



**GAL4 Search Improvements**

# Survey Questions

Jan 2017



### Introduction

FlyBase is exploring ways to make GAL4 drivers and other transgenic drivers/reporters more readily searchable by expression pattern. Our current expression pattern searches are optimized for gene expression only. As a consequence, continuing to a list of transgenic construct or insertion expression patterns is labor-intensive and non-intuitive for our users. This survey is intended to gather user feedback on approaches we're considering.



## Current gene expression data search tools

1. Are you aware that expression data from the literature are captured using hierarchical controlled vocabularies (for developmental stage, tissue, subcellular localization)?

- Yes
- No
- Not sure

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Questions 2-5 pertain to existing FlyBase tools that support searches for expression data curated from the literature. Which of these tools have you used to find gene expression data of any kind (gene, GAL4, lacZ, GFP, etc.)?

### 2. QuickSearch Expression tab

- I have used this, and found it useful
- I have used this, but couldn't find what I was looking for
- I have seen this but not used this tool
- I was unaware of this tool

### QuickSearch

- Human Disease
- Expression**
- GO
- Phenotype
- References

- Simple
- Orthologs
- Protein Domains
- Gene Groups
- Data Class

Search literature-curated expression patterns: Search

refine search by adding qualifier terms (such as 'ventral')

Stage:  e.g., third instar larval stage

Tissue:  e.g., neuron

Cell Loc.:  e.g., growth cone

RNA-Seq Expression Search/Browse:

[Also see the RNA-Seq overview page](#)

### 3. QueryBuilder Expression Pattern search

- I have used this, and found it useful
- I have used this, but couldn't find what I was looking for
- I have seen this but not tried this
- I was unaware of this tool



DataClass-> **Finish editing**  
Field-> **Expression Patterns**  
SearchText-> **CV compound statement**

#### Defining Query Segment 1

DataClass

#### Developmental Stage

Qualifier

#### Body Part / Tissue

Qualifier

#### Subcellular Location

Qualifier

### 4. Vocabularies term reports

- I have used this, and found it useful
- I have used this, but couldn't find what I was looking for
- I have seen this but not tried this
- I was unaware of this tool

General Information			
Term	wing disc	ID (Ontology)	FBbt:00001778 (Fly Anatomy)
Definition	"Dorsal imaginal disc of the mesothorax. Precursor of dorsal mesothoracic structures of the adult including the postnotum, scutum, scutellum, wing, wing hinge and part of the notal pleura. [ FlyBase:FBfr0064789 ]		
Also Known As	"dorsal mesothoracic disc"		
Comment			

**Annotations**  
**Records which annotation includes this term**

Data Class	Field	Records
Alleles (FBal)	PHENOTYPE_MANIFEST_IN	913
Genes (FBgn)	POLYPEPTIDE_EXPRESSION	103
Genes (FBgn)	TRANSCRIPT_EXPRESSION	192
Cell Lines (FBtc)	TISSUE	36
Insertions (FBti)	EXPRESSION_STAGE_TISSUE_POSITION	221
Insertions (FBti)	PHENOTYPE_MANIFEST_IN	112
Constructs (FBtp)	PHENOTYPE_MANIFEST_IN	438

**Records which annotation includes this term OR any of its CHILDREN TERMS**

Cell Lines 36	Insertions 351	Genes 290	Constructs 588	Images 3	Alleles 1026
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Results list data from **ALL** species. Please use [QueryBuilder](#) to retrieve species specific data.

5. Do you have any suggestions to make these tools more obvious to FlyBase users?

No

Yes (please specify)



## QuickSearch Expression search tool improvements

6. FlyBase plans to optimize the QuickSearch Expression search tool to support directly searching binary system drivers such as GAL4 or LexA, and non-binary transgenic reporters such as lacZ, GFP, or protein traps. We are considering a couple of options. One possibility is to modify the Expression tab to allow the user to select an output type, using a dropdown menu (as shown), radio buttons, or some other selection method. Alternatively, we could add a separate tab dedicated to expression searches of GAL4/binary drivers and transgenic reporters.

Which of the following options would make the added functionality of this search most obvious (please note that the mockups shown below are suggestions of what the tool may look like, not a definitely final design)?

- Alter existing QuickSearch Expression tab, add a mechanism to select different output types (**PANEL A**)
- Have two QuickSearch Expression tabs: the original tab for gene expression searches, and a second tab for GAL4/binary drivers and transgenic reporters (**PANEL B**)

### PANEL A

QuickSearch

Human Disease GO Phenotype References Expression: Genes, Reporters, GAL4/Binary Drivers

Simple Orthologs Protein Domains Gene Groups Data Class

Search literature-curated expression patterns: Search

Output Data Class

refine search by adding qualifier terms (such as 'ventral')

Stage:  e.g., third instar larval stage

Tissue:  e.g., neuron

Cell Loc.:  e.g., growth cone

RNA-Seq Expression Search/Browse:

Also see the [RNA-Seq overview page](#)

Dropdown menu

Genes  
Binary drivers (GAL4, LexA, etc.)  
Reporters (lacZ, GFP, etc.)


**PANEL B**



**QuickSearch**

Human Disease Expression GO Phenotype References GAL4/Binary Driver, Reporter Expression

Simple Orthologs Protein Domains Gene Groups Data Class

**Search literature-curated expression patterns:** **Search**

Output Data Class  

 **refine search by adding qualifier terms (such as 'ventral')** 

Stage:  e.g., third instar larval stage

Tissue:  e.g., neuron

Cell Loc.:  e.g., growth cone

Dropdown menu

Binary drivers (GAL4, LexA, etc.)  
Reporters (lacZ, GFP, etc.)



## Tabular resource

We're considering adding a tabular resource of the most commonly used GAL4 drivers. In the example below, we have included (1) the allele symbol of the driver, (2) synonyms that are commonly used for that GAL4 driver in the published literature, (3) how the major tissue in which the driver is expressed is commonly referred to in the literature, and (4) stock center links for those GAL4 drivers available from a public stock center.

