

The past and the future of consciousness



Mariano Sigman
Universiad Di Tella

- 1) Setting the hypothesis: The consciousness of our ancestors
- 2) The space of meanings (world of words)
- 3) Testing the soft Jaynes hypothesis. A punctuated cultural evolution of consciousness.
- 4) Language as a window to the human mind. The future of consciousness

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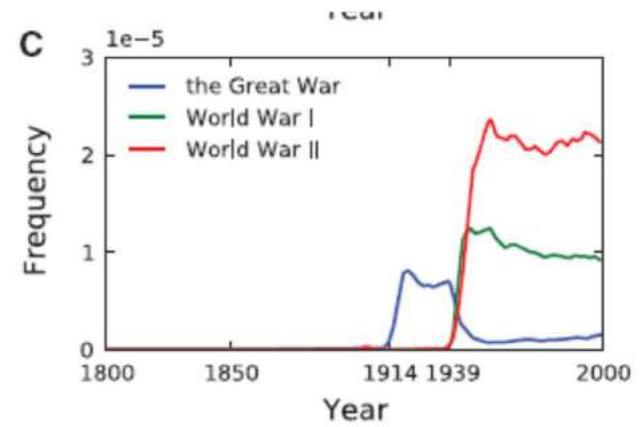
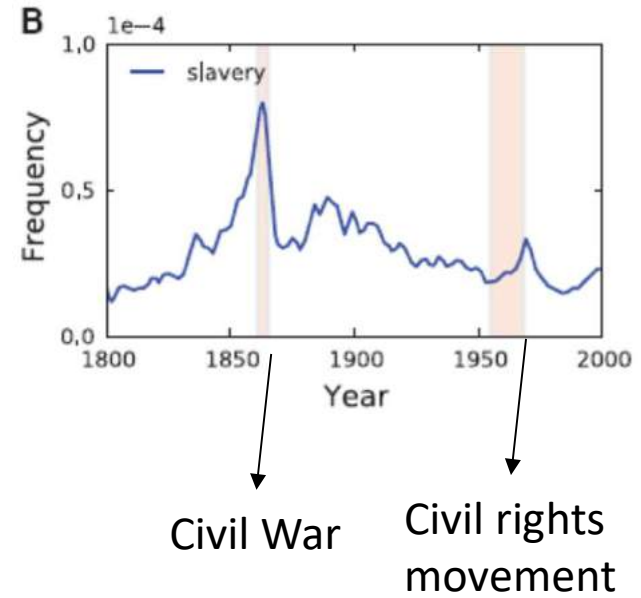
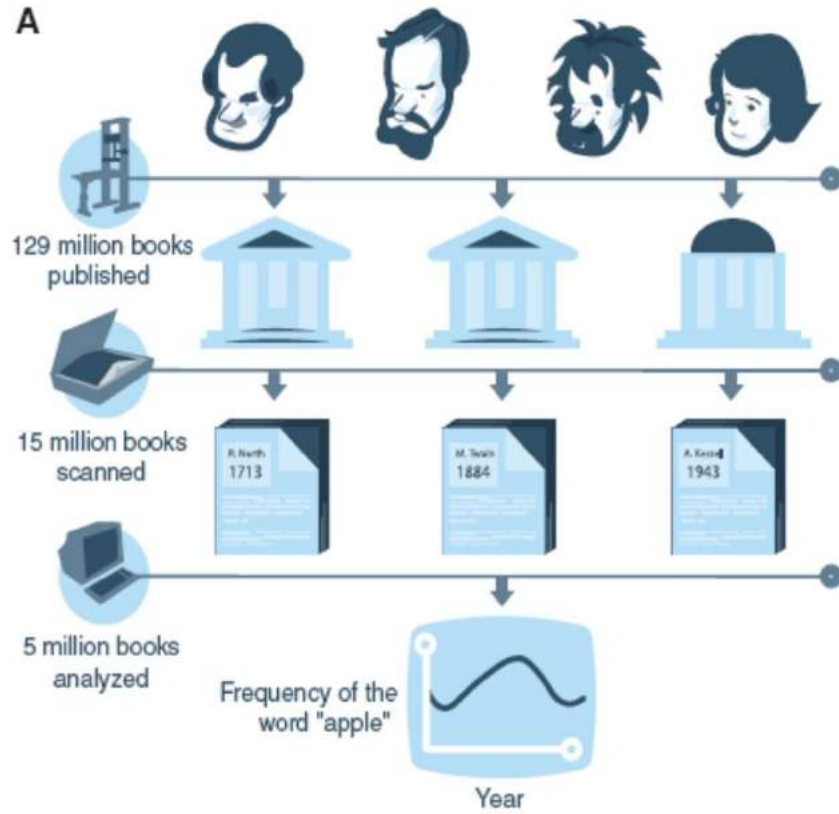
Apollo preceding Hector with his Aegis, and dispersing the Greeks
Flaxman

