UNIVERSITY OF CAMBRIDGE

HARVARD UNIVERSITY

FlyBase 2023:

New features and tools to accelerate your research

Steven Marygold

sjm41@cam.ac.uk

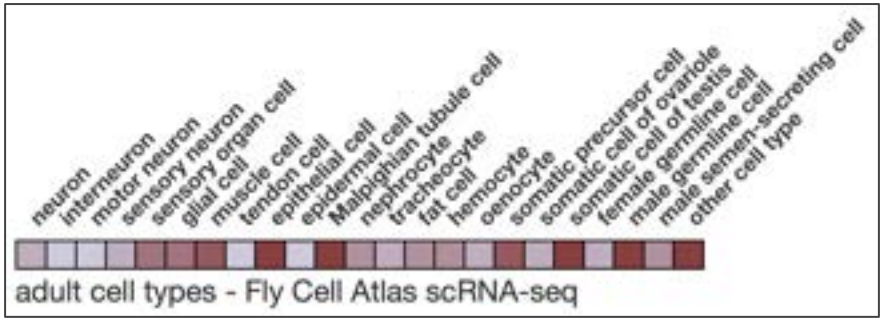
INDIANA UNIVERSITY

THE UNIVERSITY OF NEW MEXICO

Curation overview

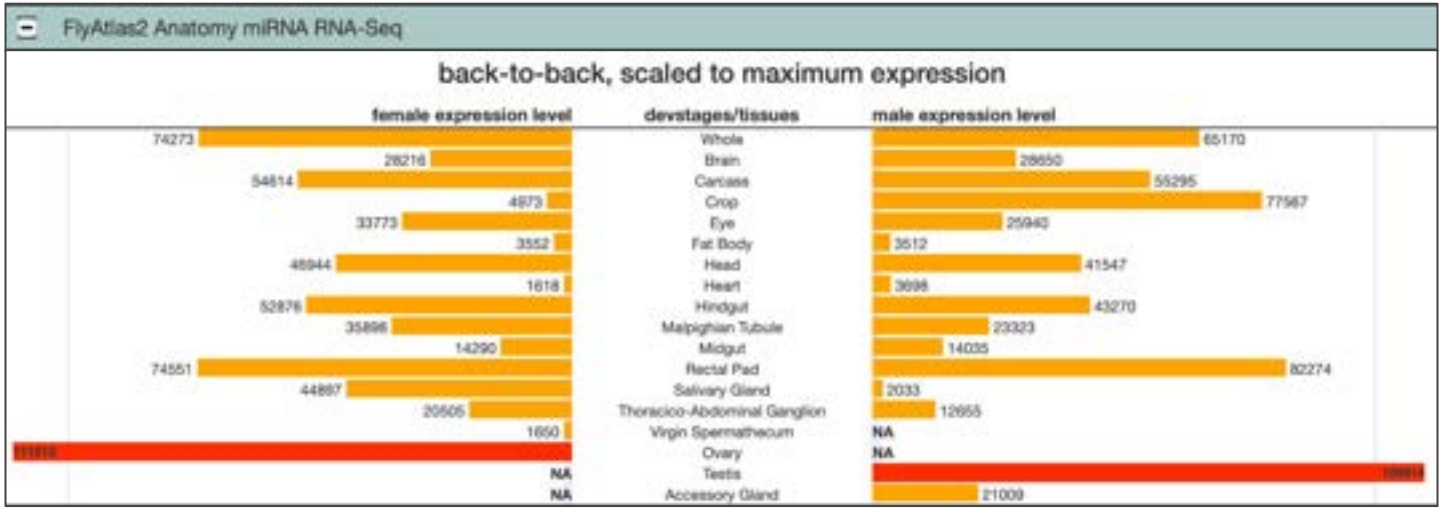
Bibliography ~2,870 references	**Ref-to-gene curation** ~1,330 papers (curators) ~1,150 papers (authors)	**Genetic reagents** ~23,220 alleles ~1,460 papers	**Phenotypes** ~7,660 annotations ~295 papers
Functional data (GO) ~3,020 annotations from ~715 papers	**Gene expression** ~1,570 annotations from ~1100 papers	**Gene Groups & Signaling Pathways** ~70 new gene groups 1 new pathway	**scRNA-seq datasets** ~10 datasets ~370 single cell clusters
Experimental Tools ~80 tools	**Genome features** ~640 features from ~210 papers	**Disease models** ~1,510 allele assoc. ~65 new disease rep.	**Physical interactions** ~845 interactions from ~180 papers
Gene models ~10 new models	**Cell lines** ~320 associations ~10 new reports	**Chemicals** ~5,370 associations from ~1,490 papers	**Ontologies** ~482 fly anatomy terms ~46 other terms

