Data Integration

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Towards a vision of meaningful integration

- Visualize the database network.
- Stimulate thoughts about scientific questions.
- “Gap analysis”:
  - Find fruitful questions & hypotheses.
  - What gaps in the database network should be filled, to maximize the # of important questions made answerable?

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Comparisons/Integration

- Goal: focus on inter-spoke integration

Comparison type	Mapping type	Resource (examples)
Time to time	Anatomic site	Imaging Expression Data
Location to location	Adjacency	Ontology-dependent
Species to species	Anatomic site	Ontology-dependent
	Genetic homology	HomoloGene
	Developmental stage	Carnegie Stage
Platform to platform	Semantic identifier map	DAVID, Enfin, ...

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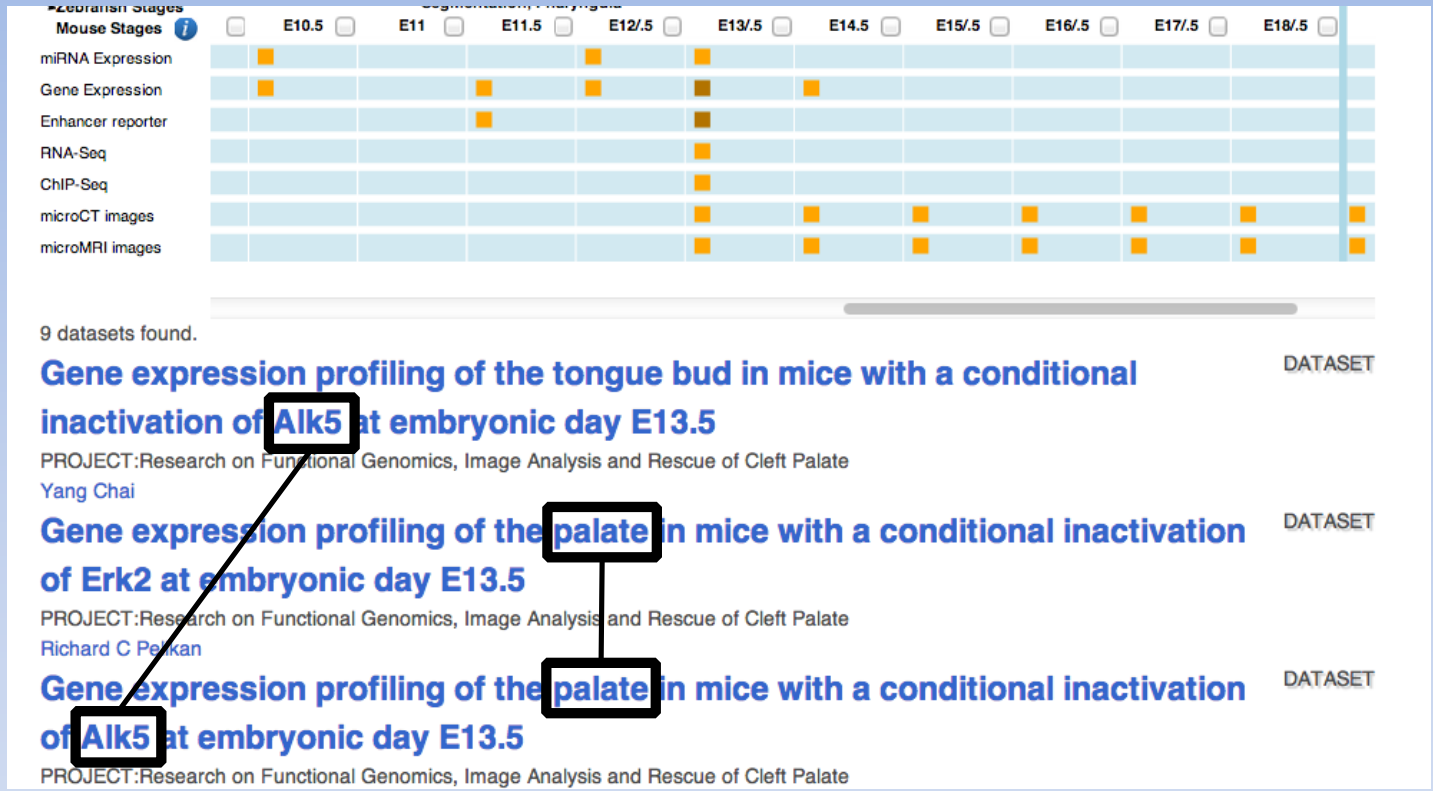
Dataset Timeline



Opportunities to merge data on both stage and anatomic site?