	GAL4 driver	Also called	Tissue	Stock number
1	Scer\GAL4 <sup>C57</sup>	C57-GAL4	somatic muscle	32556
2	Scer\GAL4 <sup>elav.C155</sup>	elav-GAL4 C155-GAL4	pan-neuronal	458, 105921
3	Scer\GAL4 <sup>GMR.PFa</sup>	GMR-GAL4	developing eye, retina	9146
4	Scer\GAL4 <sup>repo</sup>	repo-GAL4	glia	-
5	Scer\GAL4 <sup>Toll-6-D42</sup>	D42-GAL4	motor neuron	8816

### 7. Would you find a table like this useful?

- Yes
- No

### 8. Should we include additional columns? Check all that apply.

- No; this covers what I need
- Anatomy controlled vocabulary (CV) terms (i.e., "nervous system" in addition to "pan-neuronal")
- Insertion or Transgenic Construct symbol (i.e., P{GawB}C57 or P{GMR-GAL4.Fa}
- Stock genotype (i.e., w\*; P{w+mC=UAS-wah.HA}7; P{w+mW.hs=GawB}C57)
- Other (please specify)



**9. The “Scer” in the allele symbols is the species designation for *Saccharomyces cerevisiae*, the yeast species from which the GAL4 gene was cloned; we use a species designation for all genes from other species transgenically expressed in *Drosophila*. As a FlyBase user, do you find this confusing?**

- Yes, please suppress the “Scer” prefix in this table
- Yes, but I can ignore the “Scer” prefix if it is greyed-out (as in the symbol field of allele reports)
- Yes, and it should be suppressed everywhere except in the symbol field of the allele report
- Yes, but it’s fine if greyed-out everywhere used
- No, it seems clear to me.
- Other (please specify)

**10. Would you like the columns of this table to be sortable?**

- Yes
- No

**11. How many GAL4 drivers should this table include?**

- The most commonly used 200 drivers
- The mostly commonly used 400 drivers
- Other number of drivers:



## GAL4 Search Improvements

FlyBase has another expression pattern issue we'd like user input on. If you have a few more minutes, we'd appreciate your additional time. If not, we thank you for completing the GAL4 questions.

**12. Would you like to provide input on another expression pattern-related tool: markers?**

Yes

No



## Markers

FlyBase is additionally considering options to improve searches for another expression pattern-related tool: markers. Markers are expression patterns that “mark” a specific tissue, cell, or GO subcellular component, and can be a *Drosophila* protein (usually detected by an antibody), a *Drosophila* transcript, or a transgenic insertion or construct. Some markers are very widely used in the published literature, for example, the transcript of *vasa*, as detected by in situ hybridization, is a marker for germline stem cells; and the protein product of the gene *dlg1*, as detected by a *dlg1* antibody, is a marker for the postsynaptic membrane of the neuromuscular junction. Markers can also involve expression patterns that are limited to a very specific cell or tissue type, and may have even been used to define the exact identity of the cell. For example, the transgenic construct P{Or43b-Mmus\Cd8a.GFP} is a marker for ‘adult olfactory receptor neuron *Or43b*’.

Marker data is found in the Expression Data section of a Gene, Insertion, or Recombinant Construct Report:

Expression Data		
Reporter Expression		
distribution deduced from reporter		
Stage	Tissue/Position (including subcellular localization)	Reference
P-stage	antennal lobe glomerulus DM5	(Sakurai et al., 2009)
	antennal lobe glomerulus VM2	(Sakurai et al., 2009)
adult stage	adult olfactory receptor neuron Or43b	(Couto et al., 2005)
	antennal basiconic sensillum ab8	(Couto et al., 2005)
Additional Information		
Statement	Reference	
Marker for	adult olfactory receptor neuron Or43b	(Couto et al., 2005)

FlyBase does not at present support searching for tissue/cell/GO subcellular component markers by FlyBase Anatomy CV or GO term.

### 13. Were you previously aware that FlyBase curates tissue markers?

- Yes, and I use that information
- Yes, but I didn't know what was meant by marker
- Yes, but I don't find that information useful
- No, I had not noticed this

14. Which of the following search options would you find useful (choose all that apply)

- An additional "Marker" annotation box on Fly Anatomy or GO Subcellular component term reports in the Vocabularies tool, similar to **PANEL A**.
- "Marker" tickbox on the QuickSearch Expression tab (**PANEL B**)
- A "Marker" option in the QuickSearch Expression tab Output Data Class menu (**PANEL C**)
- I don't want to search for tissue markers

**PANEL A**

Cell Lines 36	Insertions 351	Genes 290	Constructs 588	Images 3	Alleles 1026	Markers 8
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**PANEL B**

**QuickSearch**

Human Disease | **Expression** | GO | Phenotype | References

Simple | Orthologs | Protein Domains | Gene Groups | Data Class

Search literature-curated expression patterns:

Output Data Class

refine search by adding qualifier terms (such as 'ventral')

Stage:  e.g., third instar larval stage

Tissue:  e.g., neuron

Cell Loc.:  e.g., growth cone

Tissue or Subcellular Component Marker

RNA-Seq Expression Search/Browse:


Also see the [RNA-Seq overview page](#)


**PANEL C**

**QuickSearch**

Human Disease   **Expression**   GO   Phenotype   References

Simple   Orthologs   Protein Domains   Gene Groups   Data Class

Search literature-curated expression patterns: **Search** 

Output Data Class  


refine search by adding qualifier terms (such as 'ventral')

Stage:  e.g., third instar larval stage

Tissue:  e.g., neuron

Cell Loc.:  e.g., growth cone

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RNA-Seq Expression Search/Browse:  

Also see the [RNA-Seq overview page](#)

Pulldown menu

- Genes
- Binary drivers (GAL4, LexA, etc.)
- Reporters (lacZ, GFP, etc.)
- Tissue or Subcellular Component Marker



## Markers

FlyBase is also considering a tabulated list of tissue markers, similar to the GAL4 tabulated list described in Question 6.