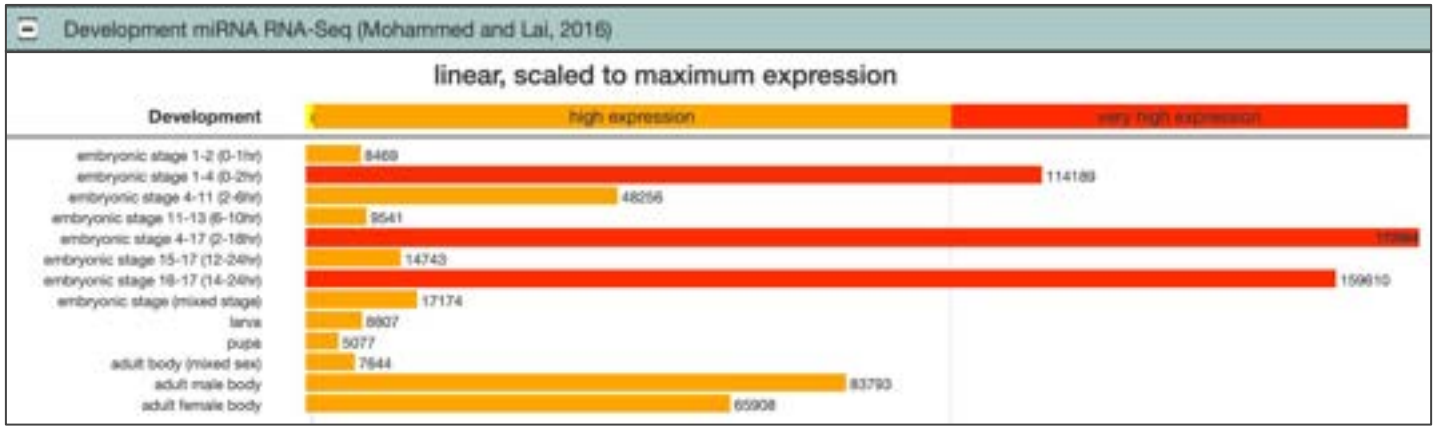
Expression: Fly Cell Atlas scRNA-seq data



Proportion (%) of cells with detectable expression	cell type	Average level in cells with detectable expression
16	neuron	610
10	interneuron	870
19	motor neuron	429
15	sensory neuron	570
17	sensory organ cell	649
26	glial cell	744
31	muscle cell	983
13	tendon cell	992
25	epithelial cell	664
14	epidermal cell	848
66	Malpighian tubule cell	334
35	nephrocyte	538
23	tracheocyte	732
36	fat cell	531
18	hemocyte	617
25	oenocyte	460
34	somatic precursor cell	595
16	somatic cell of ovariole	482
58	somatic cell of testis	405
24	female germline cell	346
60	male germline cell	701
14	male semen-secreting cell	426

