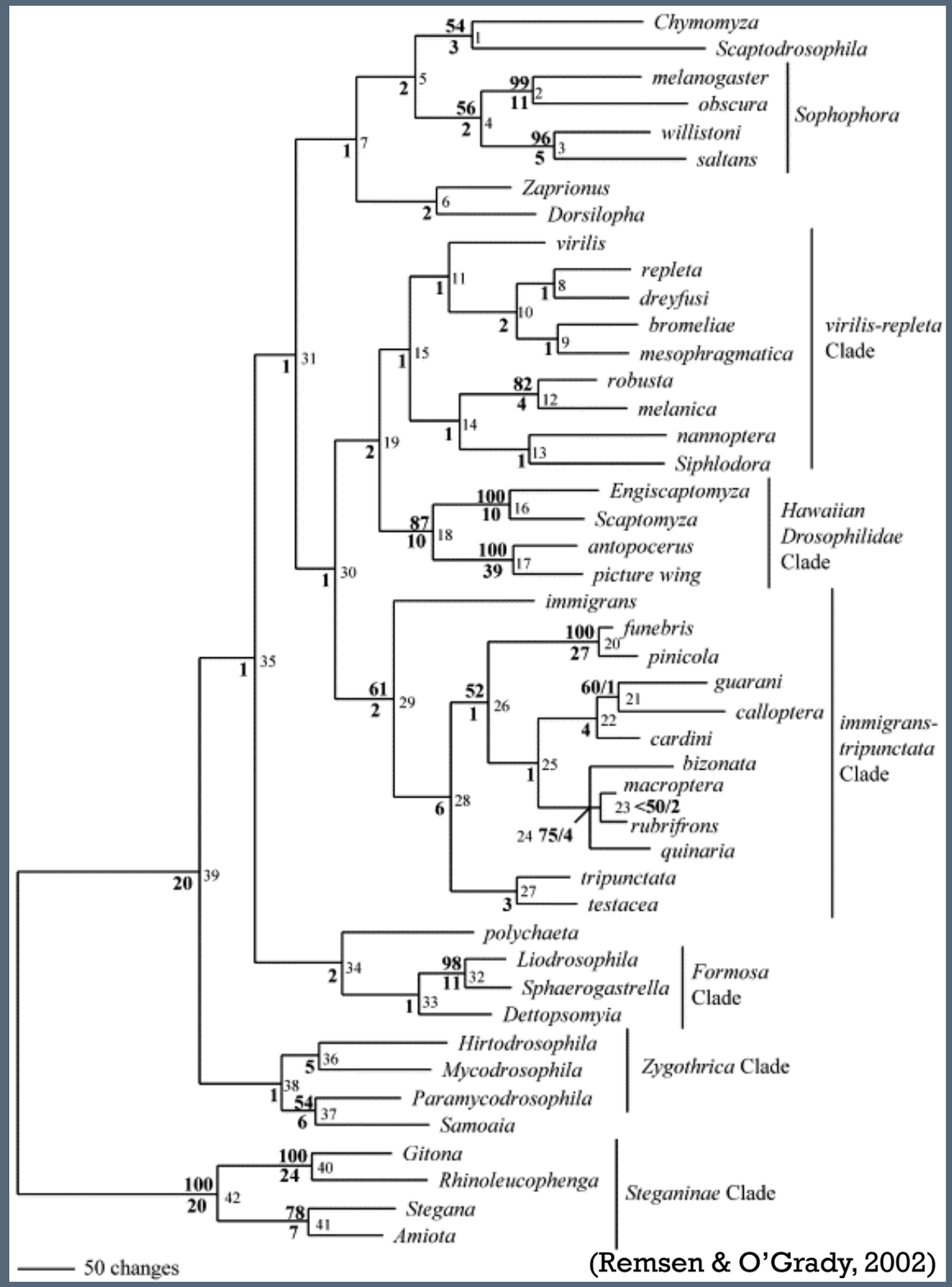
DSSC - Collection

- 250+ species
- 1600+ stocks
- Global in scale

Image Credit: Nicolas Gompel

DSSC - Collection

- 250+ species
- 1600+ stocks
- Global in scale
- Broad phylogenetic breadth



(Remsen & O'Grady, 2002)

