Discovery of the Archaea

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10/25/2017

Bio590S

Phylogenetic Trees

http://www.pbs.org/wgbh/nova/labs/lab/evolution/research#/evo/deeptree

Building Phylogenetic Trees

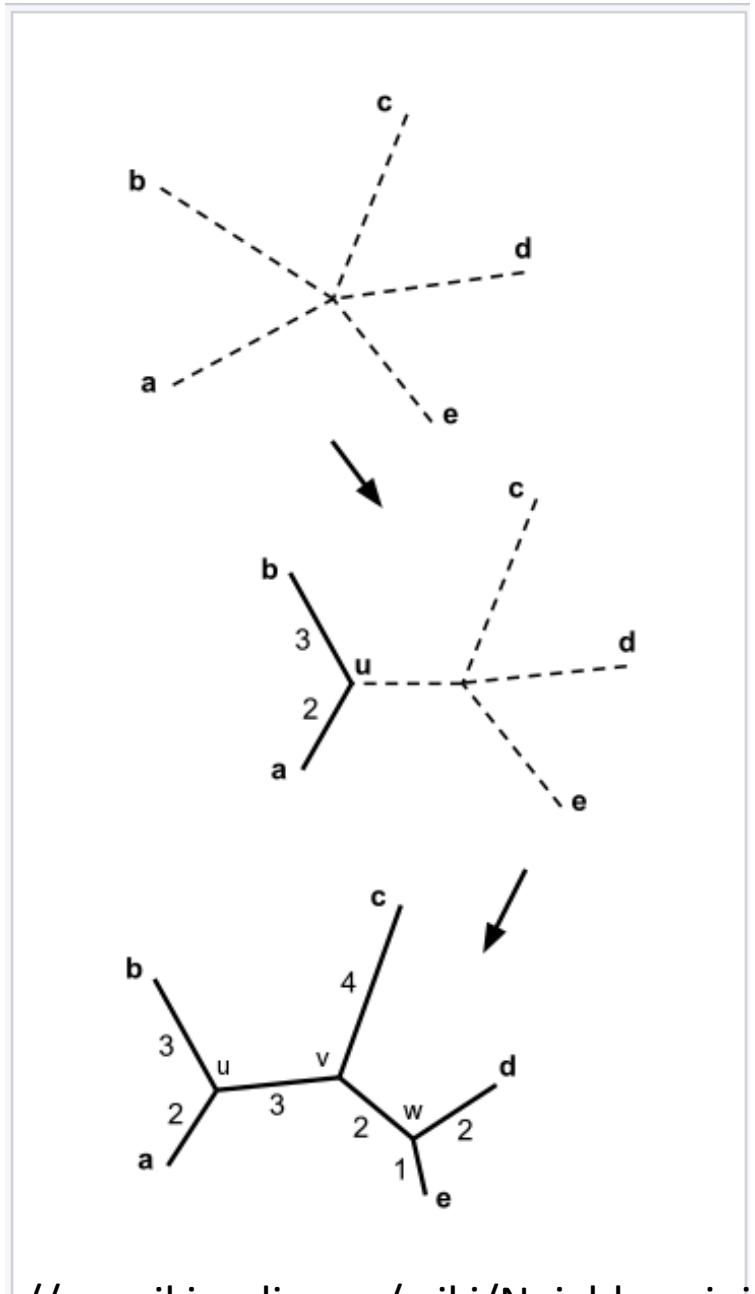
- Distance methods

Building Phylogenetic Trees

- Distance methods
  - Rooted vs unrooted

Building Phylogenetic Trees

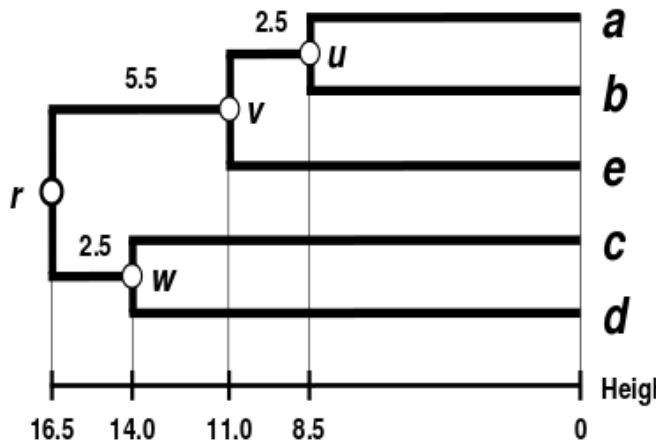
- Distance methods
  - Rooted vs unrooted
  - Neighbor joining



https://en.wikipedia.org/wiki/Neighbor_joining

Building Phylogenetic Trees

- Distance methods
  - Rooted vs unrooted
  - Neighbor joining
  - Unweighted pair group method with arithmetic mean (UPGMA)



	a	b	c	d	e
a	0	17	21	31	23
b	17	0	30	34	21
c	21	30	0	28	39
d	31	34	28	0	43
e	23	21	39	43	0

	(a,b)	c	d	e
(a,b)	0	**25.5**	**32.5**	**22**
c	**25.5**	0	*28*	*39*
d	**32.5**	*28*	0	*43*
e	**22**	*39*	*43*	0

	((a,b),e)	c	d
((a,b),e)	0	**30**	**36**
c	**30**	0	*28*
d	**36**	*28*	0

	((a,b),e)	(c,d)
((a,b),e)	0	**33**
(c,d)	**33**	0

https://en.wikipedia.org/wiki/UPGMA

Building Phylogenetic Trees

- Distance methods
  - Rooted vs unrooted
  - Neighbor joining
  - Unweighted pair group method with arithmetic mean (UPGMA)
- Maximum parsimony

Building Phylogenetic Trees

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Building Phylogenetic Trees

- Distance methods
  - Rooted vs unrooted
  - Neighbor joining
  - Unweighted pair group method with arithmetic mean (UPGMA)
- Maximum parsimony
- Maximum likelihood
- Bayesian inference

Build a tree

- What type of information do you need?

Build a tree

- What type of information do you need?
  - Physical characteristics and traits

Build a tree

- What type of information do you need?
  - Physical characteristics and traits
  - Molecular data

Build a tree

- What type of information do you need?
  - Physical characteristics and traits
  - Molecular data
    - rRNA
    - DNA