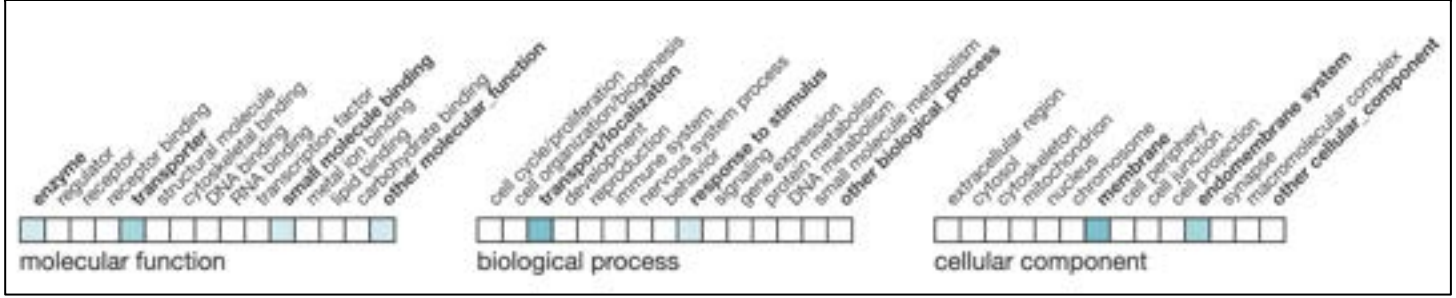
Expression: miRNA histograms



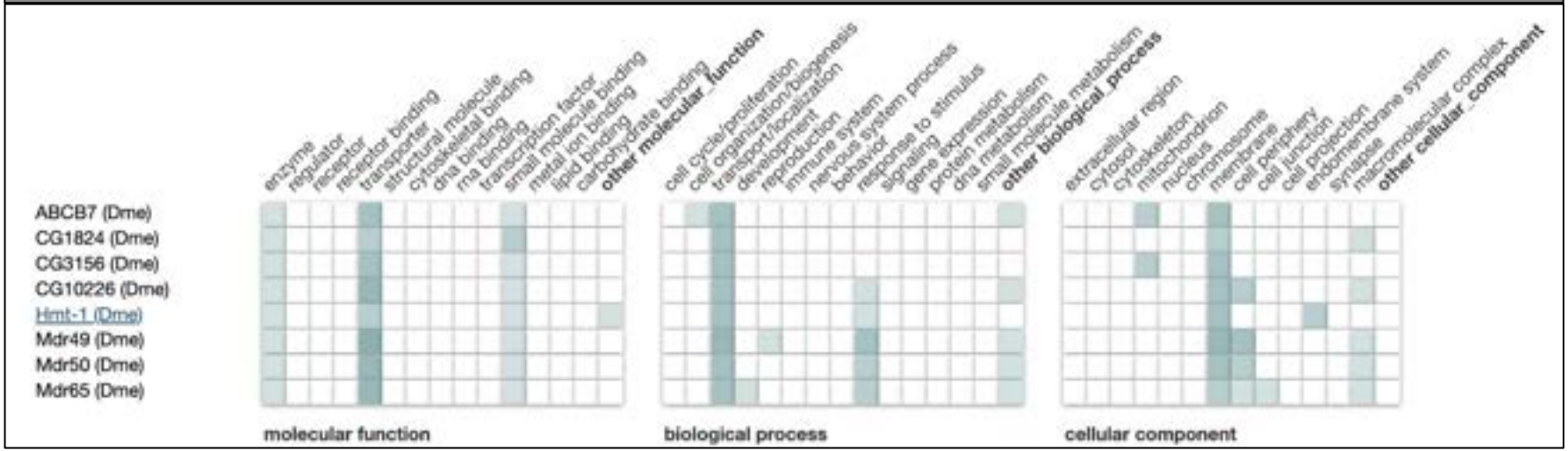


Function: GO ribbons and stacks

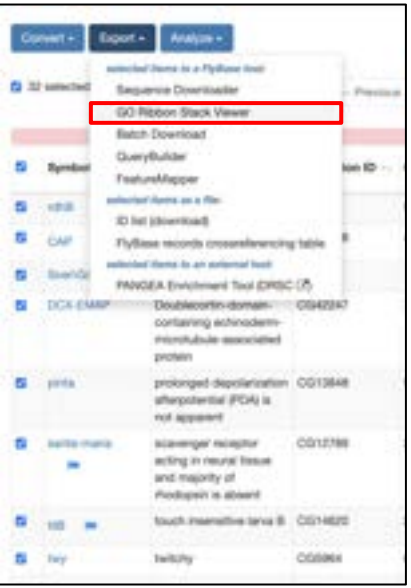
Gene Report: Hmt-1

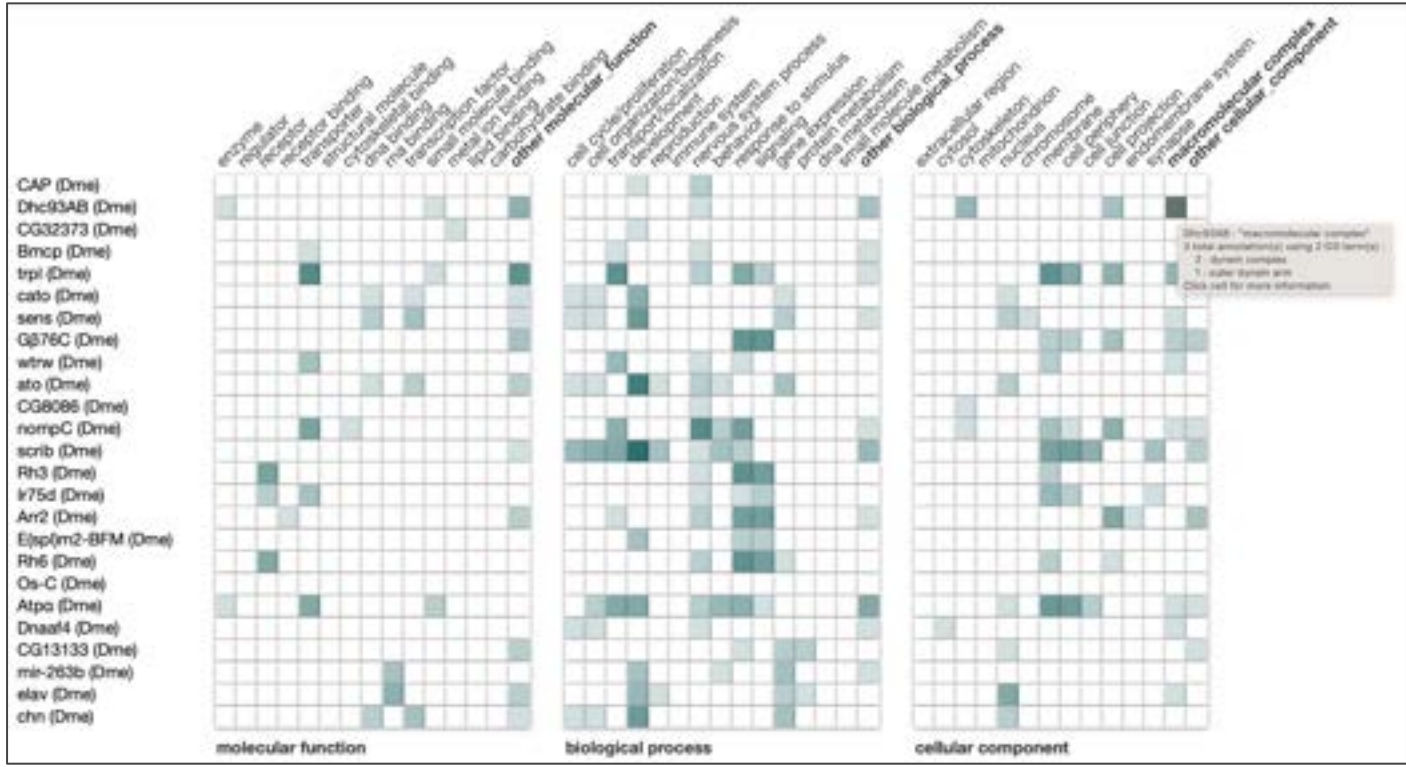


Gene Group Report: ABCB ATP-Binding Cassette Transporter Subfamily