Genus	Subgenus	Species Group	# of Species	# of Stocks
Drosophila	Dorsilopha	busckii	1	1
	Drosophila	annulimana	1	2
		bromeliae	1	1
		cardini	9	29
		funebris	2	13
		guarani	3	5
		guttifera	1	3
		histrio	1	1
		immigrans	13	61
		melanica	4	5
		mesophragmatica	1	2
		nannoptera	3	9
		pallidipennis	1	2
		polychaeta	3	11
		quinaria	6	6
		repleta	42	267
		repletoides	1	2
		robusta	3	10
		testacea	1	1
		tripunctata	5	15
		virilis	12	176
	Sophophora	melanogaster	58	631
		obscura	12	257
		saltans	9	22
		willistoni	8	65
Chymomyza		fuscimana	1	2
		procnemis	2	3
Hirtodrosophila		duncani	1	1
Samoaia	Samoaia	leonensis	1	1
Scaptodrosophila	Scaptodrosophila	latifasciaeformis	1	1
		victoria	2	3
Scaptomyza	Bunostoma		1	1
Zaprionus	Anaprionus		1	1
	Zaprionus	armatus	7	16
		inermis	3	3
		neglectus	1	1
		vittiger	3	3
		Total	225	1641

DSSC - Collection

- 250+ species
- 1600+ stocks
- Global in scale
- Broad phylogenetic breadth
- 30+ species with sequenced genomes

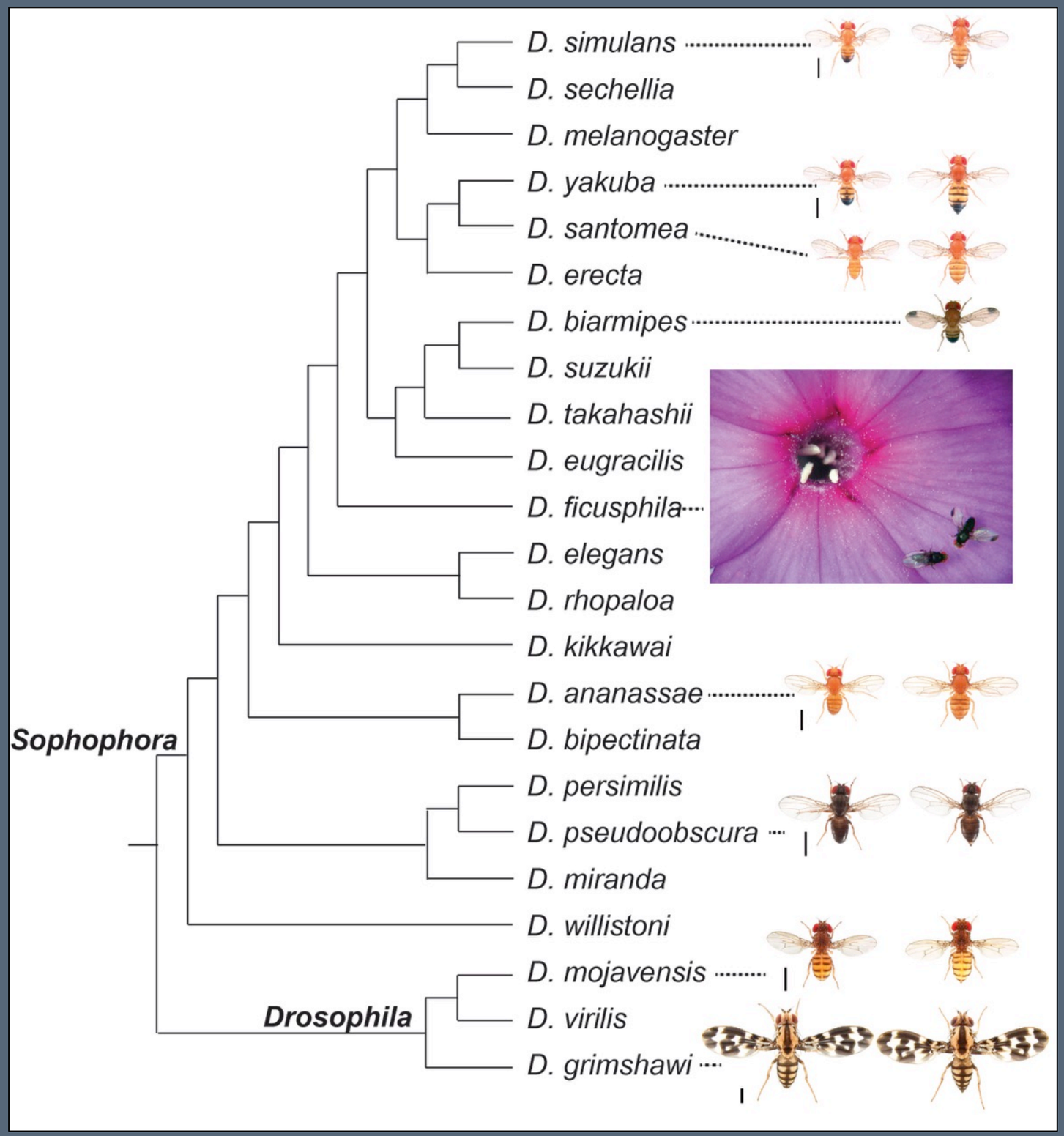


Image Credit: Nicolas Gompel

DSSC – Logistics

DROSOPHILA SPECIES STOCK CENTER

Home | About Us | Contact Us | How To Order | Support | Log In

Stocks

- Introduction
- Search Stock List
- Genome Stock Sets
- Genome Projects & BAC Libraries
- Genomic DNA
- Stocks from Isofemale Lines
- Transgenic Stocks