### 15. Would you use this resource?

- Yes
- Maybe
- No

### 16. How extensive should this list be?

- It should include all identified markers
- It's more important to include the less common markers; everyone already knows the common ones
- It should include the 200 most commonly used markers
- It should include the \_\_\_ most commonly used markers (please specify the number)

**17. FlyBase curates gene- or transgene-based markers. Should this table include other kinds of markers, such as antibodies to antigens that aren't proteins (such as anti-HRP, which marks all neurons); Hoechst, which stains DNA; or TUNEL for apoptotic cells? Check all answers that apply**

- Yes, everyone uses them
- Yes, it seems odd to exclude them
- No, every pertinent protocol already documents them
- No, everyone uses them and already knows about them
- No, such reagents are out of FlyBase's purview

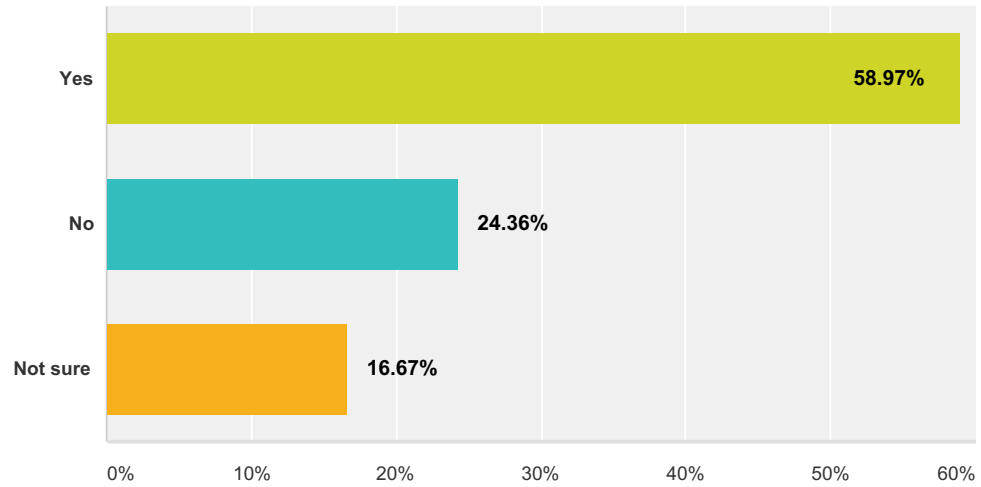


**GAL4 Search Improvements**

# Survey Answers

**Q1 Are you aware that expression data from the literature are captured using hierarchical controlled vocabularies (for developmental stage, tissue, subcellular localization)?**

Answered: 156 Skipped: 1

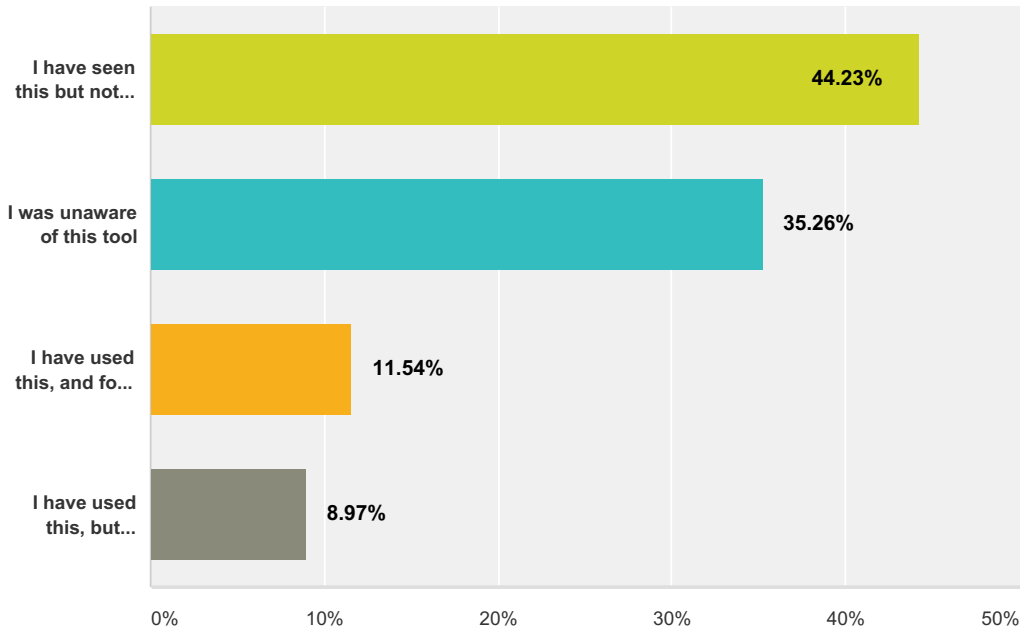


Answer Choices	Responses
Yes	58.97% 92
No	24.36% 38
Not sure	16.67% 26
<b>Total</b>	<b>156</b>



## Q2 QuickSearch Expression tab

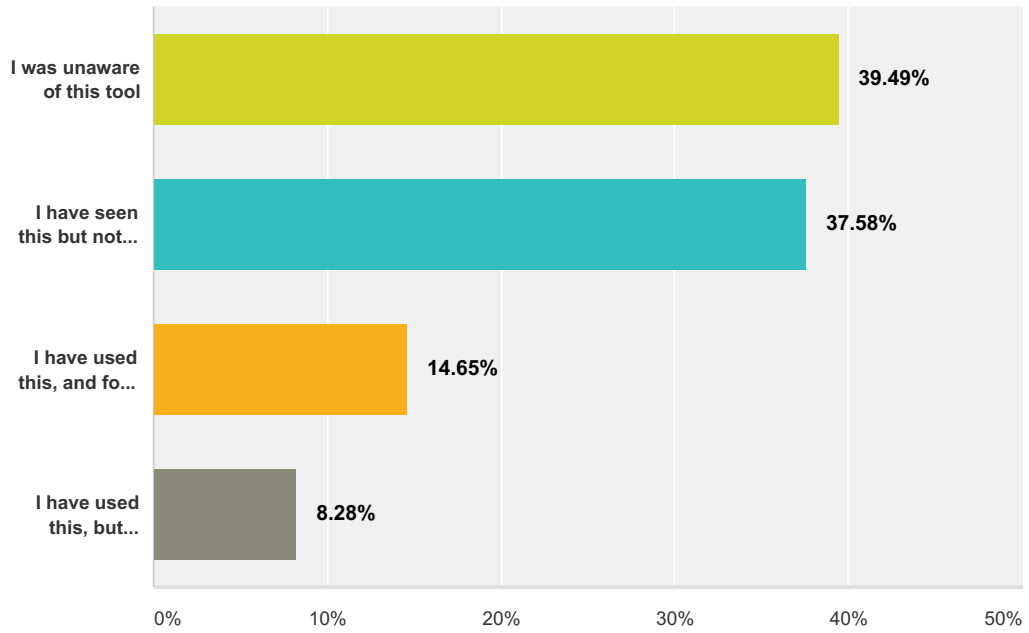
Answered: 156 Skipped: 1



Answer Choices	Responses	Count
I have seen this but not used this tool	44.23%	69
I was unaware of this tool	35.26%	55
I have used this, and found it useful	11.54%	18
I have used this, but couldn't find what I was looking for	8.97%	14
<b>Total</b>		<b>156</b>