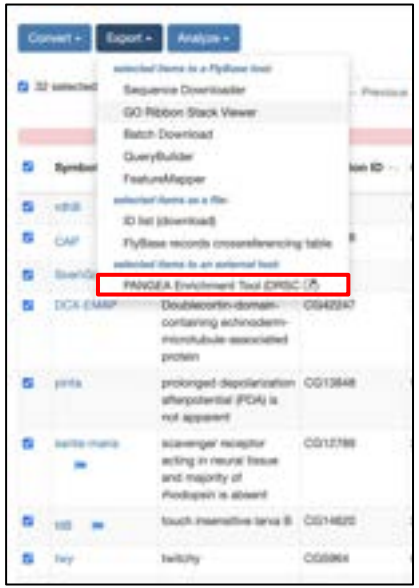


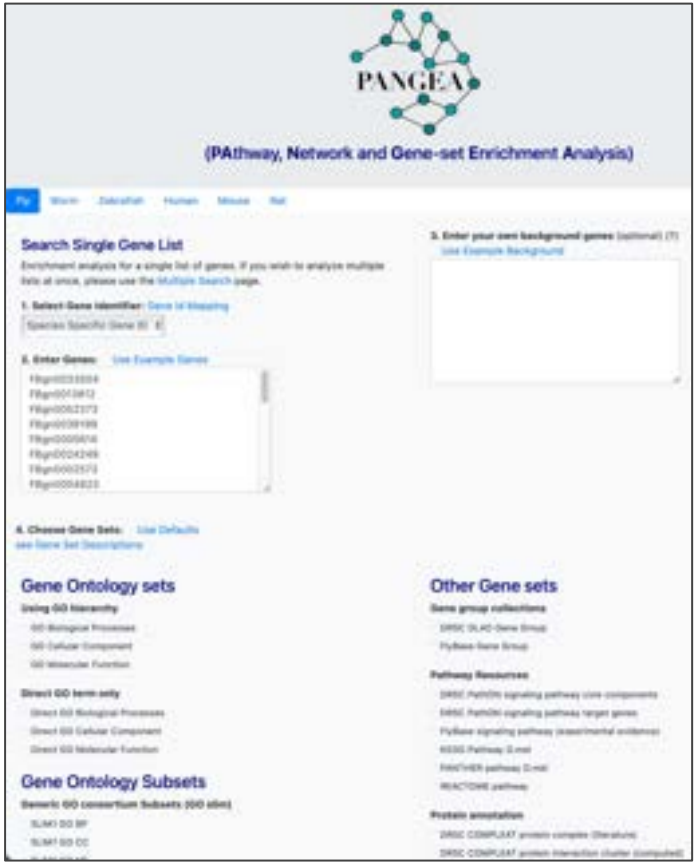
Function: GO ribbon stack from HitList

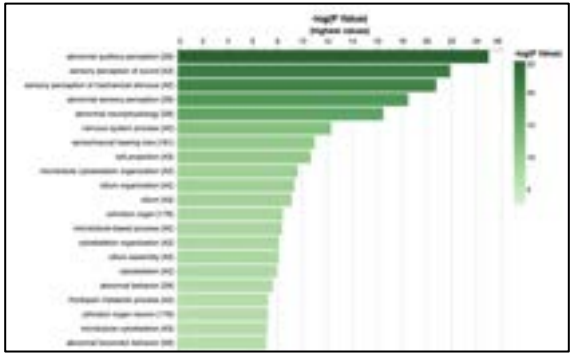


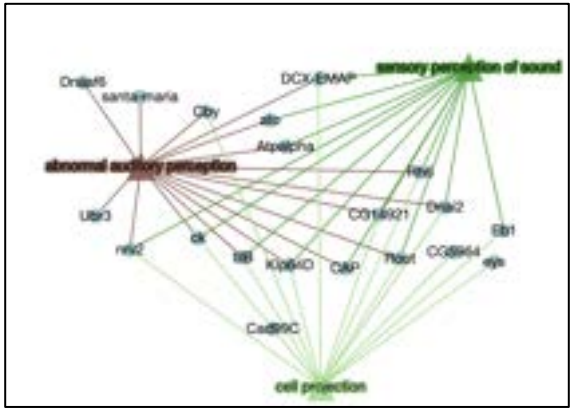


Function: Export to PANGEA (GSEA tool) from HitList

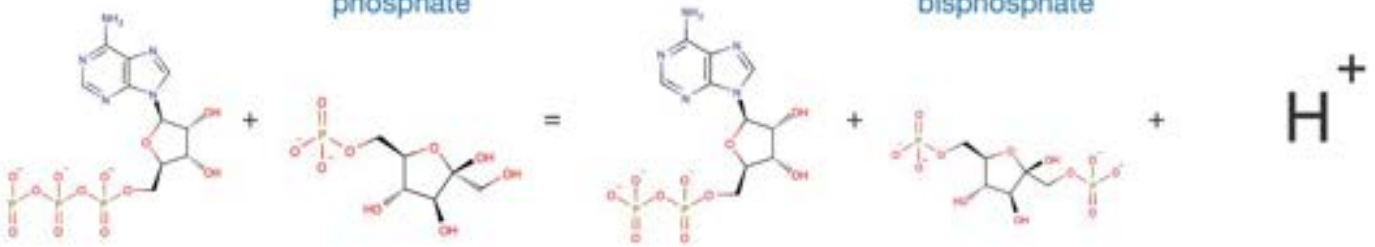




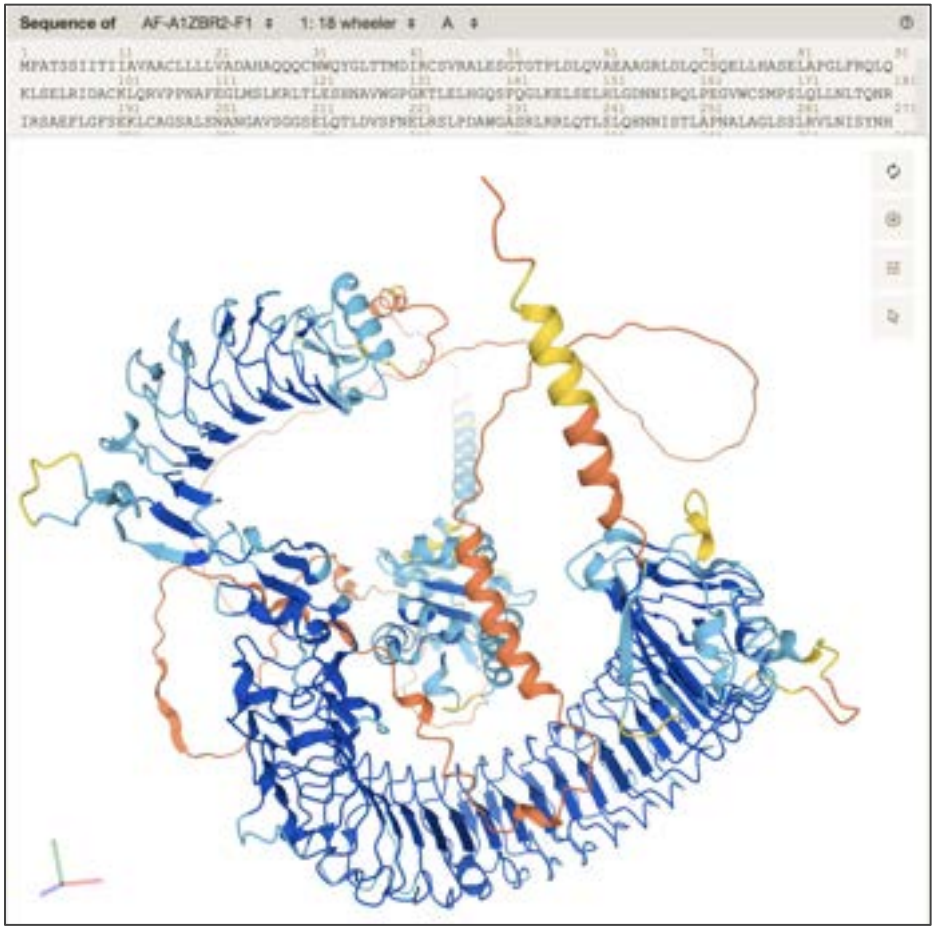


