The Mystery of the Triceratops's Mother

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Paleontological Practice

Paleontological investigation is *indifferent* to species concepts.

Species Debate

Naturalized Metaphysics

Plan

- Conceptual Pluralism: A Primer
- The Mystery of the Triceratops's Mother
- 'Indifference'
- Indifference → Realism
- 3 Objections

Conceptual Pluralism: A Primer

For some *category*…

Conceptual Pluralism: A Primer

For some *category*…

There are at least two *concepts*…

Conceptual Pluralism: A Primer

For some *category*…

There are at least two *concepts*…

Which are:

(a) non-equivalent,

and

(b) ineliminable,

(c) *qua* some *legitimate* research program(s).

Conceptual Pluralism: A Primer

For some category, there are at least two non-equivalent concepts which are ineliminable *qua* some legitimate research programs.

Biological Species Concept: organism *a* and organism *b* are part of species *S* just in case *a* and *b* are parts of the same *interbreeding population, S**.

Phylogenetic Species Concept: organism *a* and organism *b* are part of species *S* just in case *a* and *b* are parts of the same species-level *lineage, S***.

Conceptual Pluralism: A Primer

For some category, there are at least two **non-equivalent** concepts which are ineliminable *qua* some legitimate research programs.

Biological Species Concept

Phylogenetic Species Concept

Conceptual Pluralism: A Primer

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Biological Species Concept

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Conceptual Pluralism: A Primer

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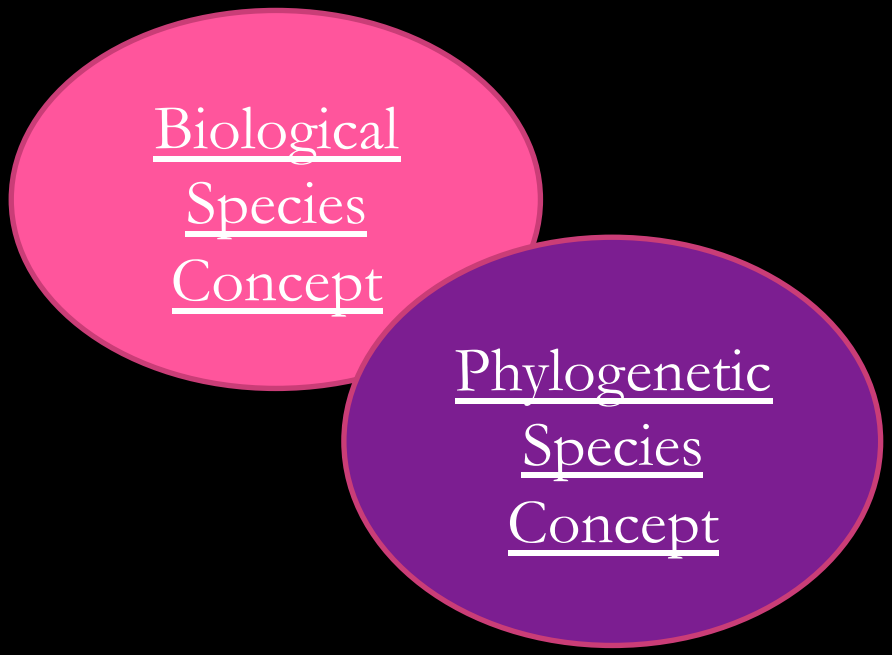
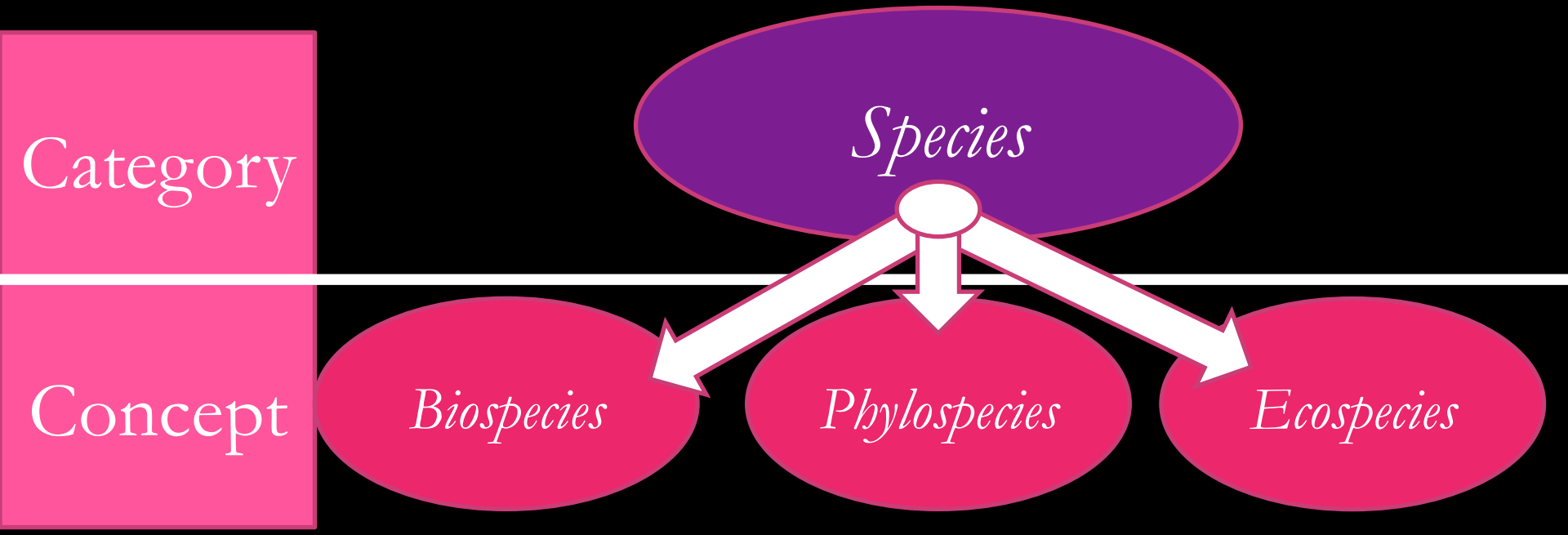