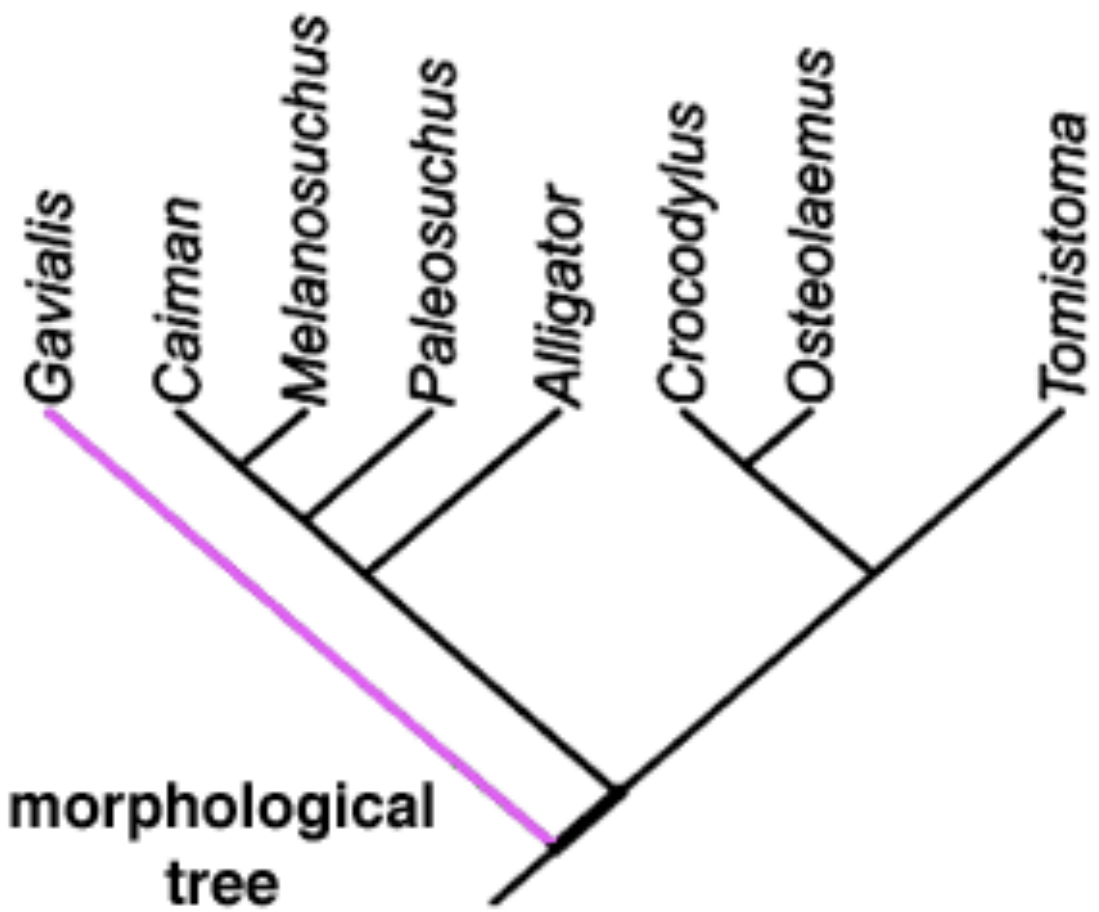
Build a tree

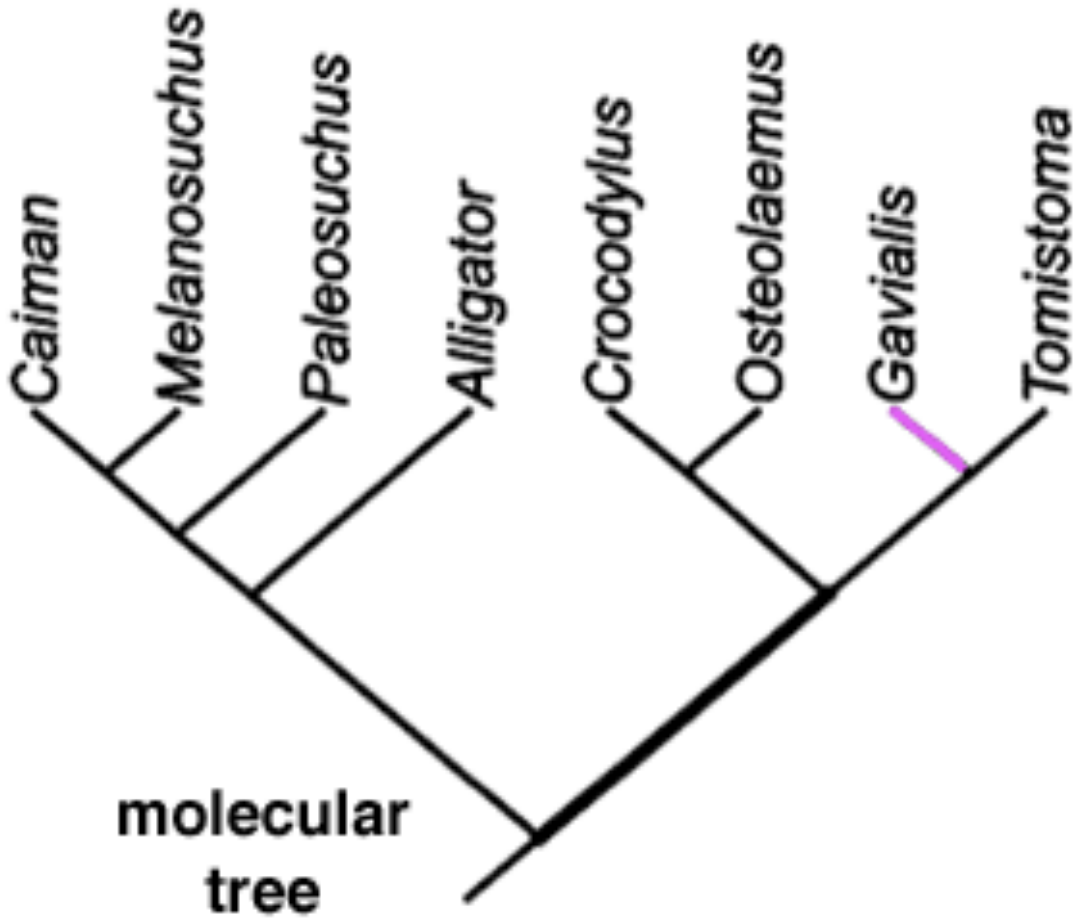
- What type of information do you need?
  - Physical characteristics and traits
  - Molecular data
    - rRNA
    - DNA
  - Molecular clock

