

Crisis in theoretical systematics

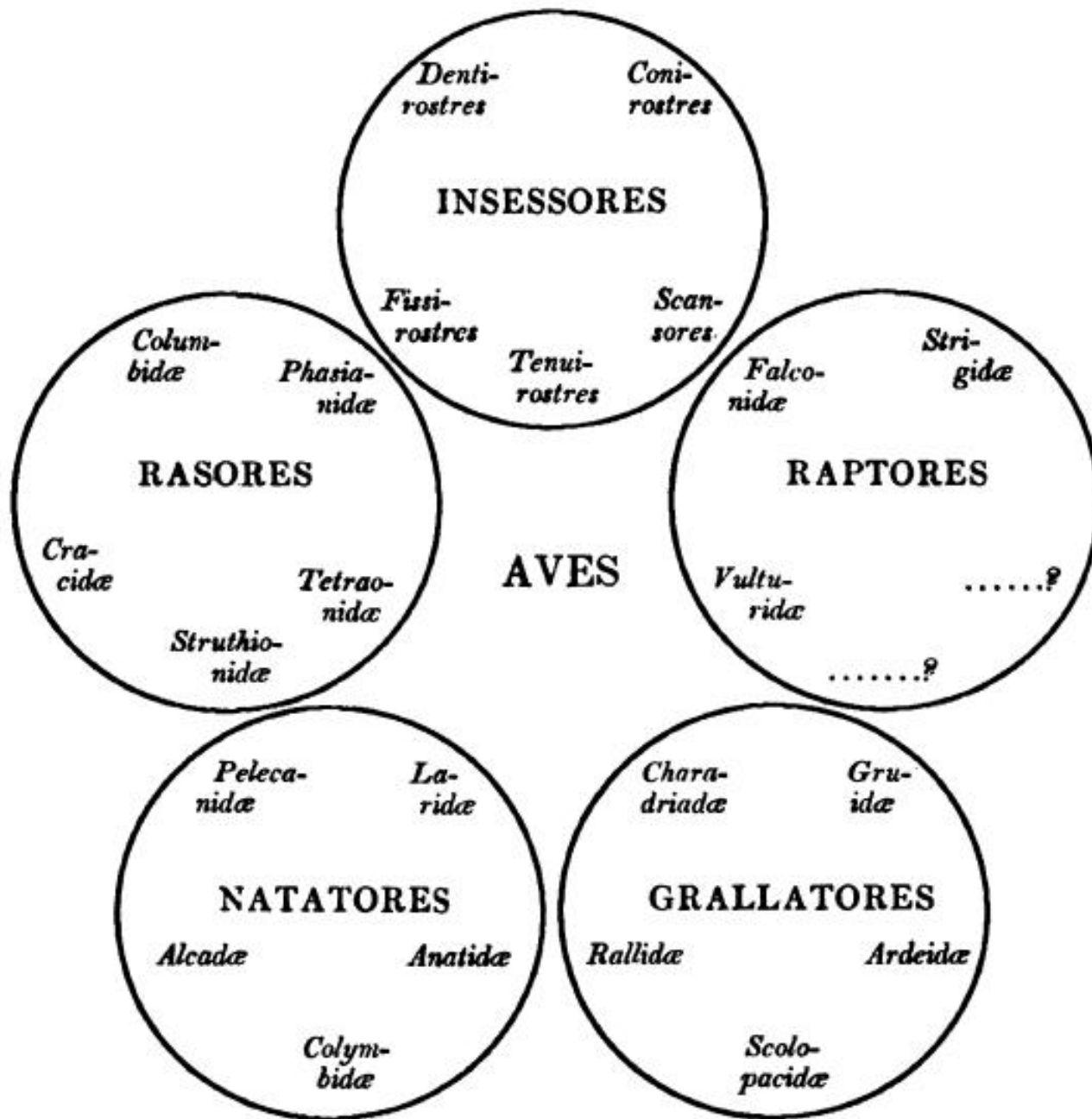
What is the source of the similarities between organisms?

1. As the number of described species increased, *essential* characters (or sets of characters) were abandoned – move to similarity over finding *the essential* characters.
2. Evolution was supported by some (Saint-Hillaire and Lamarck), but a compelling mechanism was lacking.
3. Buffon, Cuvier, and Agassiz were vigorous opponents of evolution – but they could not provide good explanations for the pattern to the diversity of life.

