

Big Data, Natural History, and Breadth

UNIL BIG Seminar, 2020.10.5

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@pencechp · @pencelab

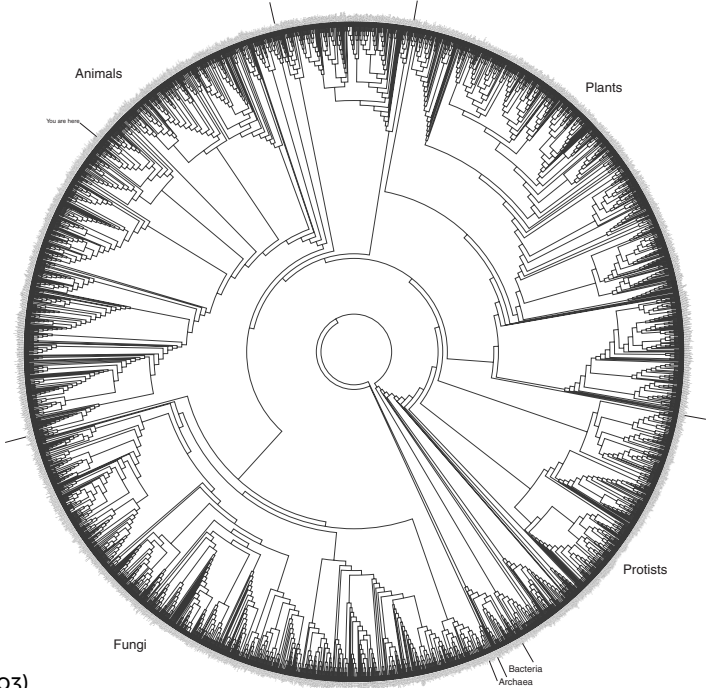
Outline

1. Two Darwins
2. Philosophy, Biology and Big Data
3. What is Breadth?
4. Biology, Ethics, and Society

The take-home: Biological explanations rely on a sense of *breadth* that's philosophically, ethically, and socially complex.







Hillis (2003)

Abb. 131

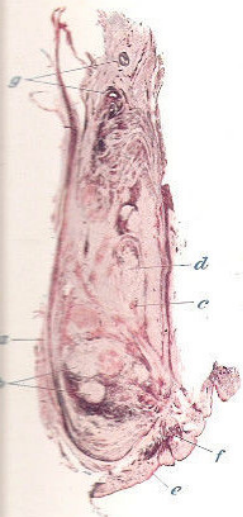


Abb. 132

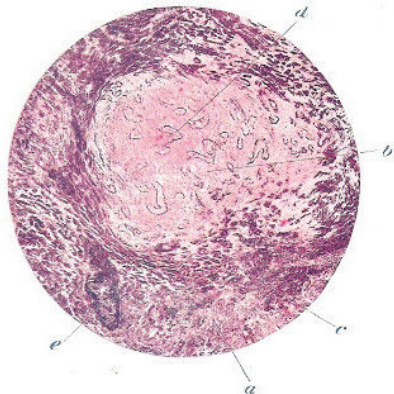
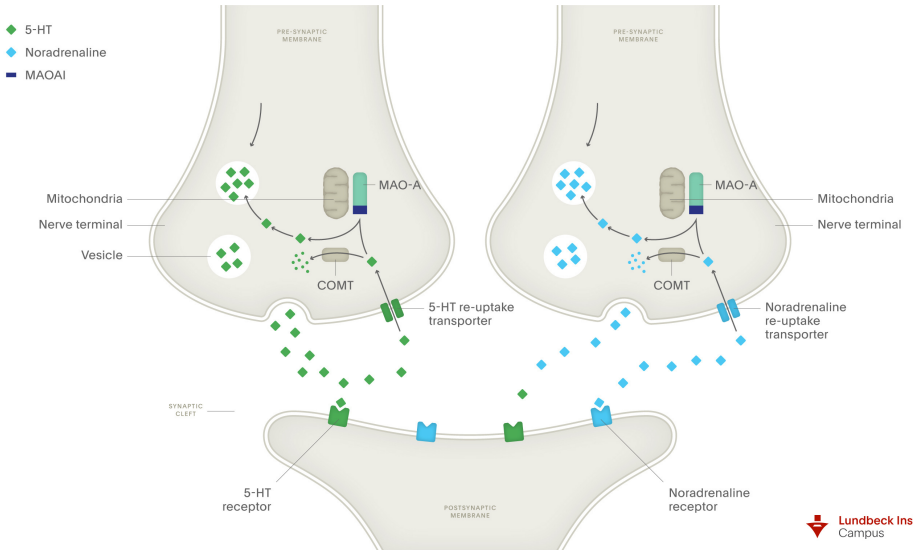