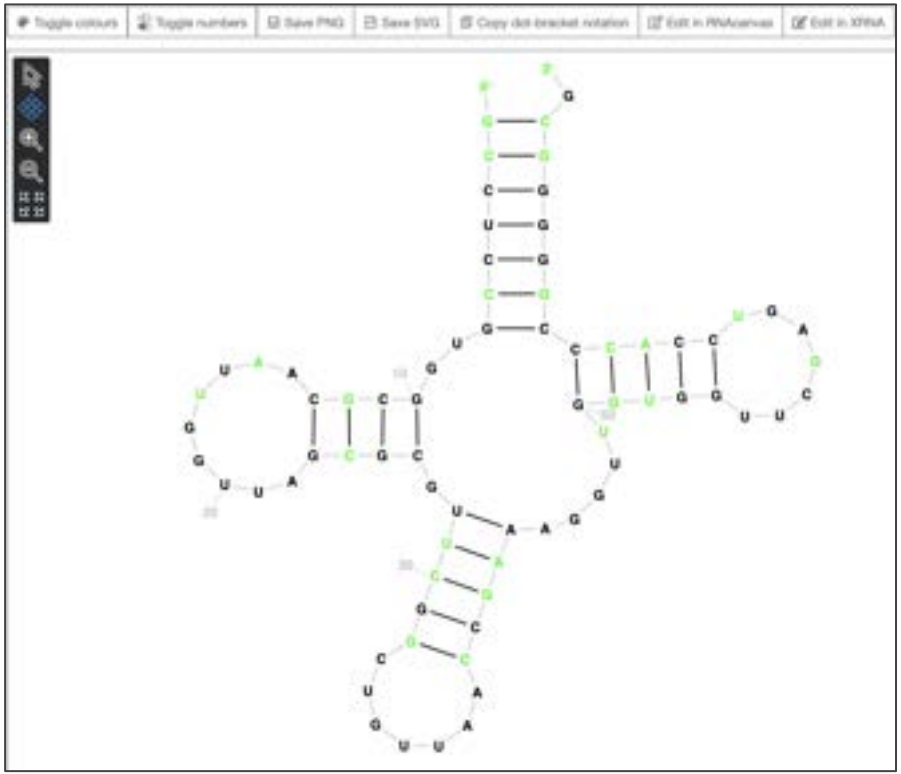


Function: enzyme reaction graphics

Function	
Catalytic Activity (EC/Rhea)	**6-phosphofructokinase activity** ATP + beta-D-fructose 6-phosphate = ADP + beta-D-fructose 1,6- bisphosphate + H(+) (2.7.1.11) RHEA 16109: ATP + β-D-fructose 6-phosphate = ADP + β-D-fructose 1,6-bisphosphate + H^+ 