Scala Natura

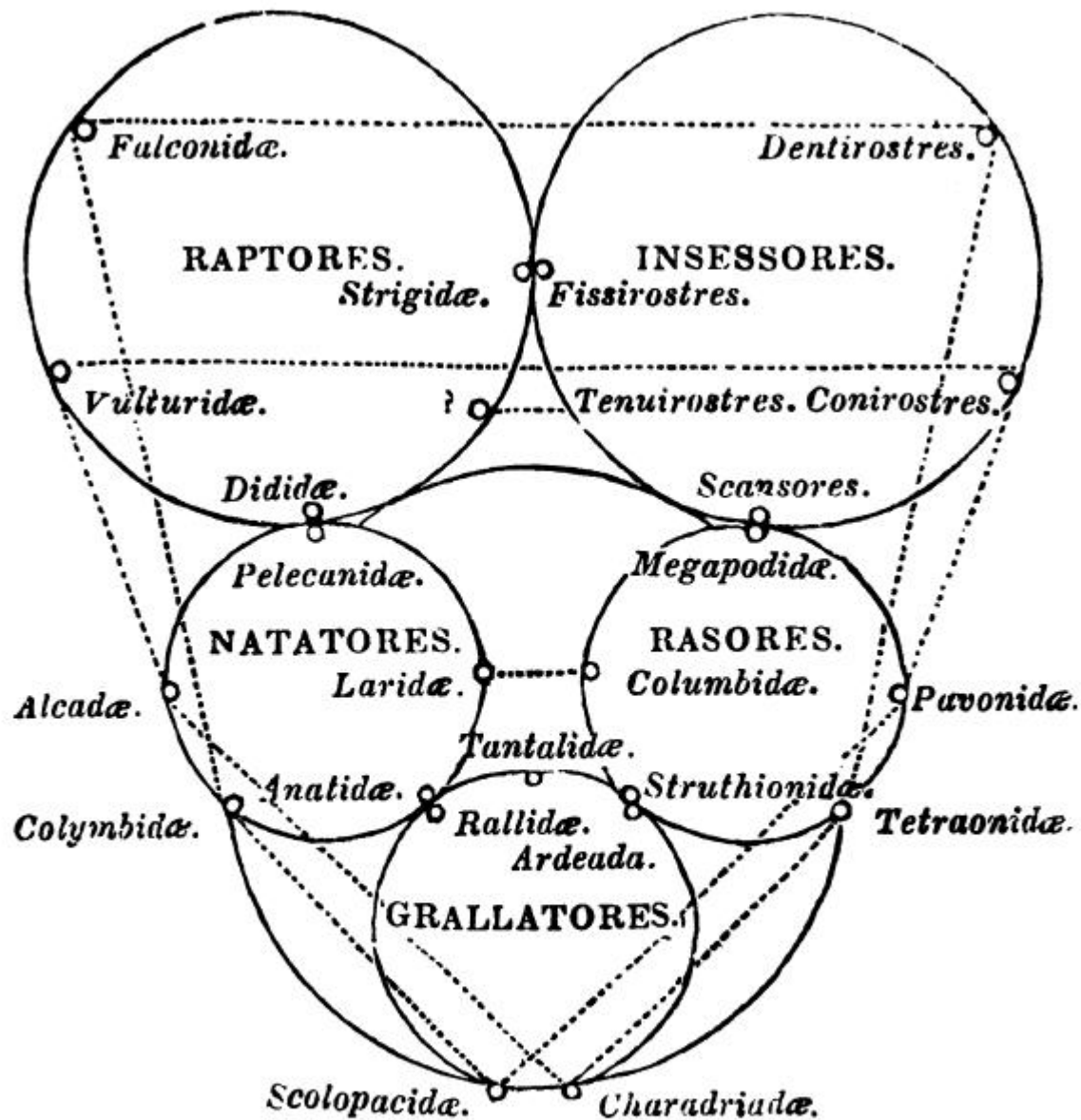
1. Another unfortunate part of Aristotle's legacy to systematics (he believed in it, but probably did not invent it).
2. "naturalness" and "relatedness" reflected the thought patterns of God during the creation. Affinity was "direct result of those laws of organic life which the Creator enacted for his own guidance in the Act of Creation" (Strickland 1846 p356 quoted by [Mayr and Ashlock, 1991](#)).
3. The idea that natural diversity reflected a progression from most imperfect (inorganic molecular) to most perfect (man) on to angels and to God.
4. In biology, this became untenable fairly early (particularity in botany where we can't use similarity to humans).
5. Nevertheless, is deeply embedded in popular conceptions of natural diversity ("lower vertebrates").





Quinarian arrangement of Vigors (1824). Question marks indicate taxa that were yet to be identified.

image from <http://en.wikipedia.org/wiki/Quinarian>



Affinities and analogies among the groups according to Swainson. The circles touch with groups on them having "affinities", but the lines connect groups that showed "analogies".

Analogies of the Five Orders of the Ptilota.

Orders of the <i>Ptilota.</i>	<i>Analogies.</i>	Classes of the <i>Vertebrata.</i>
LEPIDOPTERA.	Wings highly developed.	BIRDS.
HEMIPTERA.	Wings imperfect, or none.	QUADRUPEDS.
HYMENOPTERA.	Tail often armed with a sting.	REPTILES.
COLEOPTERA.	{ Most imperfect of their respective } circles.	AMPHIBIANS.
NEUROPTERA.		Pre-eminently aquatic.

from William Swainson's 1840 book:

"On the history and natural arrangement of insects"

image from <http://en.wikipedia.org/wiki/Quinarian>

The impact of the recognizing evolution on systematics

1. Genealogical relationships between species could serve as the basis for taxonomy
2. Two sources of similarity:
 - (a) similarity from descent
 - (b) similarity caused by convergence (driven by natural selection for the same function).

Phylogeny as the basis of Taxonomy

Before the acceptance of evolutionary theory, “related” and “naturalness” were used with a variety of meanings.

After Darwin “genealogically related” when we say “related” and we could *define* “naturalness” of taxa by whether or not they recognize clades.

clade – a branch of a phylogenetic tree including an ancestral species and *all* of its descendants.

monophyletic – the adjective form (from the Greek words “mono” for one and “phylon” for race, class or tribe). A clade is a monophyletic group.

References

Mayr, E. and Ashlock, P. D. (1991). *Principles of Systematics Zoology*. McGraw-Hill, New York, 2nd edition.