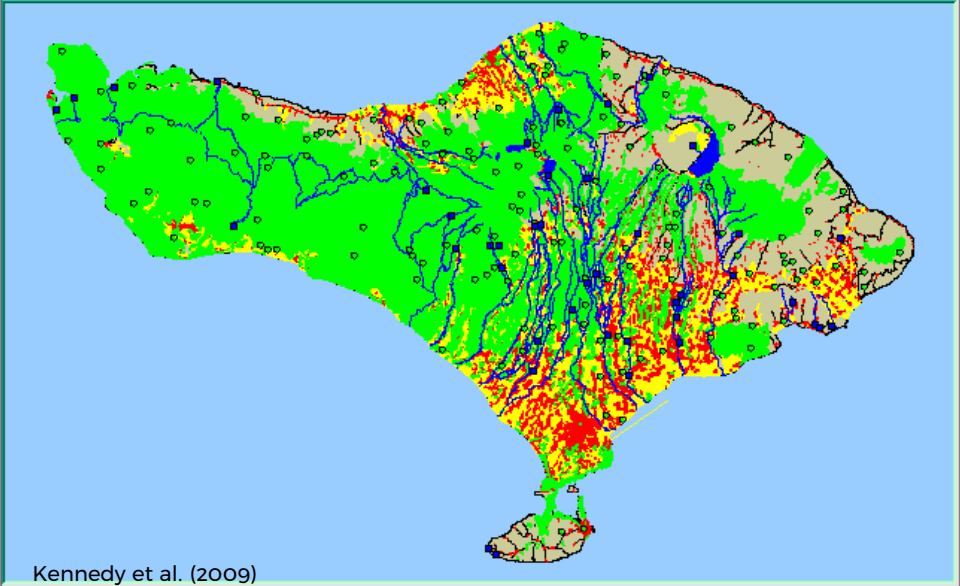
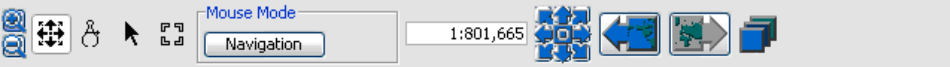
Abb. 133



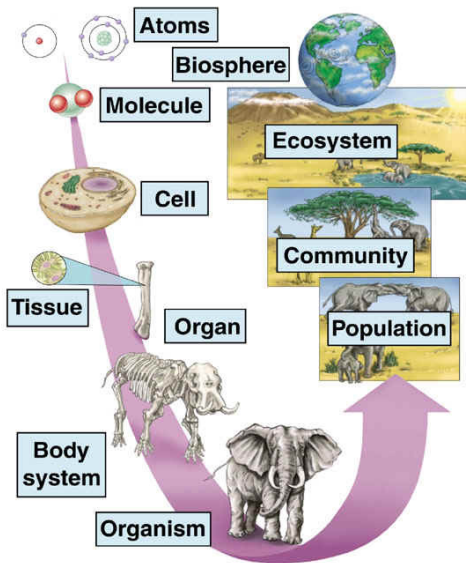
Mouse Mode

Navigation

1:801,665



Kennedy et al. (2009)



horizontal breadth: across the entire tree of life,
present and historical

vertical breadth: across scales of organization
from ecosystem to biochemistry

But this is sketchy and intuitive: What **is** breadth in this sense, and how should biology (and philosophy) deal with it?