“The impulsive, irreflexive heroes of the Iliad, driven by passions insuflated into them by the gods, give way to the wily, cunning Odysseus who outsmarts Polifemo and leads his men to Scylla with a bad conscience.”

“the wrathful, interventionist god of the Old Testament, who expels Adam and Eve from the garden (Genesis 6:22), is followed by the rich inner life of the New Testament, where Jesus asks the accusers of an adulterous woman to examine their own guilt (John 8:1).”

***Apollo Preceding Hector with His Aegis, and Dispersing the Greeks
John Flaxman (Yale Center for British Art)***

N-grams



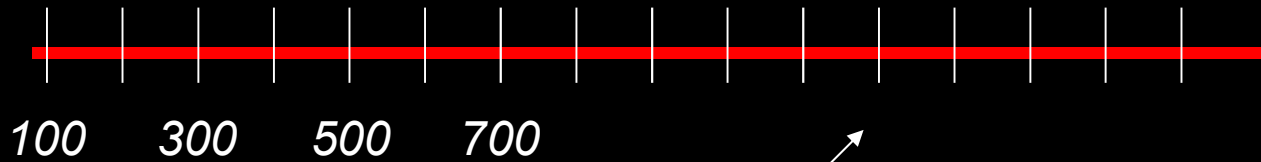
Michel et al *Science* (2011)

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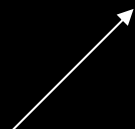
4) Language as a window to the human mind. The future of consciousness



Where is 1000?

What number is here?

Is 1300, left or right from 1500?



Logarithm

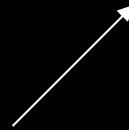
Hope

Lettuce

Where is elephant?

*What meaning is
here?*

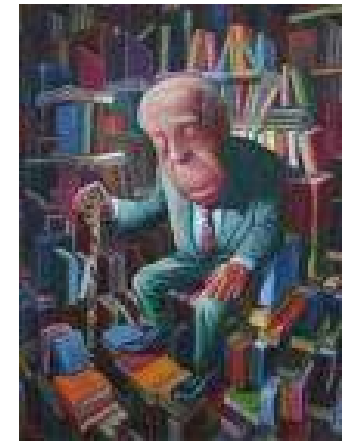
*Is night closer to
hope or to lettuce?*



Descartes ... had already noticed that, using the decimal number system, it may take only one day to learn how to name all the numbers up to infinity and how to write them in a new language, namely that of ciphers;

he did also suggest the creation of a language similar to this former system, a general language, organizing and covering all human ideas.

John Wilkins, around 1664, started to work on this task.



He divided the universe in forty categories or classes, these being further subdivided into differences, which was then subdivided into species...

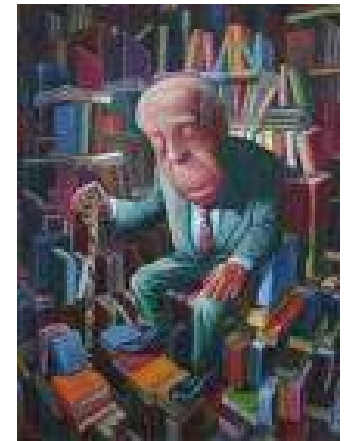
a means animal;

ab, mammal;

abo, carnivore;

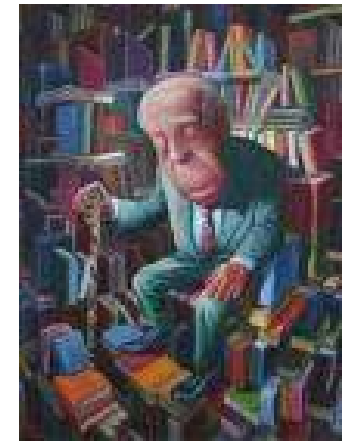
aboj, feline;

aboje, cat;

