

Mashing up Fruit Flies: Genomic Science in the Web

Alistair Miles

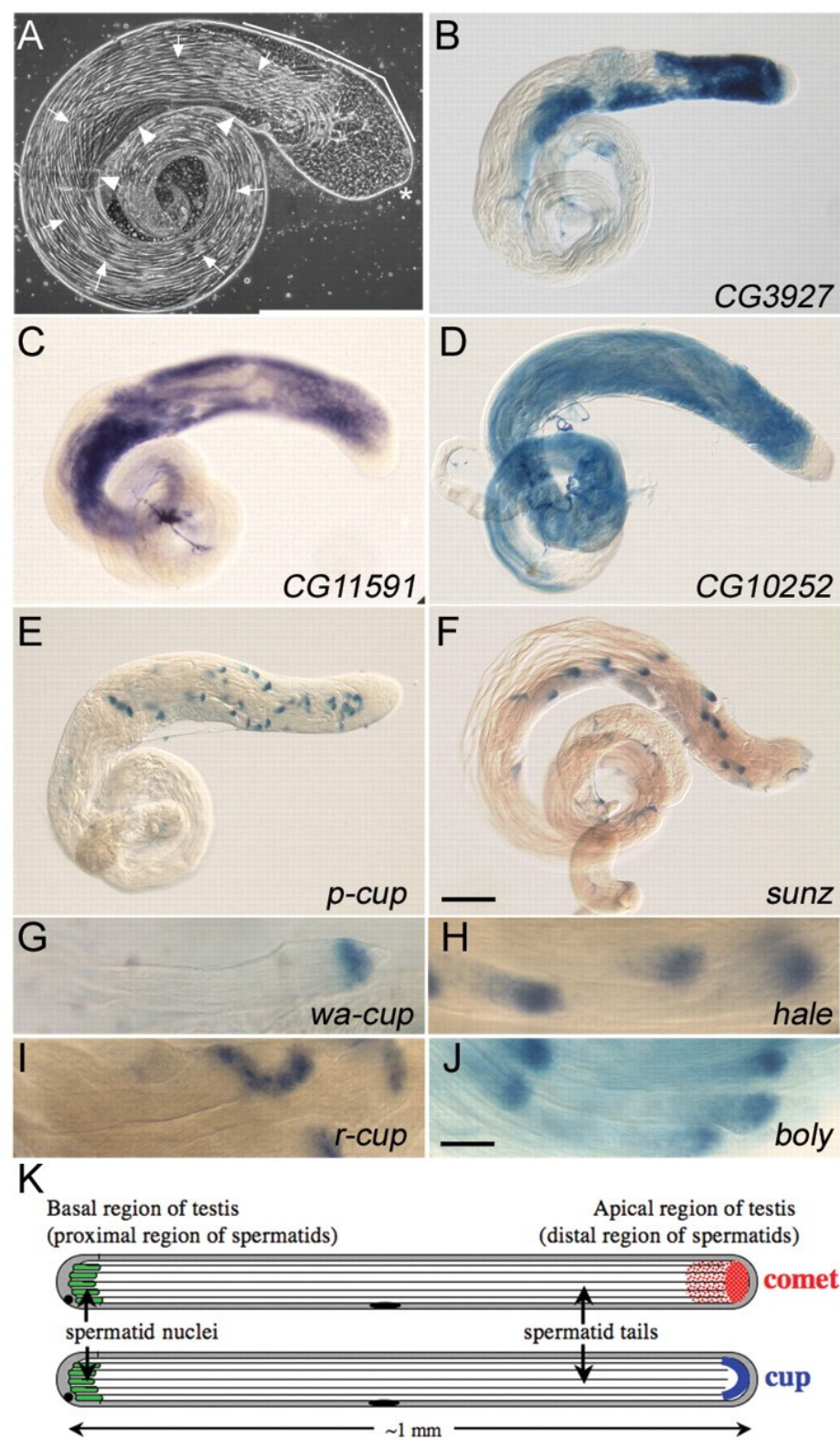
FlyWeb Project - **flyweb.info**

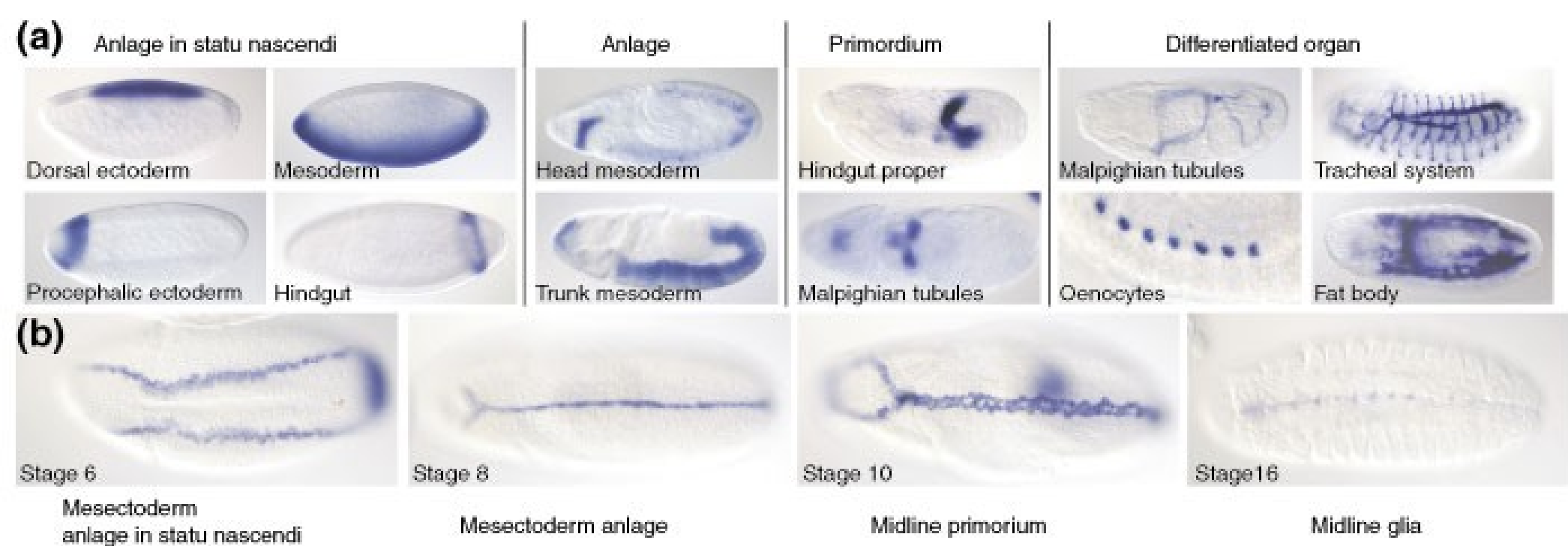
Department of Zoology, University of Oxford

Oxford Geek Nights, 25 March 2009

Carine Barreau, Elizabeth Benson, Elin Gudmannsdottir and Helen White-Cooper, Post-meiotic transcription in *Drosophila* testes, *Development*. 2008 Jun;135(11):1897-902.

www.fly-ted.org





Tomancak P, Beaton A, Weiszmam R, Kwan E, Shu S, Lewis SE, Richards S, Ashburner M, Hartenstein V, Celniker SE, Rubin GM. Systematic determination of patterns of gene expression during *Drosophila* embryogenesis. *Genome Biol.* 2002;3:research0088.1–0088.14.