### Q3 QueryBuilder Expression Pattern search

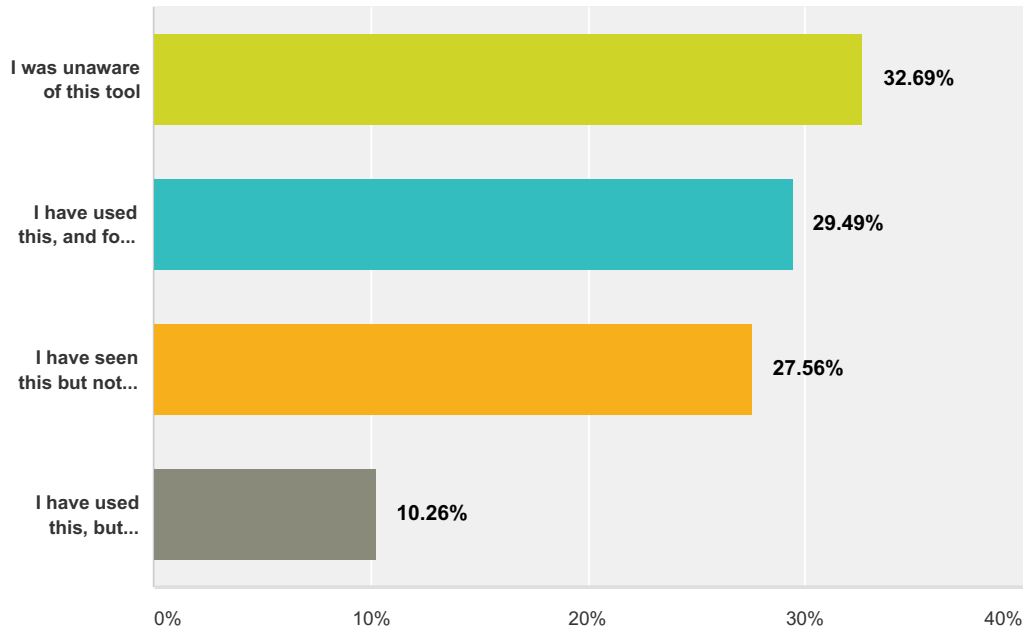
Answered: 157 Skipped: 0



Answer Choices	Responses
I was unaware of this tool	39.49% 62
I have seen this but not tried this	37.58% 59
I have used this, and found it useful	14.65% 23
I have used this, but couldn't find what I was looking for	8.28% 13
<b>Total</b>	<b>157</b>

### Q4 Vocabularies term reports

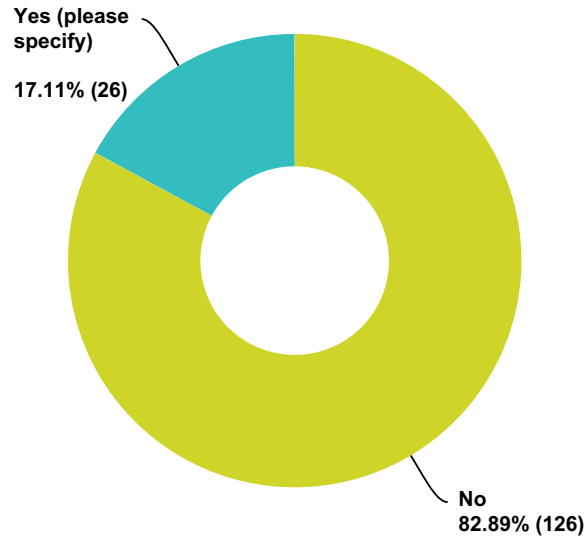
Answered: 156 Skipped: 1



Answer Choices	Responses	
I was unaware of this tool	32.69%	51
I have used this, and found it useful	29.49%	46
I have seen this but not tried this	27.56%	43
I have used this, but couldn't find what I was looking for	10.26%	16
<b>Total</b>		<b>156</b>

### Q5 Do you have any suggestions to make these tools more obvious to FlyBase users?

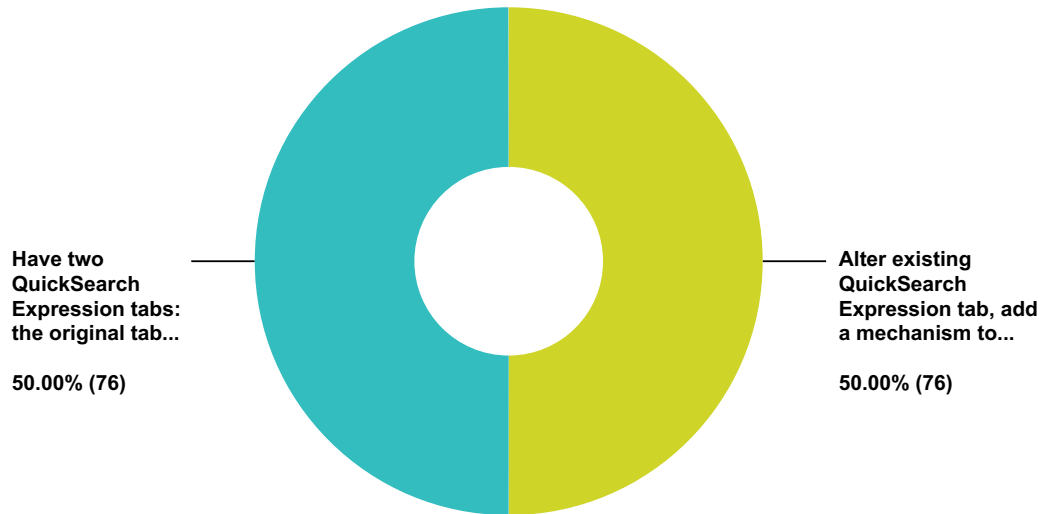
Answered: 152 Skipped: 5



Answer Choices	Responses	
No	82.89%	126
Yes (please specify)	17.11%	26
<b>Total</b>		<b>152</b>