Function: protein & ncRNA structures

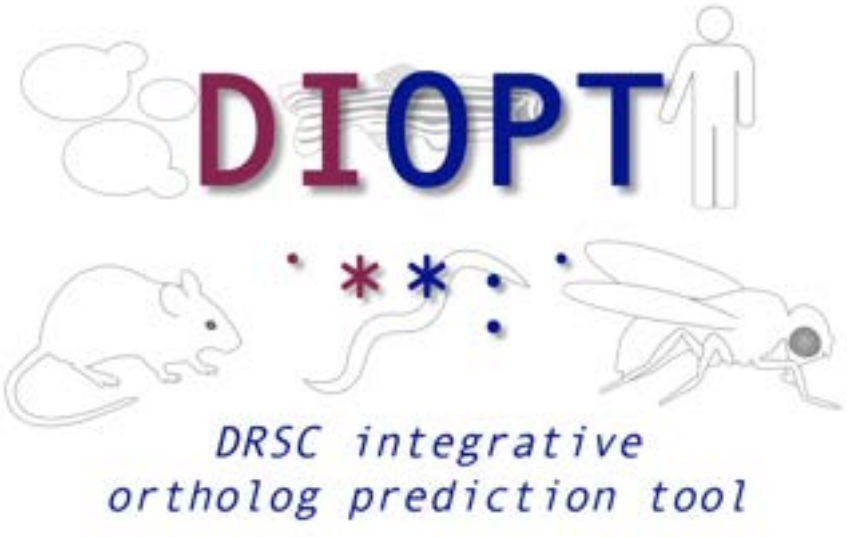




Variant molecular consequences

Variant	Affected Genes	Related Alleles	Affected Transcripts
deletion C. > C 3R:11,963,124..11,964,369 NT_033777.3:g.11963124_11964369del	aurA **consequence:** splice_acceptor_variant, splice_donor_variant, start_lost, 5_prime_UTR_variant, intron_variant **impact:** HIGH	$aurA^{ST}$	aurA-RA **consequence:** splice_acceptor_variant, splice_donor_variant, start_lost, 5_prime_UTR_variant, intron_variant **impact:** HIGH
insertion C > C. 3R:11,963,170..11,963,171 NT_033777.3:g.11963170_11963171ins	aurA **consequence:** 5_prime_UTR_variant **impact:** MODIFIER	$aurA^{EY03490}$ assoc. with P{EPgy2}aurA[EY03490]	aurA-RA **consequence:** 5_prime_UTR_variant **impact:** MODIFIER
point_mutation C > T 3R:11,963,298 NT_033777.3:g.11963298C>T	aurA **consequence:** missense_variant **impact:** MODERATE	$aurA^{3}$	aurA-RA **consequence:** missense_variant **impact:** MODERATE
point_mutation A > C 3R:11,963,623 NT_033777.3:g.11963623A>C	aurA **consequence:** missense_variant **impact:** MODERATE	$aurA^{3}$	aurA-RA **consequence:** missense_variant **impact:** MODERATE

Orthology updates



OrthoDB

- Orthologs in humans and model organisms
- Updated to v9.1
  - 14 different algorithms
  - *A. gambiae* and *E. coli* added

- Orthologs in other insects & arthropods
- Now retrieved via live API call
  - Always up-to-date (v11)

Outreach: ‘New to Flies’ and FAQ update

FlyBase:New to Flies

FlyBase is a database of genetic and molecular data for *D. melanogaster* and other Dro
audience of research professionals. The resources listed here may be especially useful t

For a quick look at answers to common issues, check out the **Frequently Asked Questi**

New To Flies?

Contents [hide]

1 Learning how to use Drosophila
2 Learning Drosophila genetics
3 External Resources on the FlyBase Wiki
4 How to use FlyBase
5 Social media and online groups

Learning how to use Drosophila

A basic introduction to Drosophila can be found at these websites:

- An introduction to Drosophila melanogaster
- Drosophila Workers Unite! A laboratory manual for working with Drosophila
- Fly Basics, from the Fly Research Portal
- A quick and simple introduction to Drosophila melanogaster
- FlyMove: Images and movies describing Drosophila development

Drosophila Workers Unite! A laboratory manual for working with Drosophila.

Online books:

- Experiments with Drosophila for Biology Courses, eds. SC Lakhotia and HA Ranganath: features 85 protocols commonly used in Drosophila labs, for use by both undergraduate labs and researchers
- Drosophila melanogaster - Model for Recent Advances in Genetics and Therapeutics, ed. FK Perveen: a disease model centered introduction to Drosophila
- The Encyclopedia of North American Drosophilids Volume 1: Drosophilids of the Midwest and Northeast, eds. T Werner, T Steenwinkel, and J Jaenike