Resources for Researchers

- Compilation of Genome Resources
- Discussion forum for germline transformation
- Workshops
- Information about Drosophila
- Links

Husbandry

- Food Recipes
- Maintenance conditions by species group
- Stocks with specific needs

Welcome to the UC San Diego Drosophila Stock Center

The Drosophila Species Stock Center (DSSC) at the University of California, San Diego is dedicated to providing a diverse array of *Drosophila* species to scientific researchers and educators.

Announcements

SHIPPING UPDATE *(2015-11-10)*

Due to the US Thanksgiving holiday (Nov. 26) we will not ship orders the week of Nov. 23-27. If you place an order during that week it will shipped the following Tuesday (Dec. 1) or Friday (Dec. 3rd). Please email Maxi with any questions.

D. GRIMSHAWI GENOME LINE NOW AVAILABLE *(2015-09-30)*

The *D. grimshawi* genome line (15287-2541.00) was kindly re-donated by Dr. Ken Kaneshiro (U. of Hawaii) and is now available from the Drosophila Species Stock Center. Due to high demand, shipments of this stock will be delayed until the middle of November.

Recent Publications Using DSSC Flies

A MAJOR LOCUS CONTROLS A GENITAL SHAPE DIFFERENCE INVOLVED IN REPRODUCTIVE ISOLATION BETWEEN DROSOPHILA YAKUBA AND D. SANTOMEA *(2015-11-02)*

Peluffo et al. (2015) G3: doi:10.1534/g3.115.023481

THE GENETICS OF RESISTANCE TO MORINDA FRUIT TOXIN DURING THE POSTEMBRYONIC STAGES IN DROSOPHILA SECHELLIA *(2015-10-20)*

Huang, Y., & D. Erezyilmaz (2015) G3 5:1973-1981.

DSSC – Logistics

- Staff
  - Director
  - Manager/Curator
  - Part-time Assistant Curator
    - 7-8 undergraduates
- Scientific advisory board
- Stocks maintained on a weekly basis
- Approximately 45-50 hours total maintenance time required
- Cultured in glass shell vials
- Food purchased from the UCSD fly kitchen

DSSC - Challenges

- Funding
- Mites
- Cross-contamination
- Stock and species verification

DSSC – Quality Control

- Quality controlled repository for species stocks
  - Stock identity verified using morphology and genetics
  - Verification of phenotypic mutations

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  - Taxonomic revisions → name changes, new species descriptions
  - Systematic revisions → new hypotheses of relationships

DSSC – Resource Use

- Ship approximately 1500 stocks per year
  - Domestic and international researchers
  - Educators
- Stocks are $35 - currently under review for a rate increase
- 98% of represented diversity ordered in the last four years

DSSC - Products

RESEARCH ARTICLE

The Circadian Clock Network in the Brain of Different *Drosophila* Species

Christiane Hermann,[1] Rachele Saccon,[1,2] Pingkalai R. Senthilan,[1] Lilith Domnik,[1] Heinrich Dircksen,[3] Taishi Yoshii,[1,4] and Charlotte Helfrich-Förster[1]*

[1]Neurobiology and Genetics, Theodor-Boveri Institute, Biocenter, University of Würzburg, Würzburg D-97074, Germany
[2]Department of Biology, University of Padova, 35100 Padova, Italy
[3]Department of Zoology, Stockholm University, S-10691 Stockholm, Sweden
[4]Graduate School of Natural Science and Technology, Okayama University, Okayama 700-8530, Japan