<http://www.fruitfly.org/cgi-bin/ex/insitu.pl>

Oligo	BrainMez	BrainSEM	BrainCa	HeadMez	HeadSEM	HeadCa	cropMez	cropSEM	cropCa	MidgutMez	MidgutSEM	MidgutCa	HindgutMez	HindgutSEM	HindgutCa	tubuleMez	tubuleSEM	tubuleCa	OvaryMez	OvarySEM	OvaryCa	TestesMez	TestesSEM	TestesCa
Brain-specific																								
1628015_2	361	20	4	7	1	0	4	1	0	6	2	0	5	2	0	3	0	0	2	1	0	2	1	
1640225_2	135	9	4	5	1	0	1	0	0	1	0	0	1	0	0	1	0	0	2	1	0	2	1	
1624411_2	185	14	4	17	4	0	2	0	0	2	0	0	1	0	0	1	0	0	1	0	0	1	0	
1636216_2	147	9	4	7	1	0	1	0	0	7	3	0	1	0	0	1	0	0	1	0	0	4	1	
1634236_2	45	4	4	2	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	
Head-specific																								
1641071_2	2	1	0	4772	176	4	1	0	0	1	0	0	3	1	0	1	0	0	1	0	0	1	1	
1627119_2	1	0	0	4766	289	4	1	0	0	14	2	0	1	0	0	2	0	0	1	0	0	1	0	
1626740_2	1	0	0	1617	213	4	1	0	0	4	1	0	0	0	0	1	0	0	3	1	0	2	1	
1622902_2	3	1	0	1449	108	4	2	0	0	1	0	0	1	0	0	2	0	0	1	0	0	1	0	
1623636_2	3	1	0	1801	119	4	1	0	0	4	1	0	1	1	0	2	1	0	1	0	0	1	0	
Crop-specific																								
1636678_2	1	0	0	3	1	0	185	34	4	4	2	0	3	1	0	3	0	0	2	1	0	3	1	
1633827_2	2	2	0	9	3	0	61	7	4	6	1	0	5	2	0	2	0	0	1	0	0	1	0	
1635140_2	3	1	0	15	2	0	57	4	4	4	2	0	1	0	0	2	0	0	2	1	0	5	1	
1637044_2	4	2	0	4	2	0	40	6	4	4	2	0	5	0	0	2	0	0	1	0	0	5	2	
1632959_2	3	1	0	19	2	0	56	2	4	1	1	0	16	2	0	4	0	0	2	1	0	3	2	
Midgut-specific																								
1630740_2	1	0	0	2	1	0	1	1	0	5891	133	4	3	1	0	1	0	0	1	1	0	3	3	
1629520_2	1	0	0	4	2	0	3	1	0	6020	183	4	4	2	0	2	0	0	1	0	0	1	0	
1630598_2	1	0	0	4	1	0	2	1	0	3919	342	4	1	0	0	1	0	0	1	0	0	1	0	
1629308_2	1	0	0	3	2	0	2	1	0	3791	445	4	1	0	0	3	1	0	1	0	0	1	0	
1636460_2	1	0	0	3	1	0	2	2	0	4675	177	4	1	0	0	2	0	0	1	0	0	1	1	
Hindgut-specific																								
1622901_2	4	1	0	4	1	0	3	1	0	11	3	0	2648	101	4	13	9	0	2	1	0	2	1	
1633066_2	0	0	0	1	1	0	0	0	0	0	0	0	330	23	4	4	3	0	0	0	0	1	1	
1639797_2	4	1	0	9	1	0	12	0	0	6	2	0	566	24	4	7	1	0	2	1	0	4	2	
1625313_2	1	0	0	3	0	0	4	2	0	11	5	0	379	8	4	6	1	0	2	1	0	8	0	
1629761_2	3	1	0	3	2	0	4	2	0	2	1	0	168	4	4	1	0	0	1	0	0	3	1	
Tubule-specific																								
1627080_2	1	1	0	1	0	0	2	1	0	1	0	0	1	0	0	6341	152	4	1	0	0	2	1	
1636501_2	3	2	0	2	0	0	3	1	0	3	1	0	2	1	0	7894	306	4	5	1	0	1	1	
1625082_2	1	0	0	2	1	0	1	0	0	3	1	0	2	1	0	3485	105	4	2	1	0	1	0	
1626964_2	1	0	0	2	1	0	3	2	0	7	3	0	6	2	0	3502	113	4	1	0	0	2	1	
1634064_2	1	0	0	2	1	0	3	1	0	2	0	0	1	0	0	1876	320	4	1	0	0	2	1	
Ovary-specific																								
1629380_2	1	0	0	1	0	0	1	0	0	2	0	0	1	0	0	1	0	0	2892	159	4	2	2	
1631556_2	15	1	0	3	0	0	9	2	0	4	1	0	6	2	0	12	2	0	2639	139	4	9	1	