**Q6 FlyBase plans to optimize the QuickSearch Expression search tool to support directly searching binary system drivers such as GAL4 or LexA, and non-binary transgenic reporters such as lacZ, GFP, or protein traps. We are considering a couple of options. One possibility is to modify the Expression tab to allow the user to select an output type, using a dropdown menu (as shown), radio buttons, or some other selection method. Alternatively, we could add a separate tab dedicated to expression searches of GAL4/binary drivers and transgenic reporters. Which of the following options would make the added functionality of this search most obvious (please note that the mockups shown below are suggestions of what the tool may look like, not a definitely final design)?**

Answered: 152 Skipped: 5

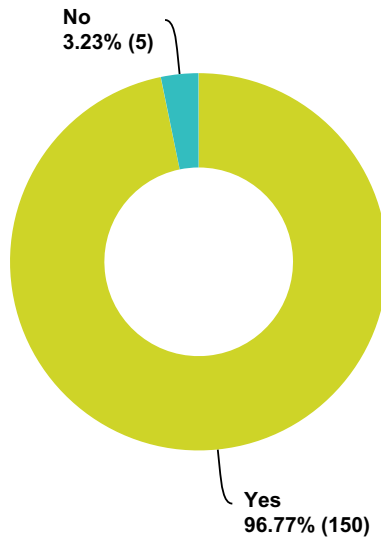


Answer Choices	Responses
Alter existing QuickSearch Expression tab, add a mechanism to select different output types (PANEL A)	50.00% 76
Have two QuickSearch Expression tabs: the original tab for gene expression searches, and a second tab for GAL4/binary drivers and transgenic reporters (PANEL B)	50.00% 76
<b>Total</b>	<b>152</b>