Two Darwins

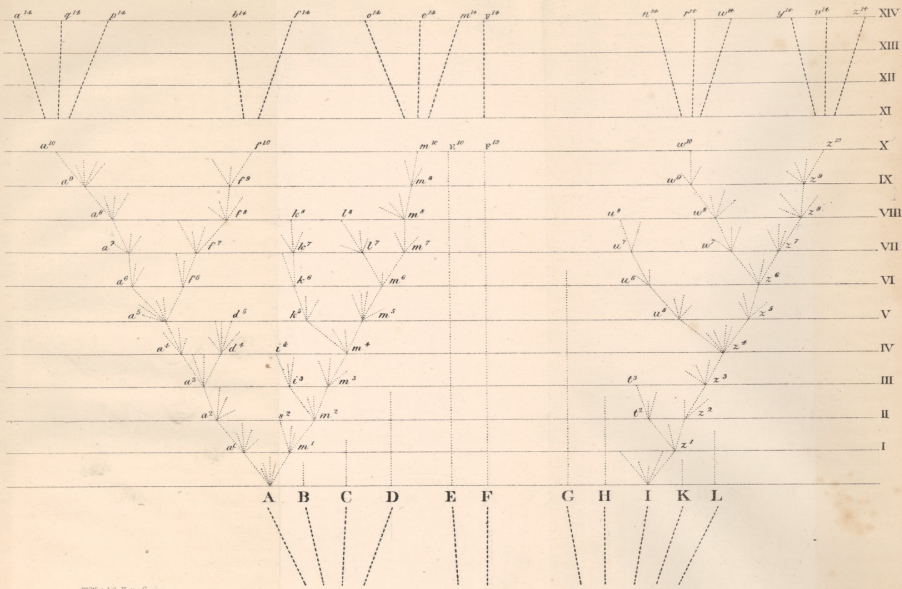


ON
THE ORIGIN OF SPECIES

BY MEANS OF NATURAL SELECTION,

OR THE

PRESERVATION OF FAVOURED RACES IN THE STRUGGLE
FOR LIFE.



W. West 14th. Easton Cor. N. Y.

a **sub-genus** or even a distinct **genus**

Origin, p. 123

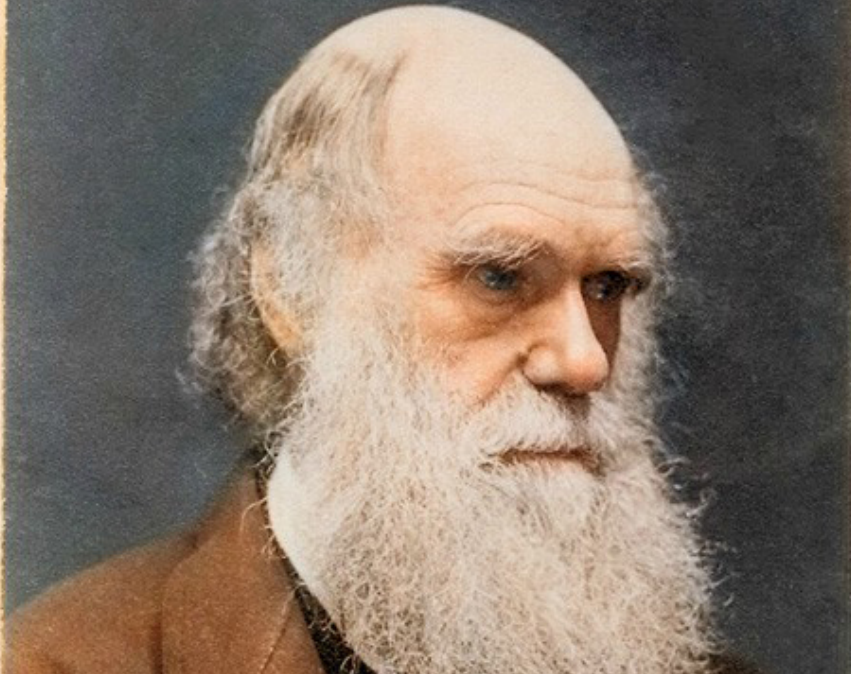
very distinct **genera** or even distinct **sub-families**