Venkateswara R Chintapalli, Jing Wang & Julian A T Dow, Using FlyAtlas to identify better *Drosophila melanogaster* models of human disease. Nature Genetics 39, 715 - 720 (2007).

www.flyatlas.org

- each dataset tells a different part of the story
- when combined are more than the sum of their parts
- mash them up

openflydata.org

Explore Gene Expression Data in Drosophila

gene name:

E.g. schuy, CG17736 or FBgn0036925 (case doesn't matter)

genefinder

gene expression levels

in situ hybridisation in testes

in situ hybridisation in embryos



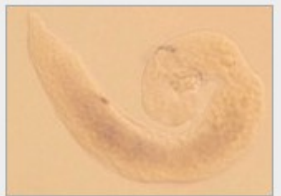
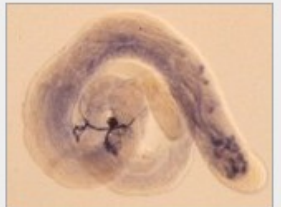
Explore Gene Expression Data in Drosophila

gene name:

E.g. schuy, CG17736 or FBgn0036925 (case doesn't matter)

genefinder				
found 1 matching gene from www.flybase.org for query 'schuy'...				
symbol	full name	annotation ID	flybase ID	user selection
schuy	schumacher-levy	CG17736	FBgn0036925	selected
selected gene: schuy (FlyBase report: FBgn0036925)				

gene expression levels					
found 1 matching probe from www.flyatlas.org for gene schuy ...					
probe	tissue	mRNA signal	present call	enrichment	affy call
1626032_at	whole	81.9 ± 7.9	4 of 4	-	-
	brain	1.2 ± 0.6	0 of 4	0	Down
	head	0.4 ± 0	0 of 4	0	Down
	crop	0.8 ± 0.2	0 of 4	0	Down
	midgut	0.6 ± 0	0 of 4	0	Down
	hindgut	0.6 ± 0.1	0 of 4	0	Down
	tubule	1.5 ± 0.7	0 of 4	0	Down
	ovary	0.5 ± 0.2	0 of 4	0	Down
	testis	1140.4 ± 36.8	4 of 4	13.9	Up
	acc	0.9 ± 0.1	0 of 4	0	Down
	l_tubule	0.6 ± 0.2	0 of 4	0	Down
	l_fatbody	68.5 ± 43.9	3 of 4	0.8	None

in situ hybridisation in testes	
found 11 matching images from www.fly-ted.org for gene schuy (Fly-TED reports: schuy , CG17736/schuy)...	
 <p>schuy in wt</p>	 <p>CG17736/schuy in wt</p>
 <p>CG17736/schuy in topi</p>	 <p>CG17736/schuy in wt</p>

stage9-10

- no staining



stage11-12

- no staining



stage13-16

- gonad



Search Gene Expression Data by Gene Batch

gene names separated by spaces:

Go

E.g. schuy CG7570 FBgn0037462 CG15178 CG30362 CG30363 CG30364 spacewatch CG34218 CG30366 CG8489 CG17645 (case doesn't matter)

batch finder

gene expression levels by tissue

in situ hybridisation in embryos

Search Gene Expression Data by Tissue Expression Profile

select tissue expression profile:

brain	head	crop	midgut	hindgut	tubule	ovary	testis	acc	l_tubule	l_fatbody	ta_ganglion	carcass	sgland
down ▼	down ▼	down ▼	down ▼	down ▼	down ▼	down ▼	down ▼	down ▼	down ▼	down ▼	down ▼	down ▼	down ▼

Go

probe finder

gene finder

gene expression levels

in situ hybridisation in embryos

in situ hybridisation in testes

openflydata.org/search/by-expression-profile

probe finder

found 14 results (13 probes, 13 genes) from flyatlas.org (data obtained on 2008-09-16) ...

matching probes: [1623089_at](#) [1623852_at](#) [1624212_at](#) [1625829_a_at](#) [1625869_at](#) [1626334_at](#) [1629365_at](#) [1630529_at](#) [1632751_at](#) [1635965_at](#) [1636963_at](#) [1637812_at](#) [1638861_at](#)

At most 200 results are shown.

gene finder

found 11 matching genes from flybase.org (FB2009_02) for query: 'FBgn0004173, FBgn0038395, FBgn0039074, FBgn0002862, FBgn0036072, FBgn0050324, FBgn0031247, FBgn0034161, FBgn0037431, FBgn0030050, FBgn0084862, FBgn0050430, FBgn0052457'...

symbol	full name	annotation ID	flybase ID	user selection
CG10407	CG10407	CG10407	FBgn0038395	[select this gene]
CG11562	CG11562	CG11562	FBgn0031247	[select this gene]
CG12111	CG12111	CG12111	FBgn0030050	[select this gene]
CG17917	CG17917	CG17917	FBgn0037431	[select this gene]
CG30324	CG30324	CG30324	FBgn0050324	[select this gene]
CG30430	CG30430	CG30430	FBgn0050430	[select this gene]
CG32457	CG32457	CG32457	FBgn0052457	[select this gene]
CG6628	CG6628	CG6628	FBgn0036072	[select this gene]
CG6784	CG6784	CG6784 / CG6784-RA / CG6784-PA / CG6784-RB / CG6784-PB	FBgn0039074	[select this gene]
Mst84Db	Male-specific RNA 84Db	CG17934	FBgn0004173	selected
Mst87F	Male-specific RNA 87F	CG17956	FBgn0002862	[select this gene]

selected gene: **Mst84Db** (FlyBase report: [FBgn0004173](http://flybase.org))

gene expression levels

found 1 matching probe from flyatlas.org for gene **Mst84Db**...

probe	tissue	mRNA signal	present call	enrichment	affy call
1623089_at	whole	808 ± 26.4	4 of 4	-	-
	brain	4.1 ± 0.7	0 of 4	0	Down
	head	10.4 ± 2.8	2 of 4	0	Down
	crop	8 ± 1.4	0 of 4	0	Down
	midgut	2.2 ± 1.2	0 of 4	0	Down

in situ hybridisation in embryos

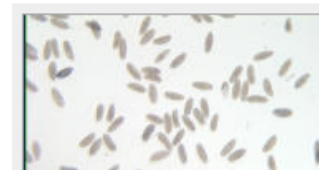
found 2 matching images from www.fruitfly.org for gene **Mst84Db** (BDGP report: [CG17934](http://www.fruitfly.org))...

stage and expressions

images

stage1-3

- no staining



client-side

- pure JavaScript apps
- **FlyUI** library of JavaScript widgets
 - flyui.googlecode.com
 - built on YUI, jQuery
 - (re-)composable into apps
 - MVC-inside
 - test-first
 - fetch data asynchronously over HTTP...

server-side

- the REST/JSON API is... SPARQL!
 - very shiny data query API
 - off-the-shelf components (Jena TDB)
 - no server-side coding
 - (well, almost... sparqlite.googlecode.com)

thanks!