### Q7 Would you find a table like this useful?

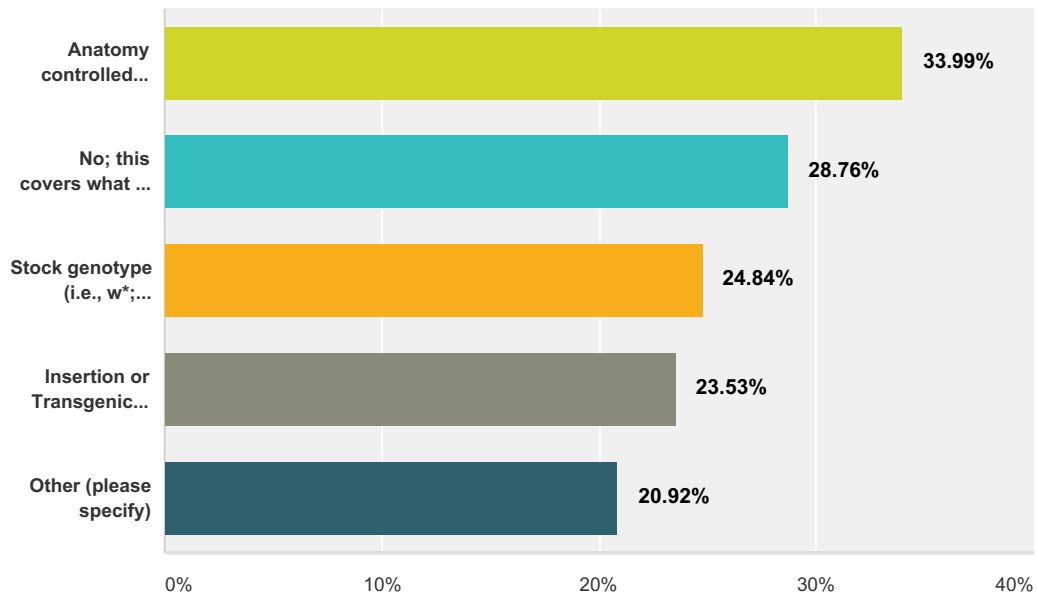
Answered: 155 Skipped: 2



Answer Choices	Responses	
Yes	96.77%	150
No	3.23%	5
<b>Total</b>		<b>155</b>

### Q8 Should we include additional columns? Check all that apply.

Answered: 153 Skipped: 4

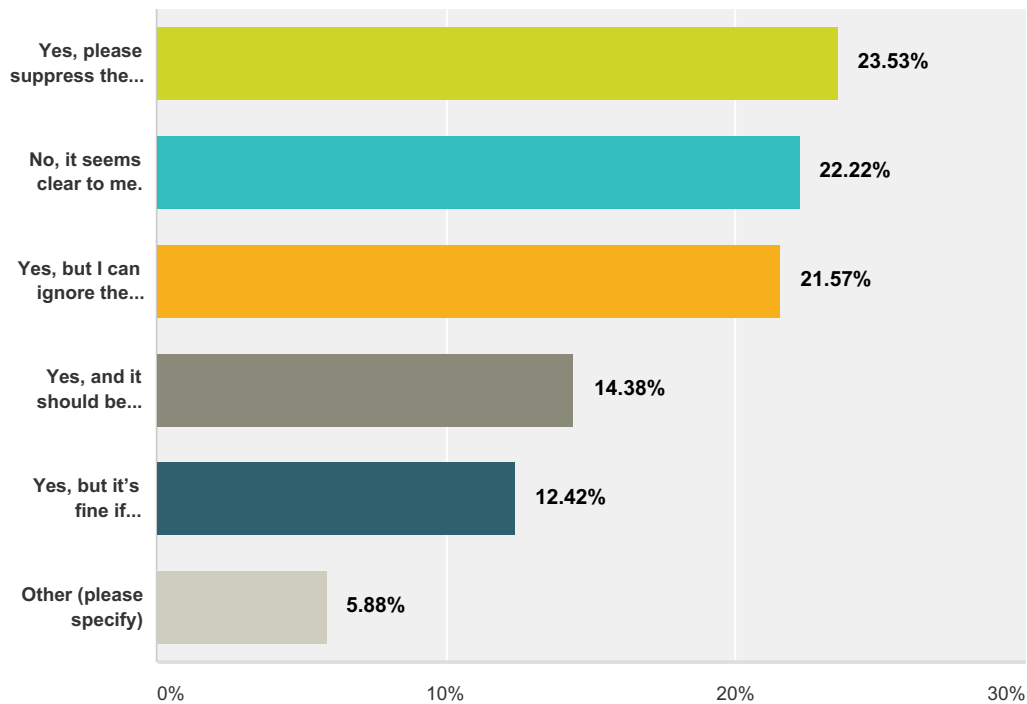


Answer Choices	Responses	
Anatomy controlled vocabulary (CV) terms (i.e., "nervous system" in addition to "pan-neuronal")	33.99%	52
No; this covers what I need	28.76%	44
Stock genotype (i.e., w*; P{w+mC=UAS-wah.HA}7; P{w+mW.hs=GawB}C57)	24.84%	38
Insertion or Transgenic Construct symbol (i.e., P{GawB}C57 or P{GMR-GAL4.Fa}	23.53%	36
Other (please specify)	20.92%	32
<b>Total Respondents: 153</b>		



**Q9 The “Scer” in the allele symbols is the species designation for *Saccharomyces cerevisiae*, the yeast species from which the GAL4 gene was cloned; we use a species designation for all genes from other species transgenically expressed in *Drosophila*. As a FlyBase user, do you find this confusing?**

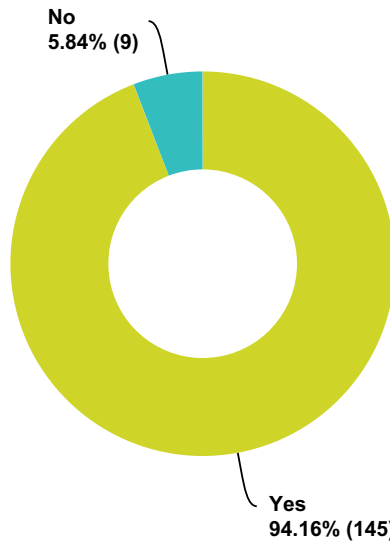
Answered: 153 Skipped: 4



Answer Choices	Responses
Yes, please suppress the “Scer” prefix in this table	23.53% 36
No, it seems clear to me.	22.22% 34
Yes, but I can ignore the “Scer” prefix if it is greyed-out (as in the symbol field of allele reports)	21.57% 33
Yes, and it should be suppressed everywhere except in the symbol field of the allele report	14.38% 22
Yes, but it's fine if greyed-out everywhere used	12.42% 19
Other (please specify)	5.88% 9
<b>Total</b>	<b>153</b>

### Q10 Would you like the columns of this table to be sortable?

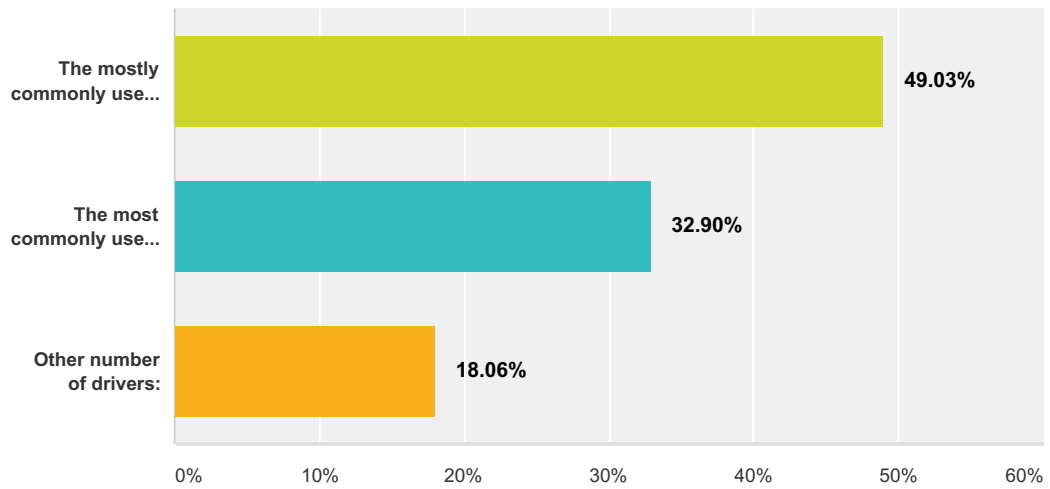
Answered: 154 Skipped: 3



Answer Choices	Responses	
Yes	94.16%	145
No	5.84%	9
<b>Total</b>		<b>154</b>

### Q11 How many GAL4 drivers should this table include?

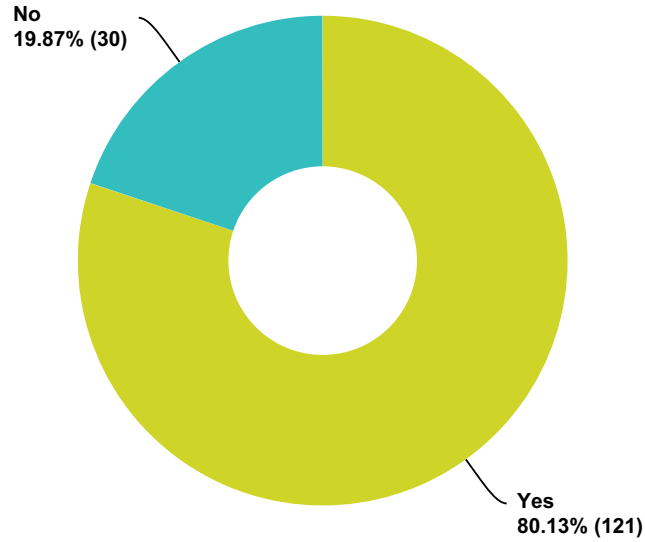
Answered: 155 Skipped: 2



Answer Choices	Responses	
The mostly commonly used 400 drivers	49.03%	76
The most commonly used 200 drivers	32.90%	51
Other number of drivers:	18.06%	28
<b>Total</b>		<b>155</b>