Build a tree

- What type of information do you need?
- What do you do if your information conflicts?

Phylogenetic Incongruence





http://www.talkorigins.org/faqs/comdesc/incongruent.html

Build a tree

- What type of information do you need?
- What do you do if your information conflicts?
- How do you have confidence that your tree is correct?

Build a tree

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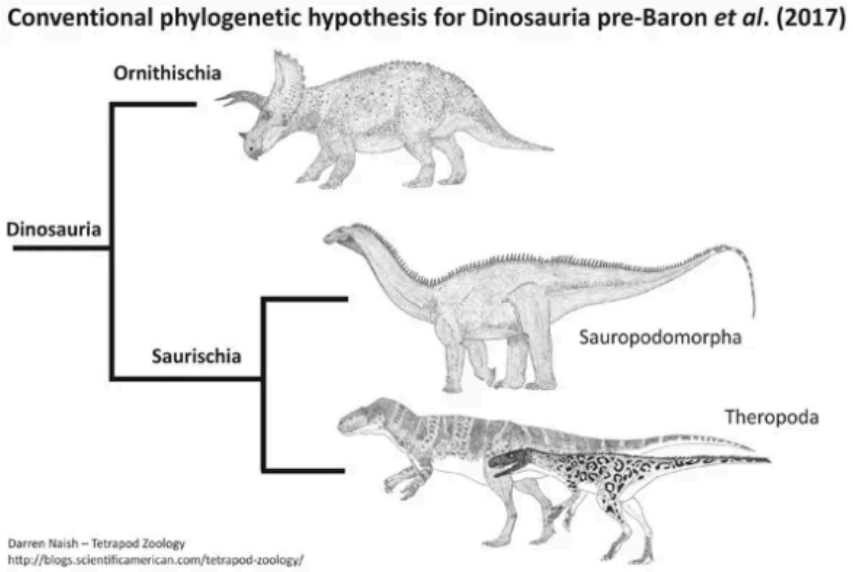
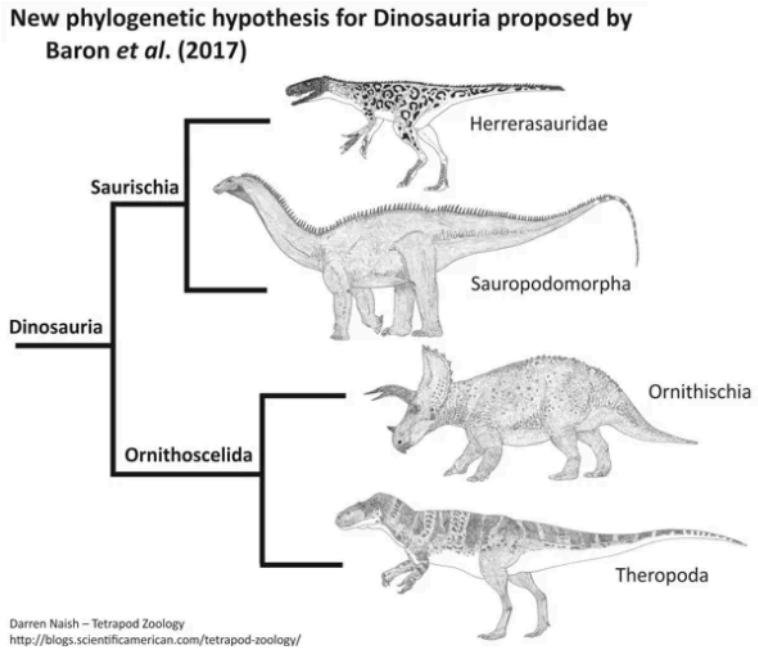
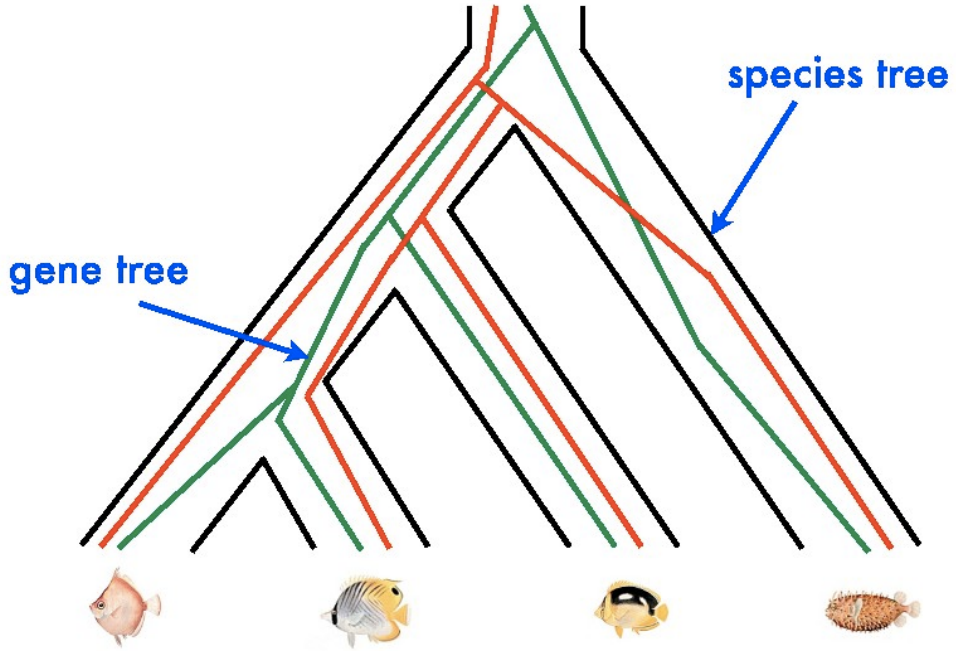




The Baron *et al.* (2017) hypothesis. Credit: Darren Naish

Build a tree

- What type of information do you need?
- What do you do if your information conflicts?
- How do you have confidence that your tree is correct?
- Gene trees vs Species trees



https://biology.stackexchange.com/questions/53141/what-is-the-difference-between-a-species-tree-a-gene-tree-and-a-phylogenetic-tr

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- http://www.pbs.org/wgbh/nova/labs/lab/evolution/research#/evo/buildatree/6
- https://www.khanacademy.org/science/biology/her/tree-of-life/a/building-an-evolutionary-tree