FlyBase:FAQ

FlyBase FAQ

1.	**Bulk data retrieval**	[Expand]
2.	***D. melanogaster* as a model organism**	[Expand]
3.	**Fast-Track Your Paper**	[Expand]
4.	**FlyBase Community Advisory Group**	[Collapse]
4.1.	**How can I join the FlyBase Community Advisory Group (FCAG)?**	
	Please fill in the FCAG registration form.	
4.2.	**I am a current member of the FCAG. I have moved to a new institution, so could you please update my details?**	
	Please fill in the FCAG registration form, so that we can update your information in our database.	
5.	**FlyBase fee**	[Collapse]
5.1.	**How can I pay the FlyBase fee? Can I pay the fee for my entire lab/institution/company?**	
	You can pay the FlyBase fee at this link. We also have a dedicated FlyBase Fees FAQs. Please contact us to discuss institutional/departmental/corporate fees.	
6.	**FlyBase people database**	[Collapse]
6.1.	**Is FlyBase people database still active?**	
	No, the FlyBase people database was retired.	
7.	**Genome browser (JBrowse and GBrowse)**	[Collapse]
7.1.	**Is GBrowse being discontinued?**	
	Yes, GBrowse is no longer being maintained, and GBrowse access will be discontinued in FlyBase release FB2202_06. All GBrowse tracks and features are now also available in JBrowse. Please use JBrowse for your queries.	

Outreach: Fly Lab List

FlyBase:Fly Lab List

The 'Fly Lab List' is an ongoing project aiming to generate an accurate list of all active labs undertaking a substantial fraction of their research using Drosophila (any species of Drosophila).

The current list can also be downloaded as an Excel file.

If you wish to **revise** your lab's entry, please use this form.

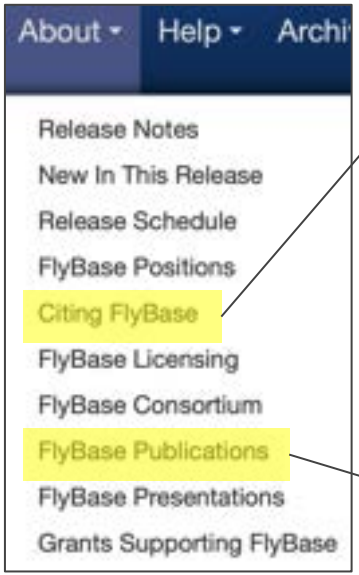
If your lab is not on the list and you wish to **add** it, please use this form. Note the PI/Lab must have a website to be included.

If you wish to **remove** your entry from the list, or do not consider your lab to be an active Fly Lab, please opt out using this form.

Last updated: 20th October 2023 (1,939 entries)

Lab head name			Website	Primary affiliation				Additional affiliation(s)
First	Middle	Last		Institution	City	State/Province/Prefecture	Country	
Jessica	K	Abbott	Link	Lund University	Lund		Sweden	
Uri		Abdu	Link	Ben-Gurion University of the Negev	Beer'Sheva		Israel	
Hermann		Aberle	Link	Heinrich Heine University Düsseldorf	Düsseldorf		Germany	
Elizabeth	T	Ables	Link	East Carolina University	Greenville	North Carolina	USA	
Amos	O	Abolaji	Link	University of Ibadan	Ibadan		Nigeria	
John	M	Abrams	Link	University of Texas Southwestern Medical Center	Dallas	Texas	USA	
Jairaj	K	Acharya	Link	National Cancer Institute	Frederick	Maryland	USA	
Takashi		Adachi-Yamada	Link	Gakushuin University	Tokyo		Japan	
Michael	E	Adams	Link	University of California	Riverside	California	USA	
Christof	M	Aegerter	Link	Universität Zürich	Zürich		Switzerland	
Stein		Aerts	Link	Katholieke Universiteit Leuven	Leuven		Belgium	
Markus		Affolter	Link	University of Basel	Basel		Switzerland	

Outreach: FlyBase publications



Citing FlyBase

If you have used FlyBase during your research project, we urge you to cite us in your published work. We recommend that you use our latest *Genetics Knowledgebase and Database Resources* publication:

Gramates LS, Agapite J, Attrill H, Calvi BR, Crosby M, dos Santos G Goodman JL, Goutte-Gattat D, Jenkins V, Kaufman T, Larkin A, Matthews B, Millburn G, Strelets VB, and the FlyBase Consortium (2022) **FlyBase: a guided tour of highlighted features.** Genetics, Volume 220, Issue 4, April 2022, iyac035

FlyBase Publications

2023

Gene Ontology Consortium (2023)
The Gene Ontology knowledgebase in 2023.
Genetics 224(1):iyad031. DOI:10.1093/genetics/iyad031