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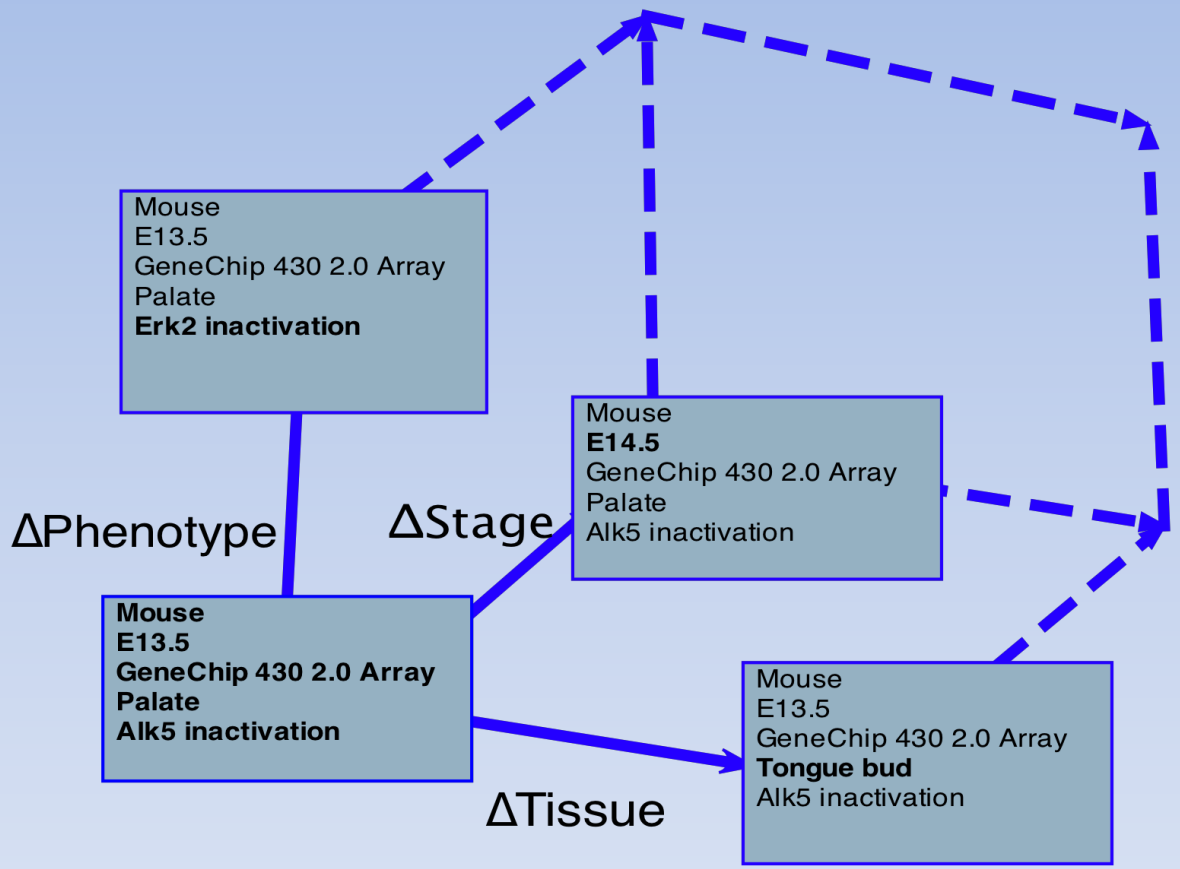
Dataset Network