Conceptual Pluralism: A Primer

Category Realism + Conceptual Pluralism?



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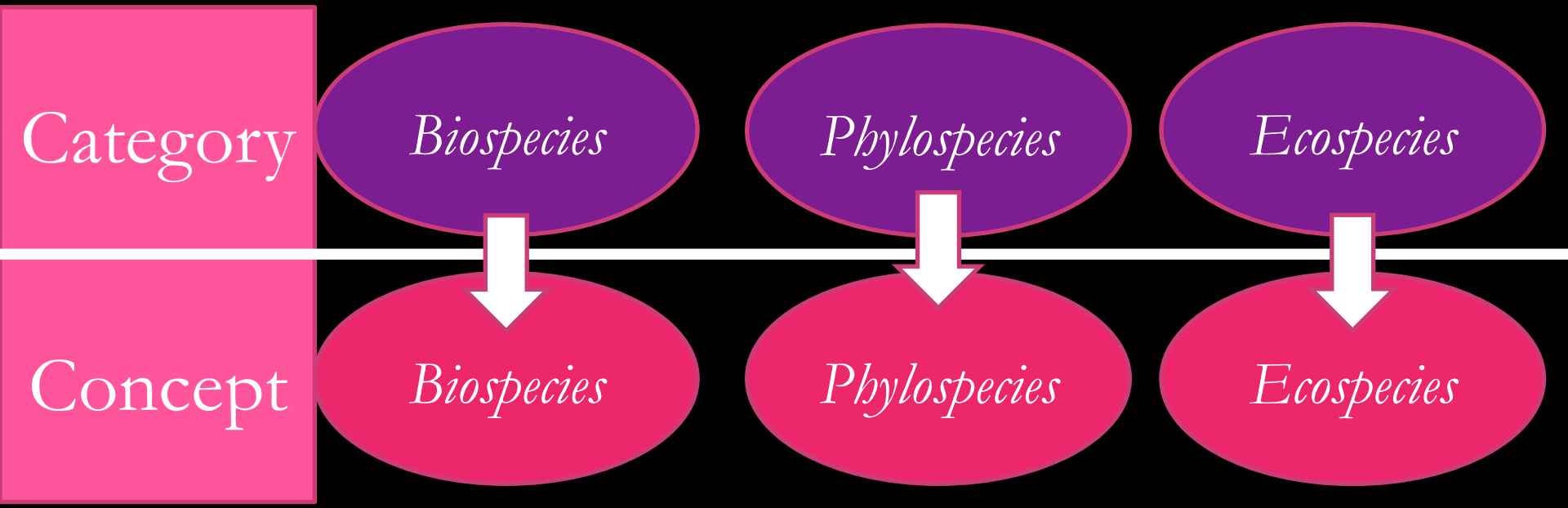

Conceptual Pluralism: A Primer

Category Realism + Conceptual Pluralism?

… contemporary biological theory provides ample evidence that the tree of life is segmented by biological forces into different types of species taxa. Consequently, there is no single unitary species category, but a heterogeneous collection of base taxa referred to by the term 'species'. (Ereshefsky 1998)

Conceptual Pluralism: A Primer

- A *conceptual pluralist* believes there are multiple concepts pertaining to some category or kind.
- Part of the justification is from *naturalized metaphysics*: concepts are vindicated via their ineliminable role in a legitimate research program.
- There is a tension between *conceptual pluralism* and *category realism*: if categories are *disunified*, what grounds could there be for realism about said category?