Origin, p. 123

two distinct **families** or even **orders**

Origin, p. 125

Darwin the Generalizer



ON

THE VARIOUS CONTRIVANCES

BY WHICH

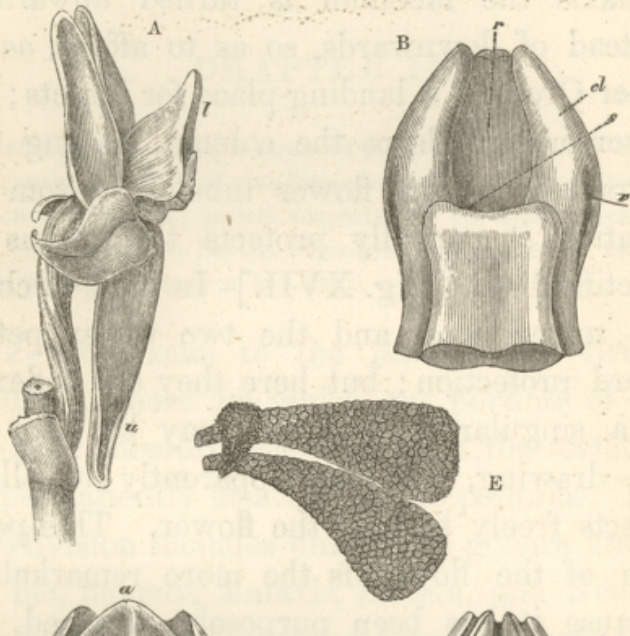
BRITISH AND FOREIGN ORCHIDS

ARE

FERTILISED BY INSECTS,

AND ON THE GOOD EFFECTS OF INTERCROSSING.

Fig. XVII.





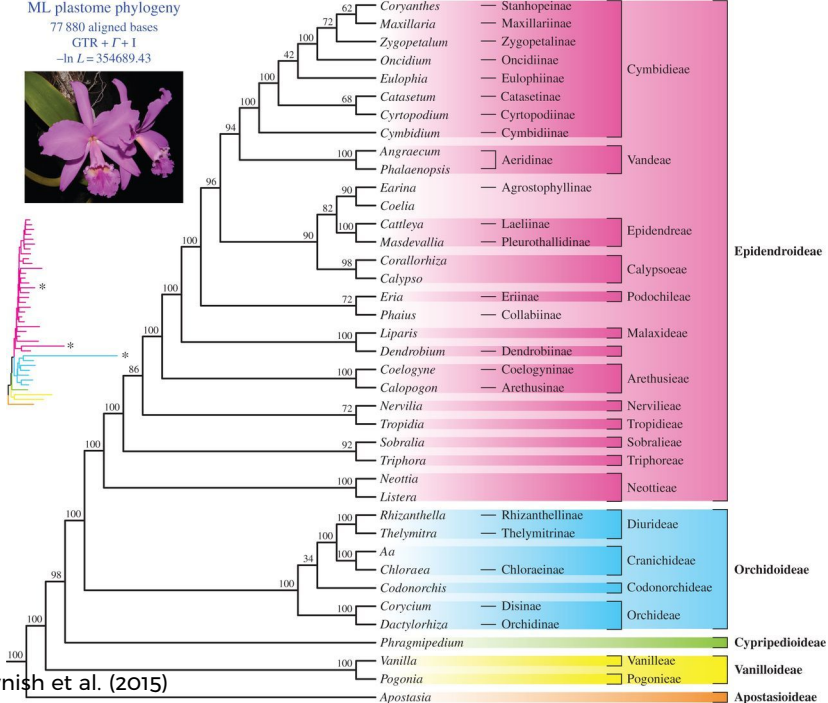
WP:Orchi

ML plastome phylogeny

77 880 aligned bases

GTR + Γ + I

$-\ln L = 354689.43$



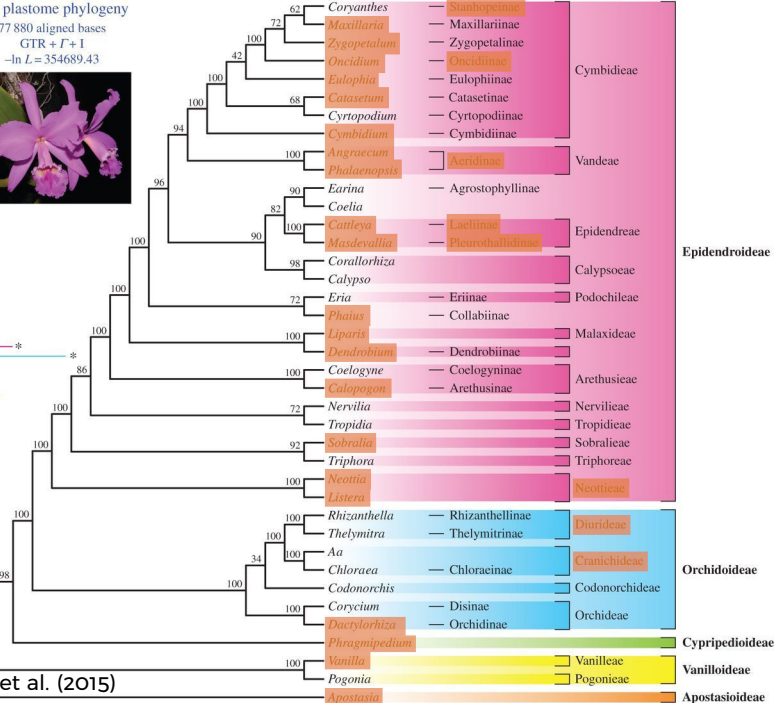
Givnish et al. (2015)