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Inter-spoke opportunities – Mouse

		E9.5	E10.5	E11.5	E12.5	E13.5	E14.5
1							
2	Mandibular Arch			Alk5			
3	Olfactory Placode						
4	Olfactory Pit						
5	Facial Mesenchyme						
6	Otic Vesicle						
7	Rathke Pouch						
8	Maxillary Arch						
9	Medial-nasal Process						
10	medial-nasal eminence						
11	Lateral-nasal process						
12	Lateral-nasal eminence						
13	Medial neuroepithelium						
14	Epithelial						
15	Neuroepithelium						
16	Manidble				Erk2	miRNA	
17	Tongue Bud					Alk5	
18	Tongue					Tgfbr2,Erk2	Tgfbr2
19	Tongue Primordium					Tgfbr, Smad4	
20	Palate					Alk5,Erk2,Tgfbr2	Erk2,Tgfbr2, Tgfbr2 and haploinsufficency of Alk5
21						p300 ChiP-Seq, RNA-Seq	
22	Medial-Edge Epithelium						Tgfbr2
23	Palate and Mandible						Mdx1-/-
24	Maxilla		miRNA	miRNA	miRNA	RNA-Seq	miRNA
25	Front-nasal prominence		miRNA	miRNA	miRNA		
26	Fronto-nasal process					RNA-Seq	
27	Palatal Shelves				miRNA	RNA-Seq	miRNA
28							

PotterMicroarray

Chai Microarray, with gene

Visel, ChIP-Seq, RNA-Seq

Clouthier miRNA, RNA-Seq

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One cross-spoke integration possibility

	E13.5	
	Microarray	**Other**
Palate	STRAINS: **Control**, Alk5, Erk2, Tgfbr2,	STRAIN: **Control,** p300 ChiP-Seq, RNA-Seq

But – different background – C57BL6J vs. CD-1

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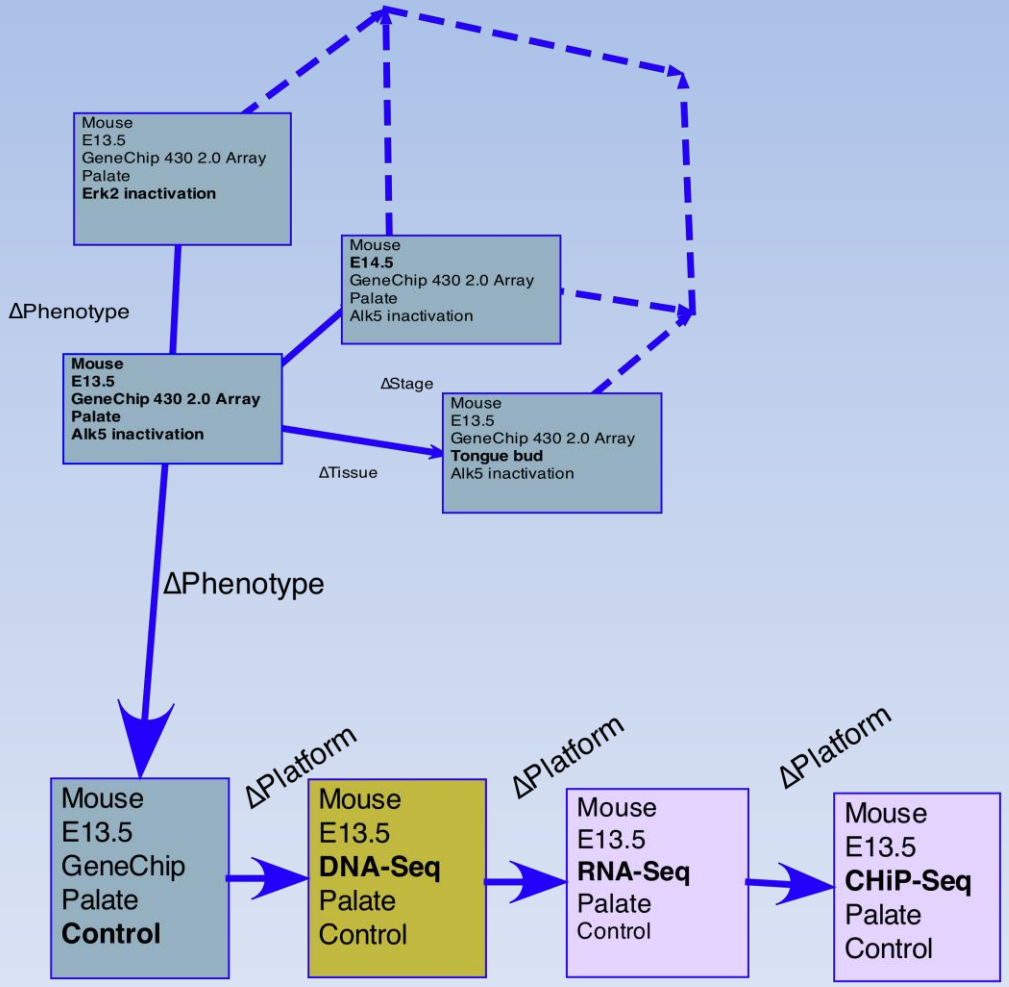
Possible Integrations