### Q12 Would you like to provide input on another expression pattern-related tool: markers?

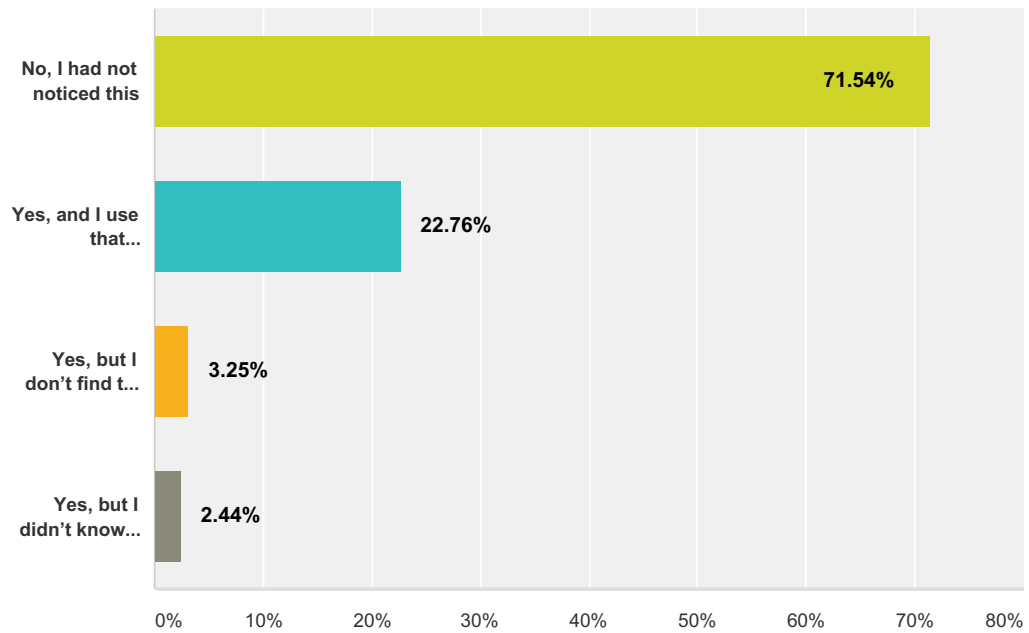
Answered: 151 Skipped: 6



Answer Choices	Responses	
Yes	80.13%	121
No	19.87%	30
<b>Total</b>		<b>151</b>

### Q13 Were you previously aware that FlyBase curates tissue markers?

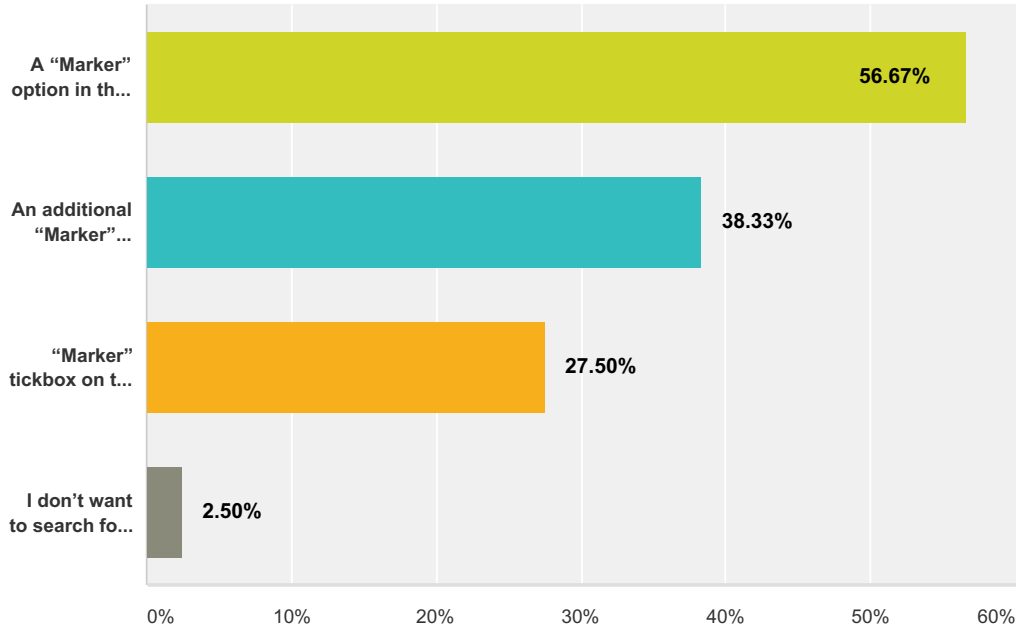
Answered: 123 Skipped: 34



Answer Choices	Responses	Count
No, I had not noticed this	71.54%	88
Yes, and I use that information	22.76%	28
Yes, but I don't find that information useful	3.25%	4
Yes, but I didn't know what was meant by marker	2.44%	3
<b>Total</b>		<b>123</b>

### Q14 Which of the following search options would you find useful (choose all that apply)

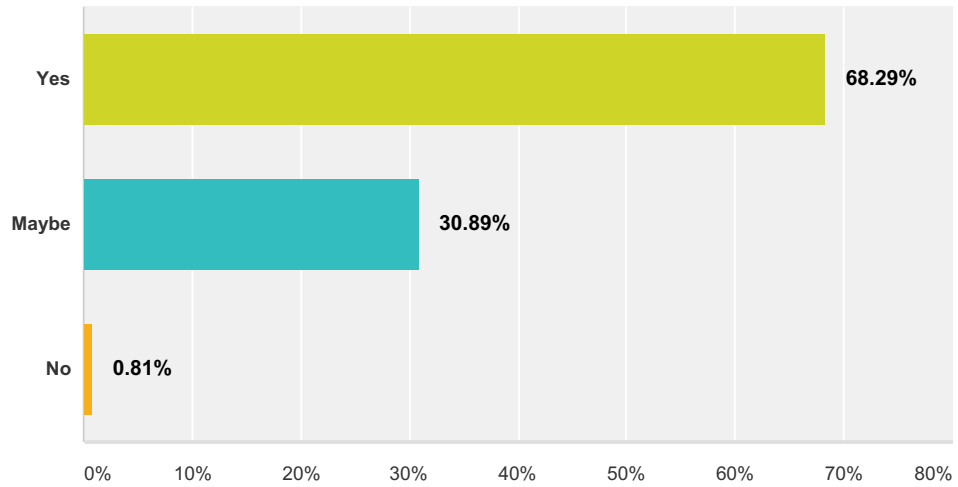
Answered: 120 Skipped: 37



Answer Choices	Responses
A "Marker" option in the QuickSearch Expression tab Output Data Class menu (PANEL C)	56.67% 68
An additional "Marker" annotation box on Fly Anatomy or GO Subcellular component term reports in the Vocabularies tool, similar to PANEL A.	38.33% 46
"Marker" tickbox on the QuickSearch Expression tab (PANEL B)	27.50% 33
I don't want to search for tissue markers	2.50% 3
<b>Total Respondents: 120</b>	