ML plastome phylogeny

77 880 aligned bases

GTR + Γ + I

$-\ln L = 354689.43$



Givnish et al. (2015)

Darwin the Big Data Analyst

big theory and big data

generalizing and analyzing

Philosophy, Biology and Big Data

What exactly does a philosopher of
biology *do*, anyway?

Classic philosophy of biology question:

What do biologists mean when they use the concept of **biodiversity**?

The generalizing approach

The diversities of biodiversity

**James Maclaurin and Kim Sterelny: What is Biodiversity?
The University of Chicago Press, Chicago, 2008, xii + 217 pp,
US\$ 24 PB**

James Justus

Published
© Springer

A more
biological
interest
endeavor
within
philosophy
and...

Biol Philos
DOI 10.1007/s10539-014-9426-2

Save the planet: eliminate biodiversity

Carlos Santana

The analyzing approach



The evoText Project

<https://www.evotext.org/>

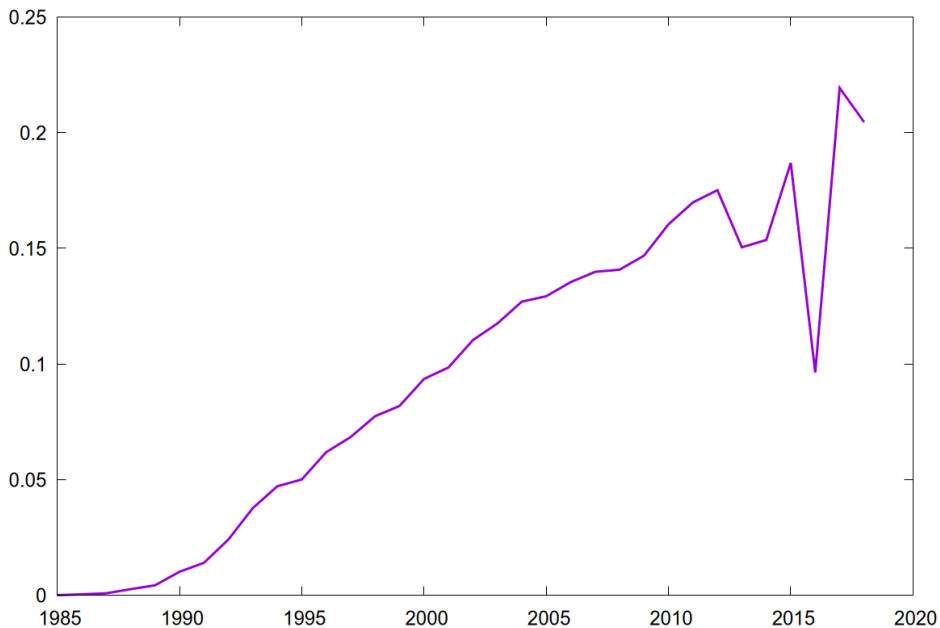
Soon to be renamed, expanded, and with improved data quality and data sharing capability:

Sciveyor

<https://www.sciveyor.org>

COMING

SOON!