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Other inter-spoke opportunities?

		E9.5	E10.5	E11.5	E12.5	E13.5	E14.5
1							
2	Mandibular Arch			Alk5			
3	Olfactory Placode						
4	Olfactory Pit						
5	Facial Mesenchyme						
6	Otic Vesicle						
7	Rathke Pouch						
8	Maxillary Arch						
9	Medial-nasal Process						
10	medial-nasal eminence						
11	Lateral-nasal process						
12	Lateral-nasal eminence						
13	Medial neuroepithelium						
14	Epithelial						
15	Neuroepithelium						
16	Manidble				Erk2	miRNA	
17	Tongue Bud					Alk5	
18	Tongue					Tgfbr2,Erk2	fbr2
19	Tongue Primordium					Tgfbr, Smad4	
20	Palate					Alk5,Erk2,Tg br2	2,Tgfbr2, fbr2 and ploinsufficency f Alk5
21						p300 ChiP-S RNA-Seq	
22	Medial-Edge Epithelium						Tgfbr2
23	Palate and Mandible						Mdx1-/-
24	Maxilla		miRNA	miRNA	miRNA	RNA-Seq	miRNA
25	Front-nasal prominence		miRNA	miRNA	miRNA		
26	Fronto-nasal process					RNA-Seq	
27	Palatal Shelves				miRNA	RNA-Seq	miRNA
28							

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CoGENE Data – Human Craniofacial Development (M. Lovett)

Tissue/Timepoint	26 days (E10-10.5)	4 weeks (E10.5)	5 weeks (E11.5)	6 weeks (E13)	8.5 weeks (E16)
1st pharangeal arch		■	■		
2nd pharangeal arch		■	■		
3rd (& 4th) pharangeal arch		■	■		
anterior rhombomere		■	■		
anterior tongue					■
dental lamina					■
frontal nasal prominence		■	■		
lateral nasal prominence				■	
lower lip					■
mandible				■	■
maxilla				■	
medial nasal prominence				■	
palatal shelf					■
posterior rhombomere		■	■		
posterior tongue					■
salivary gland					■
upper lip					■
whole embryo	■	■			

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Beyond Expression and SEQ data

- What can we do to integrate image data?
- Currently looking at revising image datasets to include metadata and source data suitable for quantitative analysis
- Can we tie the quantification or localization to expression data?
- Morphometrics?
- Integrating across organisms? Human <-> Mouse <-> Fish

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Beyond Datasets

- Goal: revise dataset model to expose details more clearly
- Show individual files, support “shopping cart” download via alternative search approaches
- Use OCDM to make connections

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Issues

- Need collaboration between spokes and hub to do this well.
- Is integration static or dynamic?
- What are the scientific questions of interest?

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