ABSTRACT

Comparative studies on cellular and molecular clock mechanisms have revealed striking similarities in the organization of the clocks among different animal groups. To gain evolutionary insight into the properties of the clock network within the *Drosophila* genus, we analyzed sequence identities and similarities of clock protein homologues and immunostained brains of 10 different *Drosophila* species using antibodies against vrille (VRI), PAR-protein domain1 (PDP1), and cryptochrome (CRY). We found that the clock network of both subgenera *Sophophora* and *Drosophila* consists of all lateral and dorsal clock neuron clusters that were previously described in *Drosophila melanogaster*. Immunostaining against CRY and the neuropeptide pigment-dispersing factor (PDF), however, revealed species-specific differences. *D. pseudoobscura* of the *Sophophora* subgenus completely lacked CRY in the large ventrolateral clock neurons (lLN_vs) and showed reduced PDF immunostaining in the small ventrolateral clock neurons (sLN_vs). In contrast, we found the expression of the ion transport peptide (ITP) to be consistent within the fifth sLN_v and one dorsolateral clock neuron (LN_d) in all investigated species, suggesting a conserved putative function of this neuropeptide in the clock. We conclude that the general anatomy of the clock network is highly conserved throughout the *Drosophila* genus, although there is variation in PDF and CRY expression. Our comparative study is a first step toward understanding the organization of the circadian clock in *Drosophila* species adapted to different habitats. J. Comp. Neurol. 521:367–388, 2013.

DSSC - Products

Molecular Characterization and Evolution of a Gene Family Encoding Both Female- and Male-Specific Reproductive Proteins in *Drosophila*

Laura K. Sirot,[†,1,2] Geoffrey D. Findlay,[†,1,3] Jessica L. Sitnik,[†,1] Dorina Frasheri,[‡,1] Frank W. Avila,[1] and Mariana F. Wolfner[*,1]

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[2]Department of Biology, College of Wooster

[3]Department of Biology, College of the Holy Cross

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Abstract

Gene duplication is an important mechanism for the evolution of new reproductive proteins. However, in most cases, each resulting paralog continues to function within the same sex. To investigate the possibility that seminal fluid proteins arise through duplicates of female reproductive genes that become "co-opted" by males, we screened female reproductive genes in *Drosophila melanogaster* for cases of duplication in which one of the resulting paralogs produces a protein in males that is transferred to females during mating. We identified a set of three tandemly duplicated genes that encode secreted serine-type endopeptidase homologs, two of which are expressed primarily in the female reproductive tract (RT), whereas the third is expressed specifically in the male RT and encodes a seminal fluid protein. Evolutionary and gene expression analyses across *Drosophila* species suggest that this family arose from a single-copy gene that was female-specific; after duplication, one paralog evolved male-specific expression. Functional tests of knockdowns of each gene in *D. melanogaster* show that one female-expressed gene is essential for full fecundity, and both female-expressed genes contribute singly or in combination to a female's propensity to remate. In contrast, knockdown of the male-expressed paralog had no significant effect on female fecundity or remating. These data are consistent with a model in which members of this gene family exert effects on females by acting on a common, female-expressed target. After duplication and male co-option of one paralog, the evolution of the interacting proteins could have resulted in differential strengths or effects of each paralog.

***Key words:* *Drosophila*, seminal proteins, protease, spermathecal proteins, gene duplication, sex-specific expression.**

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Drosop

Christiane Her
Taishi Yoshii,[1,

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Switzerland
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Associate editor: Pa

Abstract

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Key words: Drosop

ORIGINAL ARTICLE

doi:10.1111/evo.12115

GENETIC ANALYSIS OF MATE DISCRIMINATION IN *DROSOPHILA SIMULANS*

Y. Chu,[1] E. Yang,[1] J. M. Schinaman,[1] J. S. Chahda,[1] and R. Sousa-Neves[2,3]

[1]*Department of Biology, Case Western Reserve University, Cleveland, Ohio*

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Courtship is an elaborate behavior that conveys information about the identity of animal species and suitability of individual males as mates. In *Drosophila*, there is extensive evidence that females are capable of evaluating and comparing male courtships, and accepting or rejecting males as mates. These relatively simple responses minimize random sexual encounters involving subpar conspecific males and heterospecific males, and over generations can potentially select novel physical and behavioral traits. Despite its evolutionary and behavioral significance, little is still known about the genes involved in mating choice and how choices for novel males and females arise during evolution. *Drosophila simulans* and *Drosophila sechellia* are two recently diverged species of *Drosophila* in which females have a preference for conspecific males. Here we analyzed a total of 1748 F2 hybrid females between these two species and found a small number of dominant genes controlling the preference for *D. simulans* males. We also mapped two redundant X-linked loci of mating choice, *Macho-XA* and *Macho-XB*, and show that neither one is required for female attractiveness. Together, our results reveal part of the genetic architecture that allows *D. simulans* females to recognize, mate, and successfully generate progenies with *D. simulans* males.

KEY WORDS: **Behavior, *Drosophila*, mapping, mate choice, recombination.**

DSSC – Future Directions

- Interactive species identification key
- Species pages for Encyclopedia of Life
- BLAST sequence server
- Phylogenetic-based search mechanism

DSSC – Acknowledgements

Biological Sciences
where discovery comes to life
UC San Diego