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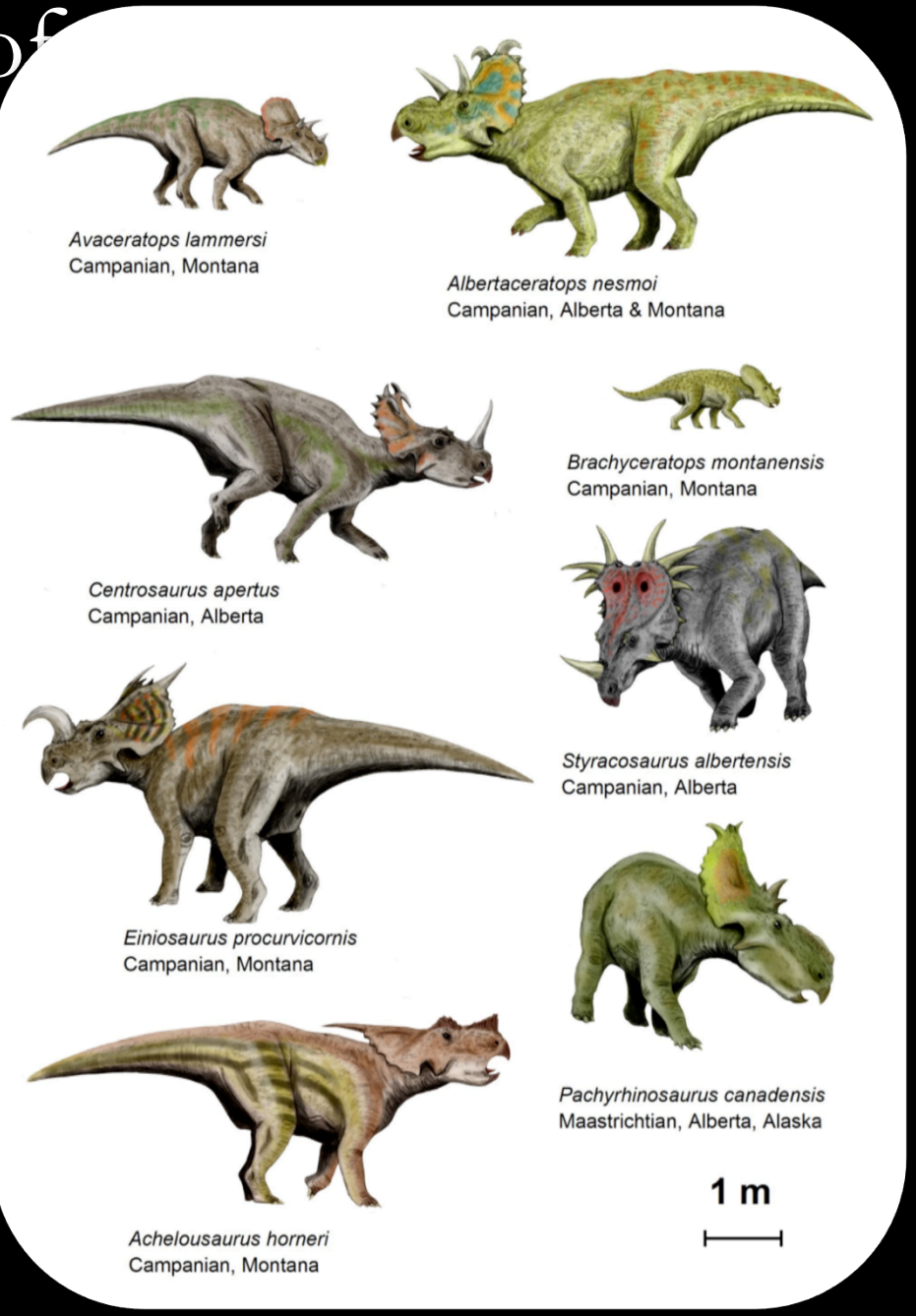