### Q15 Would you use this resource?

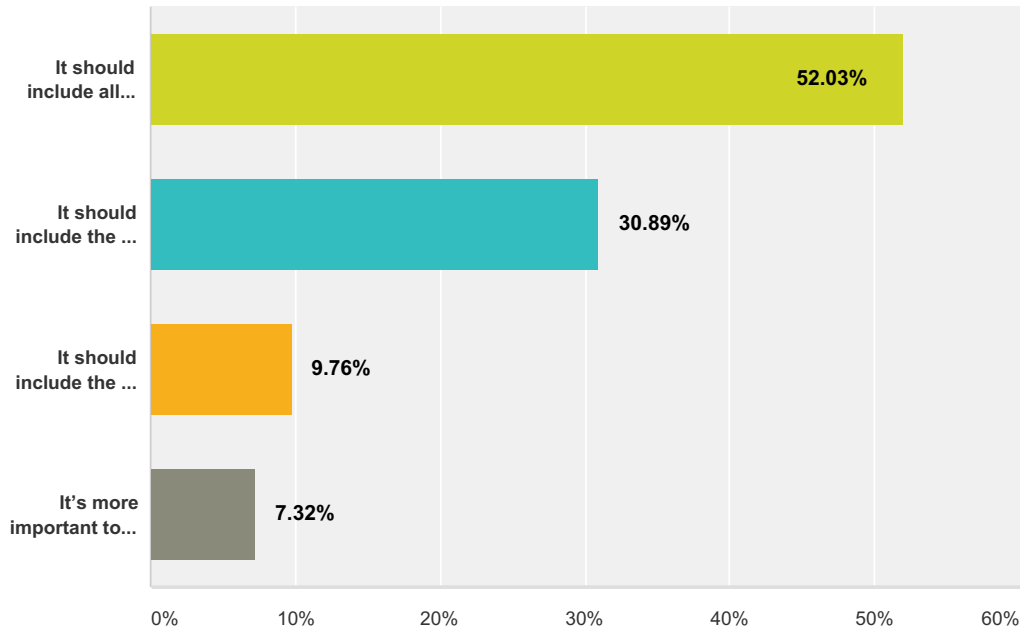
Answered: 123 Skipped: 34



Answer Choices	Responses	Count
Yes	68.29%	84
Maybe	30.89%	38
No	0.81%	1
<b>Total</b>		<b>123</b>

### Q16 How extensive should this list be?

Answered: 123 Skipped: 34

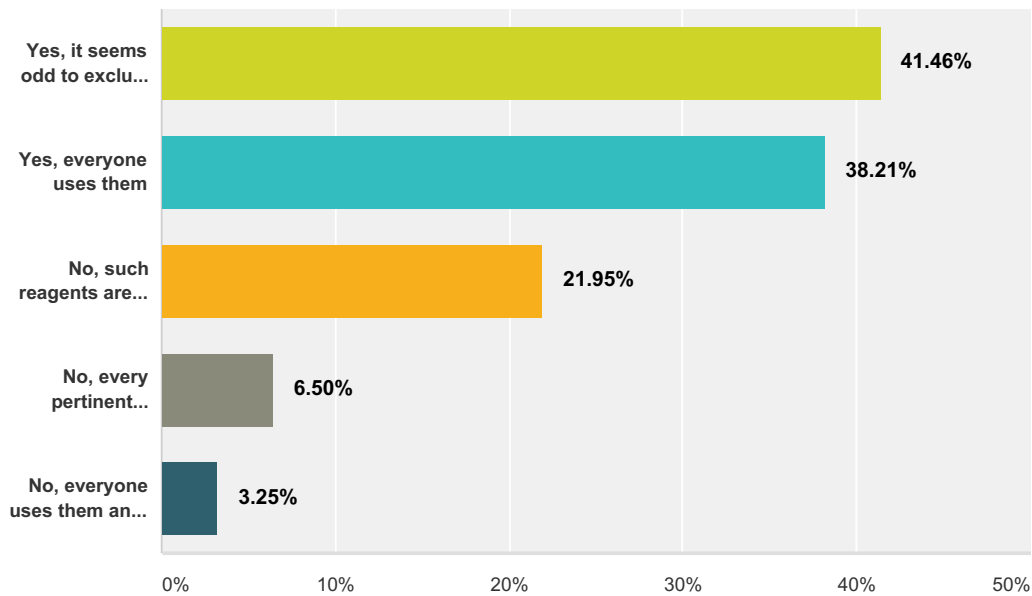


Answer Choices	Responses	
It should include all identified markers	52.03%	64
It should include the 200 most commonly used markers	30.89%	38
It should include the ___ most commonly used markers (please specify the number)	9.76%	12
It's more important to include the less common markers; everyone already knows the common ones	7.32%	9
<b>Total</b>		<b>123</b>



**Q17 FlyBase curates gene- or transgene-based markers. Should this table include other kinds of markers, such as antibodies to antigens that aren't proteins (such as anti-HRP, which marks all neurons); Hoechst, which stains DNA; or TUNEL for apoptotic cells? Check all answers that apply**

Answered: 123 Skipped: 34



Answer Choices	Responses
Yes, it seems odd to exclude them	41.46% 51
Yes, everyone uses them	38.21% 47
No, such reagents are out of FlyBase's purview	21.95% 27
No, every pertinent protocol already documents them	6.50% 8
No, everyone uses them and already knows about them	3.25% 4
<b>Total Respondents: 123</b>	