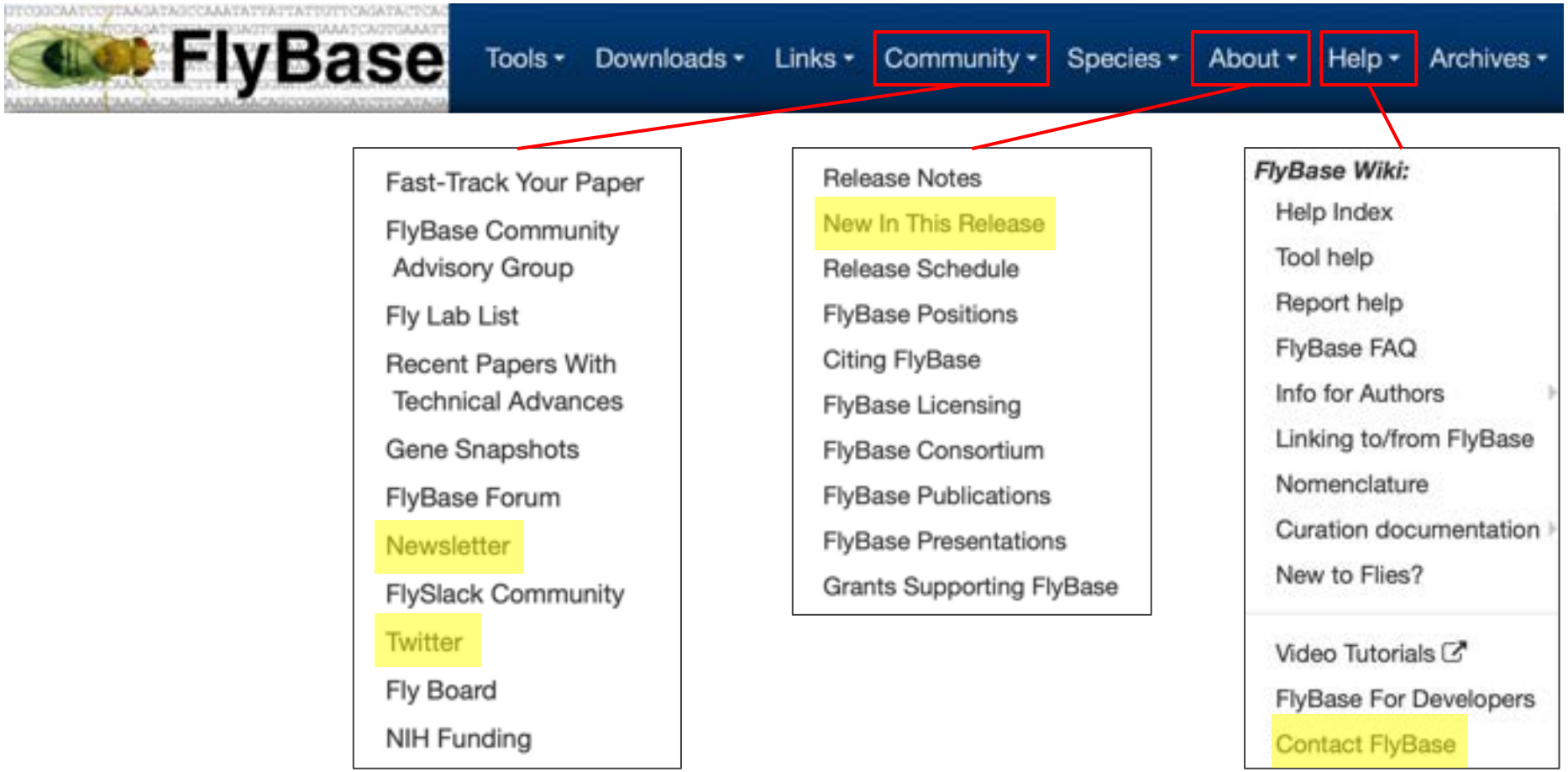
Hu Y, Comjean A, Attrill H, Antonazzo G, Thurmond J, Chen W, Li F, Chao T, Mohr SE, Brown NH, Perrimon N. (2023)
PANGEA: a new gene set enrichment tool for Drosophila and common research organisms.
Nucleic Acids Res:gkad331. DOI:10.1093/nar/gkad331 FBrf0256969

Marygold SJ and the FlyBase Consortium (2023)
Exploring FlyBase Data Using QuickSearch (Updated protocol)
Current Protocols 3:e731. DOI:10.1002/cpz1.731 FBrf0256232

Coming soon…

- Macromolecular complex reports
- Better representation of split-GAL4 lines & combinations
- ‘Gene toolkit’
- Metabolic pathways
- Further integration with the ALLIANCE of GENOME RESOURCES

Notifications and help



Acknowledgements

FlyBase @ University of Cambridge:
Nick Brown (Co-PI)
Giulia Antonazzo
Helen Attrill
Damien Goutte-Gattat
Aoife Larkin
Steven Marygold
Alex McLachlan
Gillian Millburn
Arzu Ozturk-Colak
Clare Pilgrim
Esther Shackleton*

FlyBase @ University of New Mexico:
Richard Cripps (Co-PI)
TyAnna Lovato

FlyBase @ Harvard University:
Norbert Perrimon (PI)
Susan Russo Gelbart (PD)
Kris Broll
Lynn Crosby
Gil dos Santos
Kathleen Falls
L. Sian Gramates
Victoria Jenkins
Ian Longden
Beverley Matthews
Jolene Seme
Christopher Tabone
Pinglei Zhou
Mark Zytkovicz

FlyBase @ Indiana University:
Thomas Kaufman (Co-PI)
Brian Calvi (Co-PI)
Seth Campbell
Josh Goodman
Victor Strelets
Jim Thurmond

Collaborators:
Fly Cell Atlas / SCEA
FlyAtlas2
Eric Lai
DRSC (PANGEA, DIOPT)
Rhea
AlphaFold
RNAcentral
Ensembl VEP
OrthoDB

Funding:

NHGRI U41HG000739, U24HG010859
NIDDK: 1R01DK136945-01
MRC: W024233/1
NSF: DBI-2035515, 2039324
BBSRC: BB/T014008/1
Wellcome Trust: PLM13398
FlyBase Users