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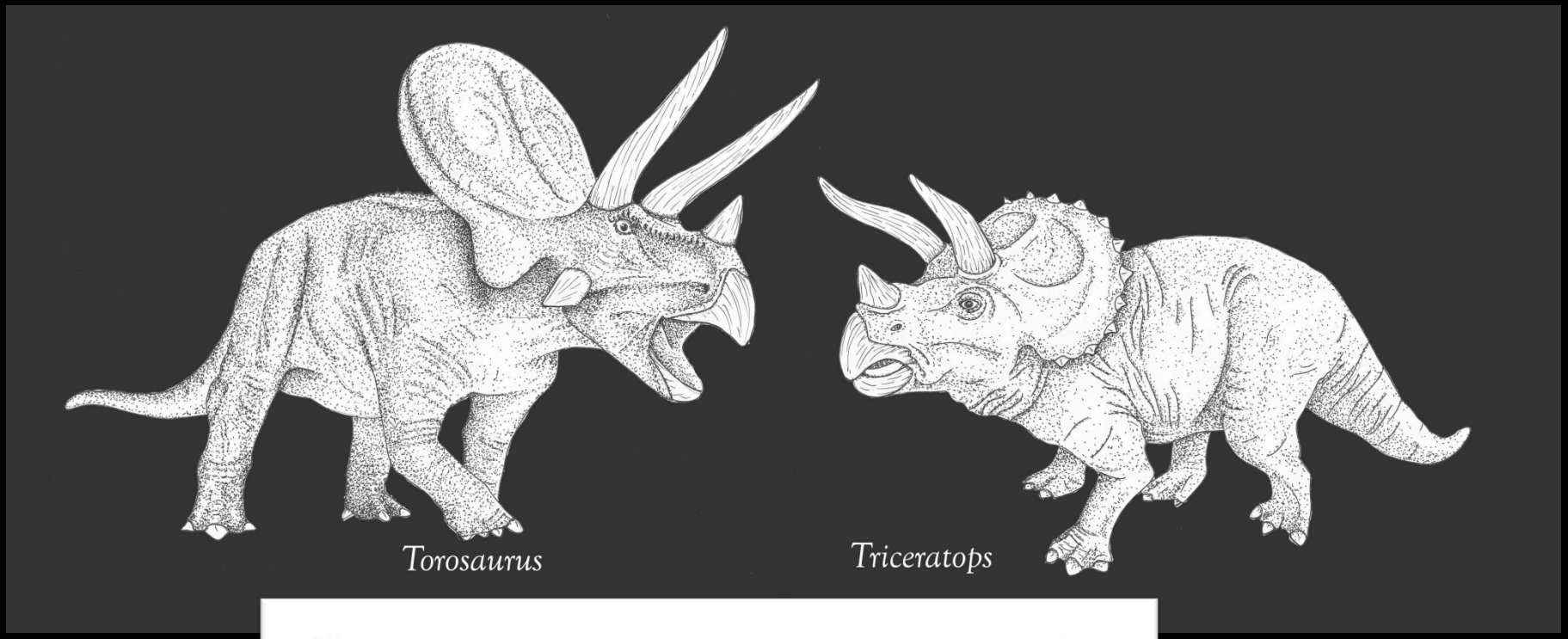

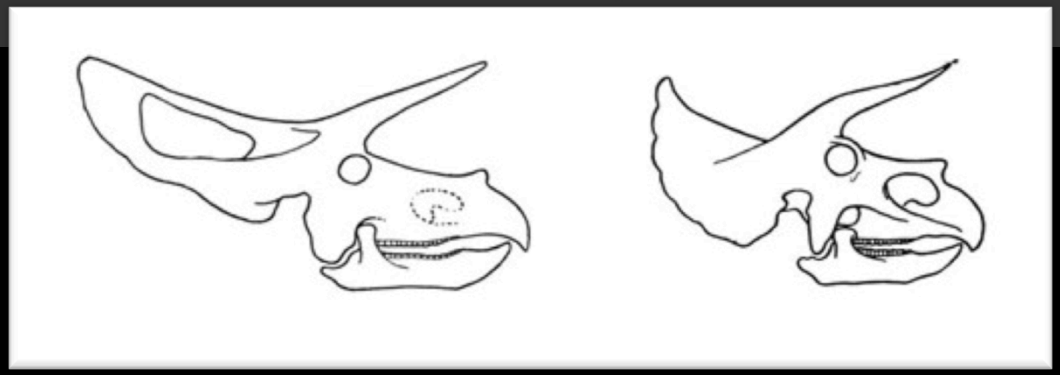

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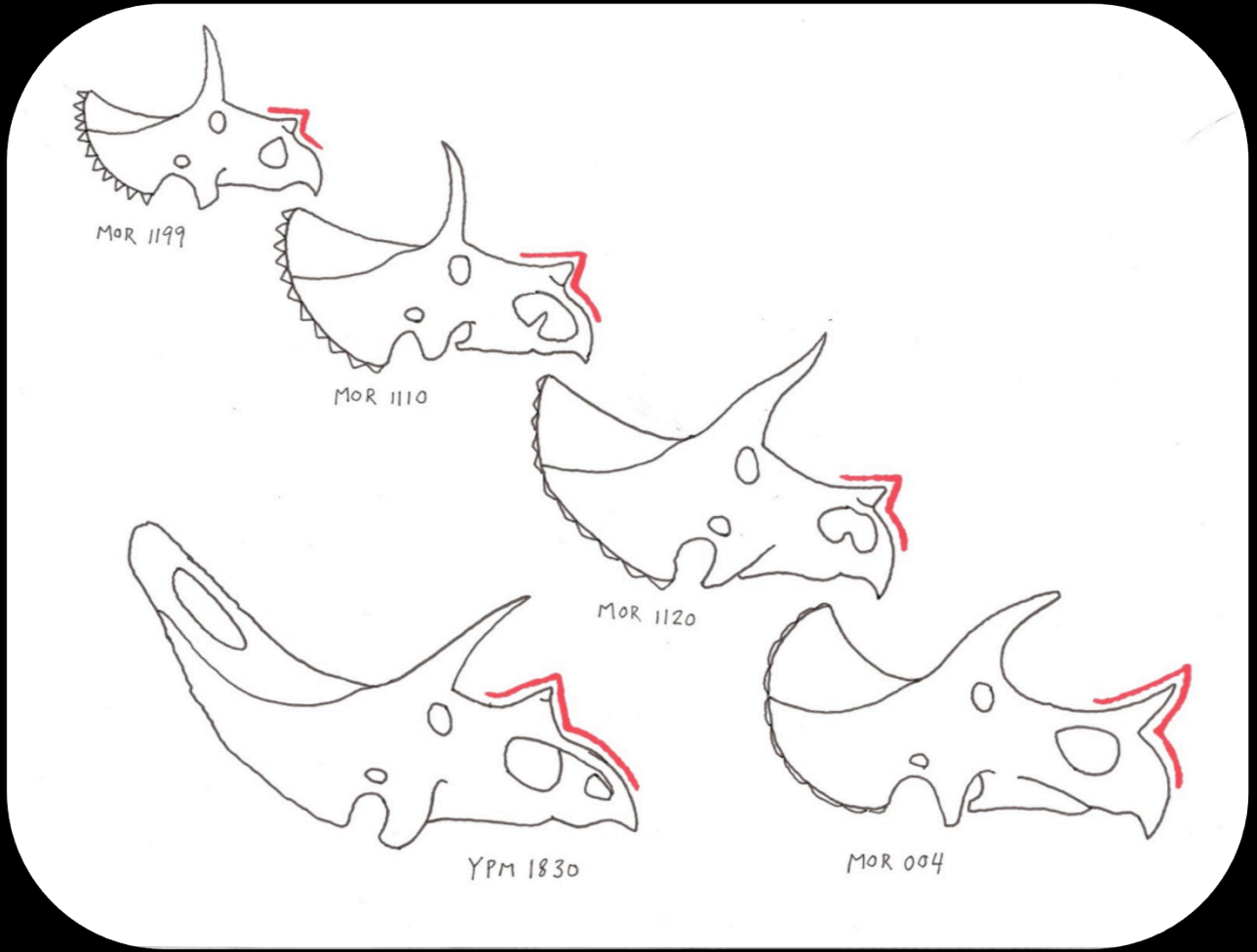