Conservation Biology

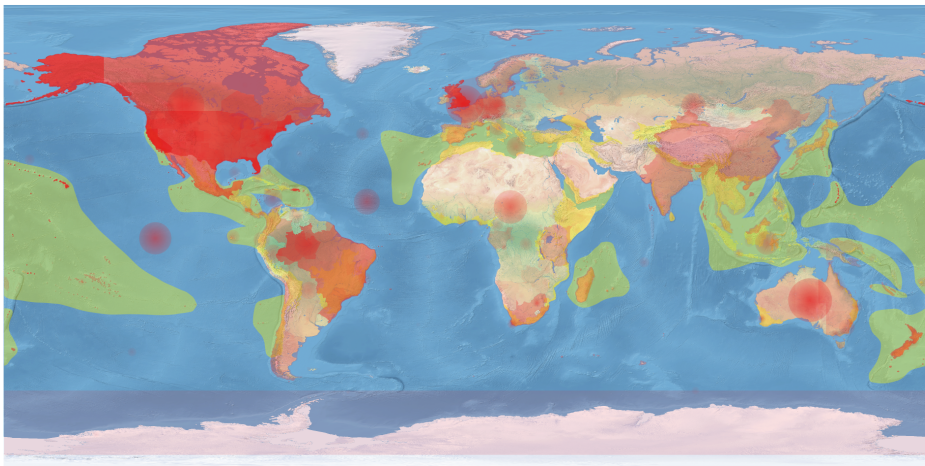
Volume 33, Number 1, February 2019

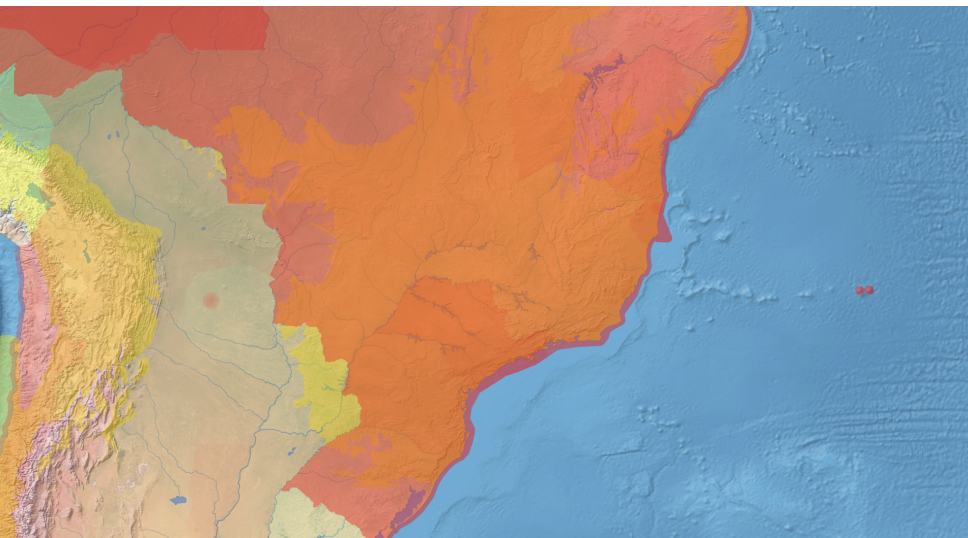


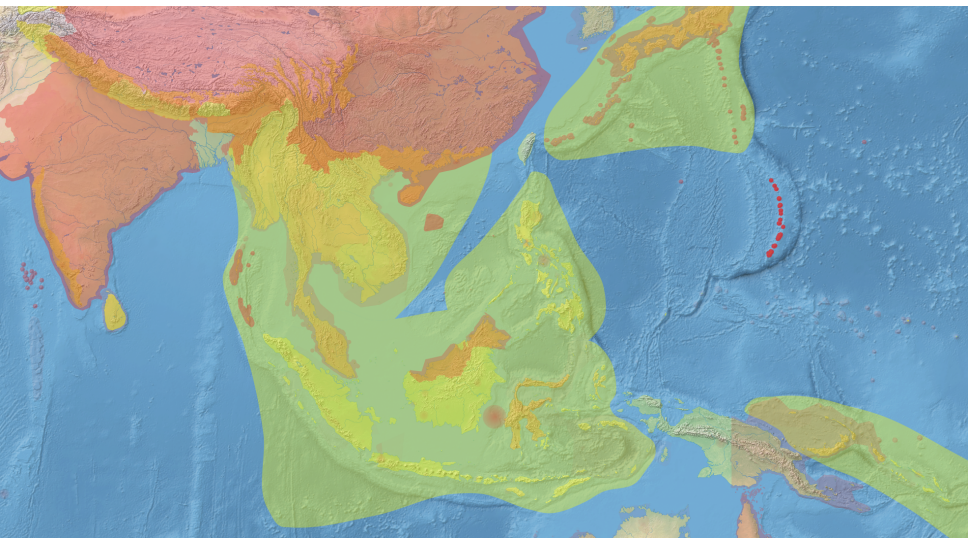
A journal of the Society for Conservation Biology • Published by Wiley Blackwell, Inc. • ISSN 0888-8892

5,459 articles, 1987–2012

Are scientists and policy-makers understanding biodiversity in the same way?







What is Breadth?