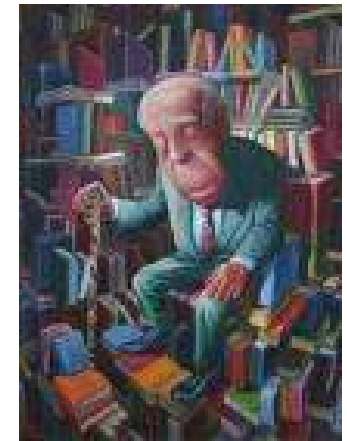


Once we have defined Wilkins' procedure, it is time to examine a problem which could be impossible or at least difficult to postpone: the value of this four-level table which is the base of the language...

These ambiguities, redundancies and deficiencies remind us of ... a certain Chinese encyclopedia ... In its remote pages it is written that the animals are divided into:

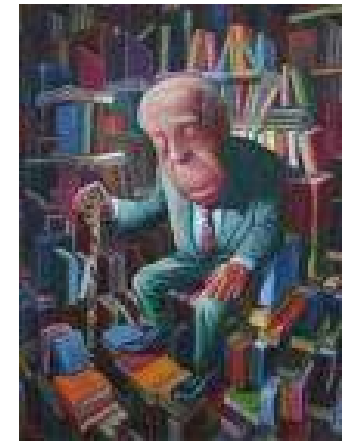


- (a) belonging to the emperor,
- (b) embalmed,
- (c) tame,
- (d) sucking pigs,
- (e) sirens,
- (f) fabulous,
- (g) stray dogs,
- (h) included in the present classification,
- (i) frenzied (que se agitan como locos)
- (j) innumerable,
- (k) drawn with a very fine camelhair brush ...



The impossibility of penetrating the divine pattern of the universe cannot stop us from planning human patterns, even though we are conscious they are not definitive.

The analytic language of Wilkins is not the least admirable of such patterns. The classes and species that compose it are contradictory and vague; the nimbleness of letters in the words meaning subdivisions and divisions is, no doubt, gifted.



George Miller



James S. McDonnell
Distinguished University Professor of
Psychology

Arabic WordNet
with Ontology

فيزيائي, بدني

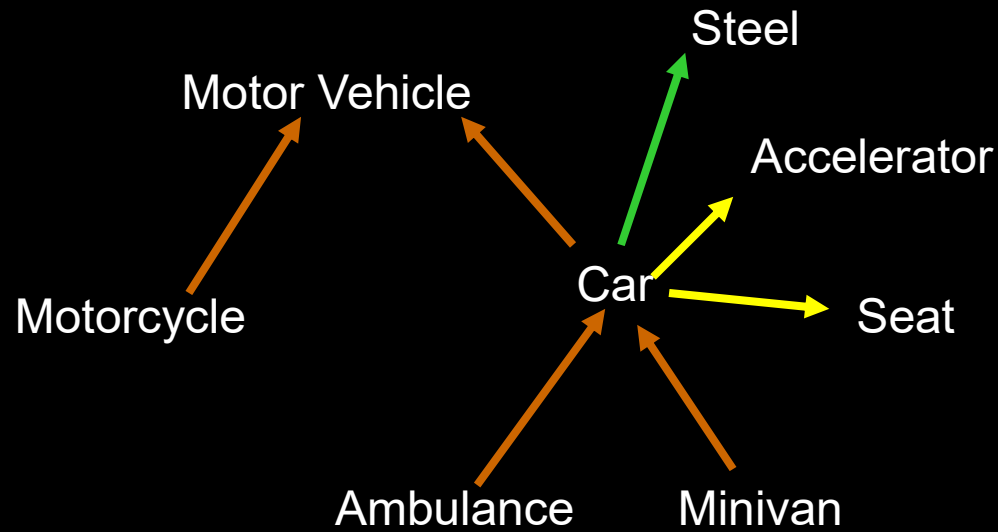
$\forall x \exists y \text{ day}(x) \wedge \text{sunrise}(y)$

PRINCETON UNIVERSITY

WordNet
A lexical database for English

Fellbaum, Miller, et al

Snapshots of the semantic graph



Hypernym (hyponym)