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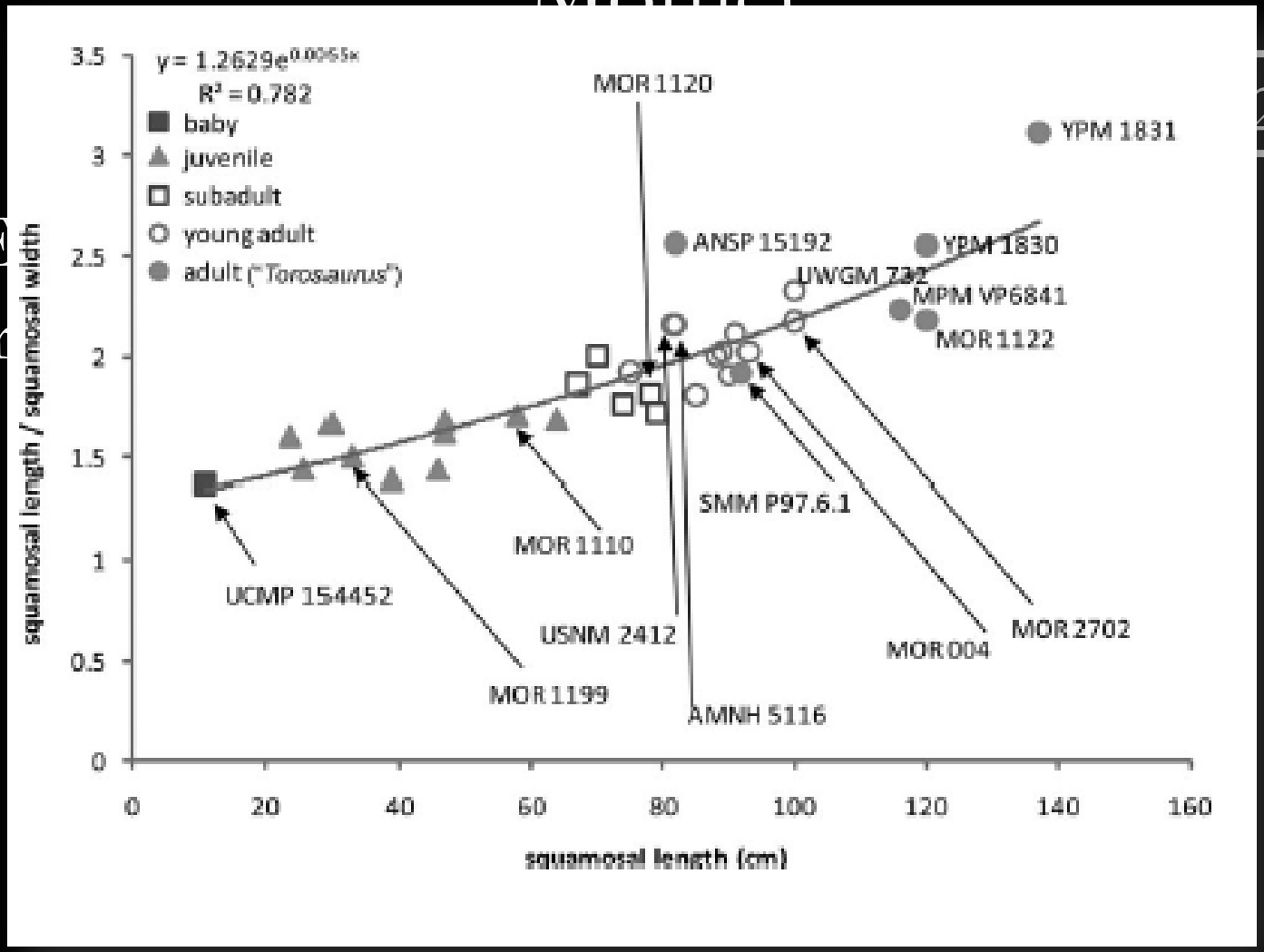