Philosophers of science have tended to focus on
scope and on **unification**

$$F = ma$$

$$F = \frac{Gm_1m_2}{r^2}$$

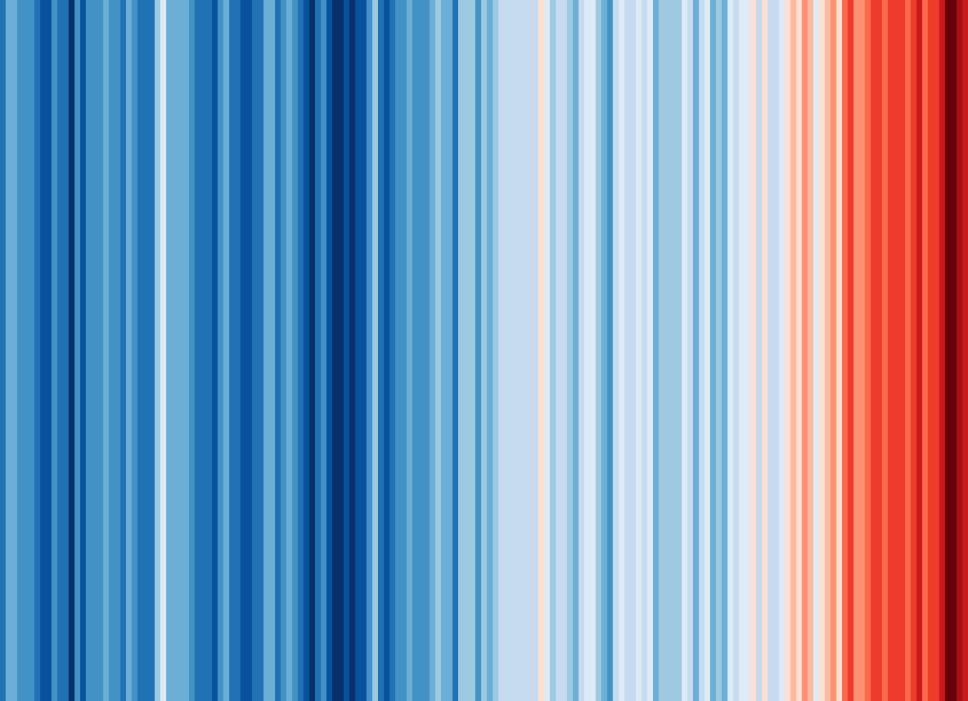
scope — limited only by our available theories and experiments; think of physics' pursuit of a Theory of Everything

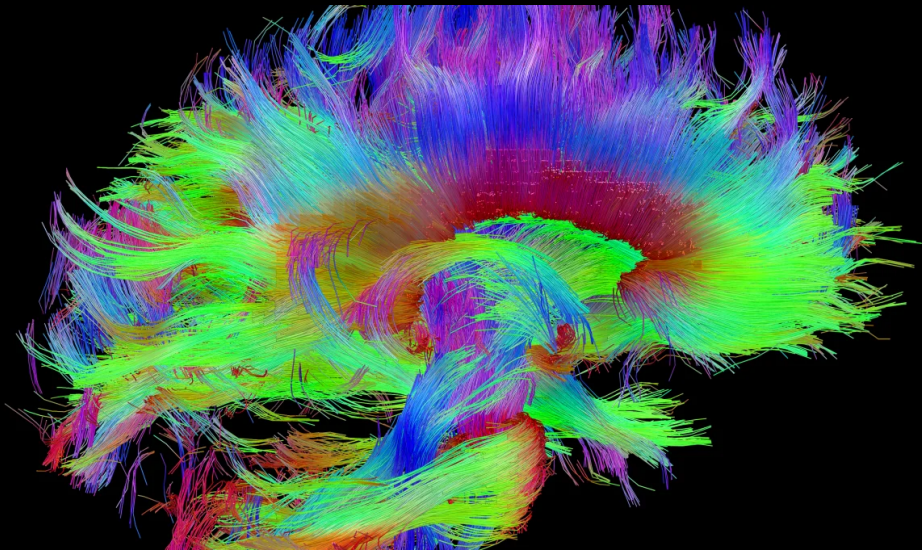
unification — bringing together disparate examples under a larger, general theory

Neither of these seems to be
what biology is up to!

Breadth seems to be an **active choice** on our
part, to emphasize certain areas of study and
neglect others.

The Ethics of Breadth





Future directions in science will require
an integrated approach bringing
together **technical, conceptual,**
historical, and ethical perspectives.

Questions?

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