The Mystery of the Triceratops's Mother

Scaller & Horner (2010)

- Extrapolating *Triceratops's* developmental trajectory leads to *Torosaurus* forms;
- Osteohistological study shows *Triceratops* specimen have younger tissue than *Torosaurus;*
- Lack of plausible juvenile *Torosaurs*;
- *Torosaurus* & *Triceratops* overlap in strata.

The Mystery of the Triceratops's Mother

Scaller & Horner (2010)

Before one can use variation to classify species, it is necessary to understand the nature of that variation. That is, do the differences between two fossils represent variation between different species, which is a result of separate evolutionary histories, or do these differences reflect variation within a single species, which can result from variation within a population, sexual dimorphism, or change in morphology over the course of development? (Longrich & Field , 2013)

The Mystery of the Triceratops's Mother

Scaller & Horner (2010)

Scaller & Horner's evidence strives to show that *within-taxa* processes (ontogenetic diversity) better explain the differences between *Triceratops* and *Torosaurus* than *without-taxa* processes.

The Mystery of the Triceratops's Mother

Not just paleonatural history!

- Inroads to *Triceratops* behaviour & adaptation;
- Inroads to general Dinosaur diversity;
- Inroads to explanations of K-pg extinction.

Summary: Species Identification in Paleobiology

At least *sometimes*, species delineation in paleobiology are made on the basis of whether *within* or *without* species processes best explain phenotypic variation between samples.

- Ontogenetic (life-stage) variation;
- Sexual dimorphism;
- Phenotypic variation & pathology;
- Strata location (timing).

Moreover, taxonomic decisions in paleobiology matter for

- Reconstructing the ecology, social organization and behaviour of populations;
- Identifying and explaining large-scale macro-evolutionary patterns.

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Indifference

Some research program is *indifferent* to a set of concepts pertaining to a category just when the various precisifications of those concepts *makes no difference* to that research program.

(1) The *criteria* with which paleobiologists delineate species is indifferent to species concepts;

(2) The *research program* of paleobiologists is indifferent to species concepts.

Indifference

Criteria:
Palebiological criteria for species-hood would matter on *any plausible* species concept.

Imagine we have a single fossil sample *f*, and a single well established species *S* which *f* might belong to. Assuming that *S* is the only plausible known species which *f* could fit, we have two possible hypotheses…

Phylogenetic Species Concept

H1: *f* is a member of *S*, that is, *f* is part of the historical lineage *S*.

H2: *f* is not a member of *S*, that is, *f* is not part of the historical lineages *S*

Indifference

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know ses…

Indifference

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Biological Species Concept

H1*: *f* is a member of *S*, that is, *f* is part of breeding population *S*.

H2*: *f* is not a member of *S*, that is, *f* is not part of breeding population *S*.

Indifference

Circumstantial

Indifference is generated by scientists *making do* with their epistemic situation.

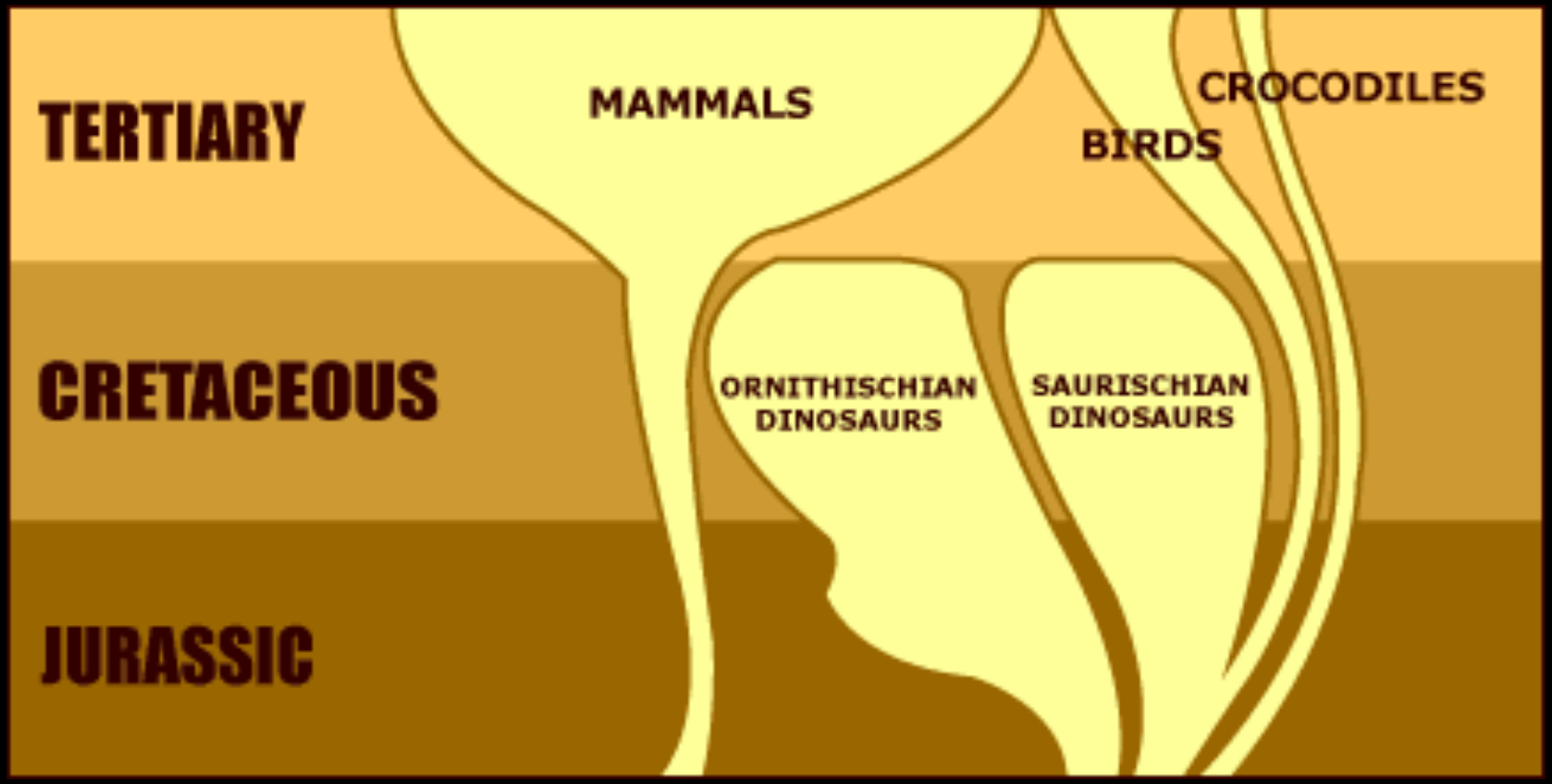
Vindicatory

Indifference is generated by the research program.

Indifference

Research Program:

One source of paleobiological indifference is the *questions they ask*.



Indifference

Research Program:
One source of paleobiological indifference is the *questions they ask*.

Species Sorting: at the macro-evolutionary level, what factors decide the survival or extinction of species?

Random Sorting: who survives and who doesn't is non-directional and non-systematic.

Species Selection: natural selection operates at the species level systematically.

Indifference

Research Program:
One source of paleobiological indifference is the *questions they ask*.

Many paleobiological investigations require species delineation (taxonomic decisions must be made), and are in fact *about* species,

But providing a more specific species delineations will, at least sometimes, not make a difference to those investigations.

Indifference

(1) Paleobiological means of differentiating between species is *indifferent* to species concepts.

(2) This indifference is *vindicatory*.

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Indifference Realism

(1) Paleobiological means of differentiating between species is *indifferent* to species concepts.
(2) Paleobiological indifference is *vindicatory*.
(3) Indifference principle: when some legitimate investigation is indifferent in regards to some category, in a vindicatory sense, then we ought to be realists about that category.
(4) Paleobiological investigation is *legitimate*.
(5) Therefore, we ought to be realists about the species category.

Indifference Realism

Indifference Principle: when some legitimate investigation is indifferent in regards to some category, in a vindicatory sense, then we ought to be realists about that category.

To deny the principle, either paleobiological inference is to a *particular* concept, or to a *fake* category…

Indifference Realism

Indifference Principle: when some legitimate investigation is indifferent in regards to some category, in a vindicatory sense, then we ought to be realists about that category.

To deny the principle, either paleobiological inference is to a *particular* concept, or to a *fake* **category**…

"If Scannella & Horner are right, and Torosaurus are mature Triceratops, then presumably they have generated knowledge, and knowledge is about something, and scientific knowledge is about real things."

(4) Paleobiological investigation is *legitimate*.

Indifference Realism

Indifference Principle: when some legitimate investigation is indifferent in regards to some category, in a vindicatory sense, then we ought to be realists about that category.

To deny the principle, either paleobiological inference is to a *particular* **concept**, or to a *fake* category…

It turns out that paleobiological investigation *is* targeted to a particular species concept after all!

No vindication if, in fact, they'd target a particular concept if only they could.

(2) Paleobiological indifference is *vindicatory*.

Indifference Realism

(1) Paleobiological means of differentiating between species is *indifferent* to species concepts.

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3 Objections

(1) Deny Indifference

Adrian, you've mischaracterized paleobiological practice: there *are* some species concepts which do not suit paleobiological investigation!

Response 1: *Show me the money.*
Response 2: fine, I have established a kind of taxa-category realism. I'm not going to quibble about the word 'species'.

(2)

3 Objections

(2) Disunified Kinds!?

Adrian, realism about disunified categories (or 'wildly disjunctive' kinds) is bloody weird *a priori*.

Response 1: that debate: not conclusive…
Response 2: this involves denying the naturalized methodology which motivated pluralism in the first place!

Hilary P[illegible] Fodor

3 Objections

(3) Higher Taxa?

Adrian, your case study is at the *genus* rather than the *species* level: have you just committed us to the existence of higher-level taxa?

Response 1: again, let's not get too caught up with the word 'species';
Response 2: it doesn't follow from similar method in *identifying* higher-taxa that they play the same role in paleobiological investigation.

Naturalized Metaphysics

Species Debate

Paleontological Practice

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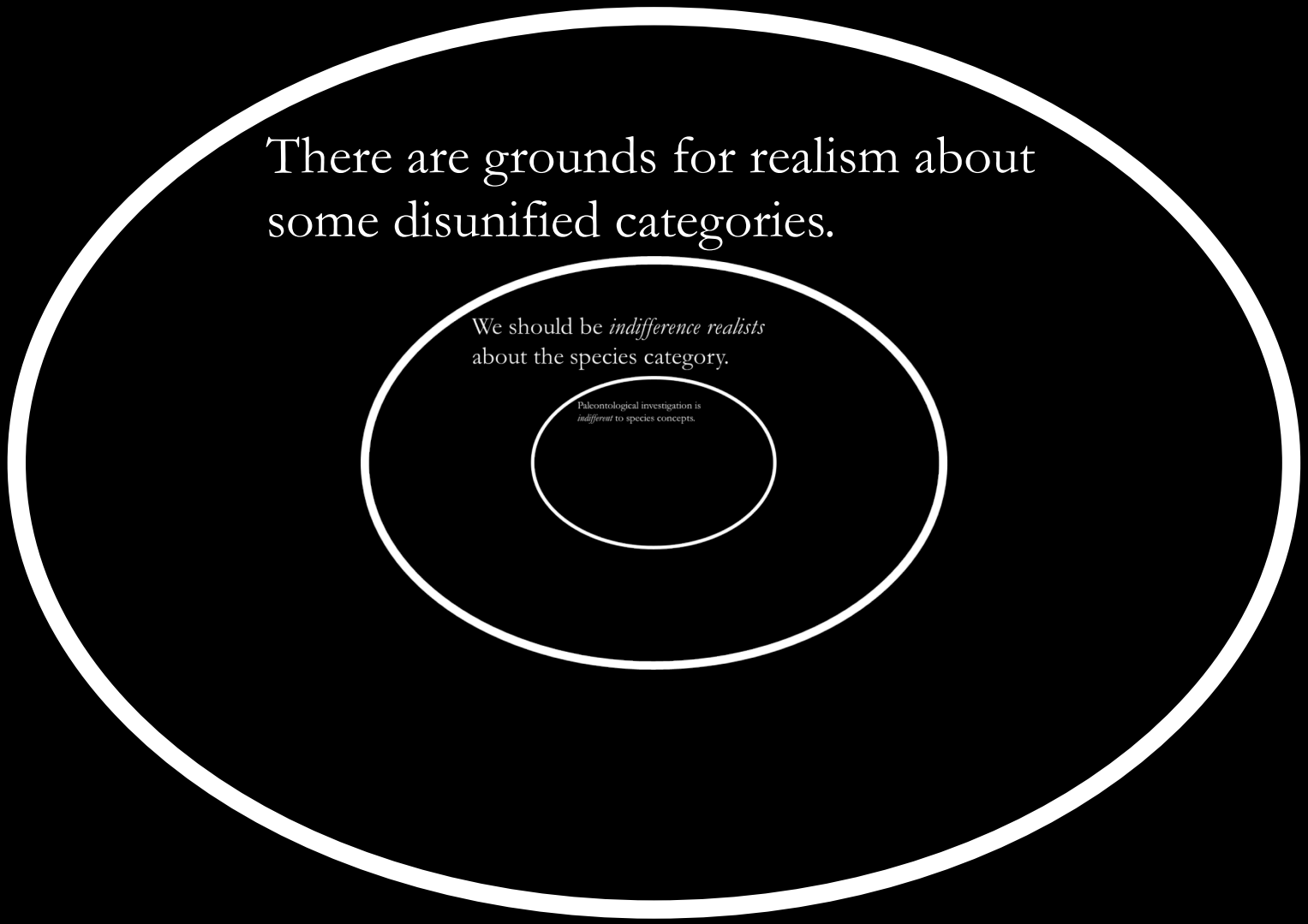
There are grounds for realism about some disunified categories.
We should be *indifference realists* about the species category.
Paleontological investigation is *indifferent* to species concepts.