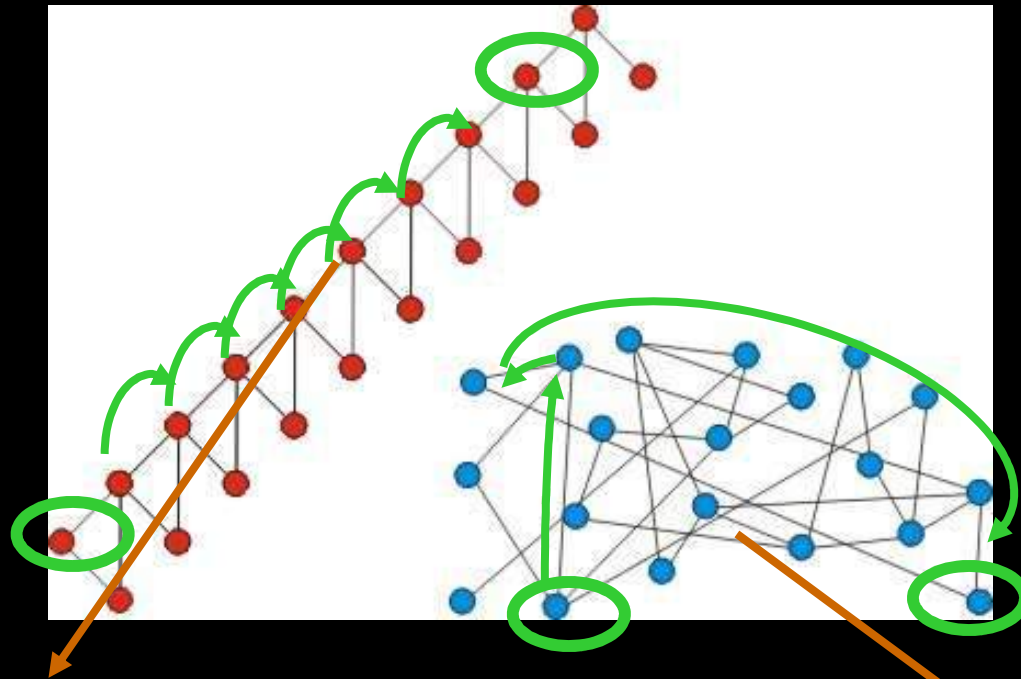
Meronym (holonym) (PART)

Meronym (holonym) (SUBS)

Antonym

White → Black

Distance: The time to navigate the graph



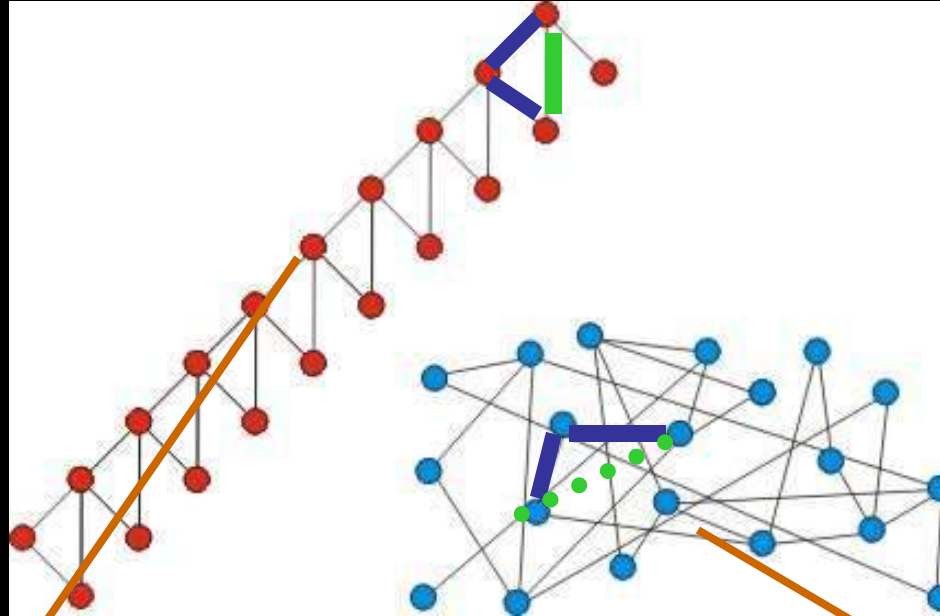
Structured graphs (Crystals)

Large diameter:

Random graphs

have short-cuts connecting distant places.

Clustering: The existence of neighborhoods

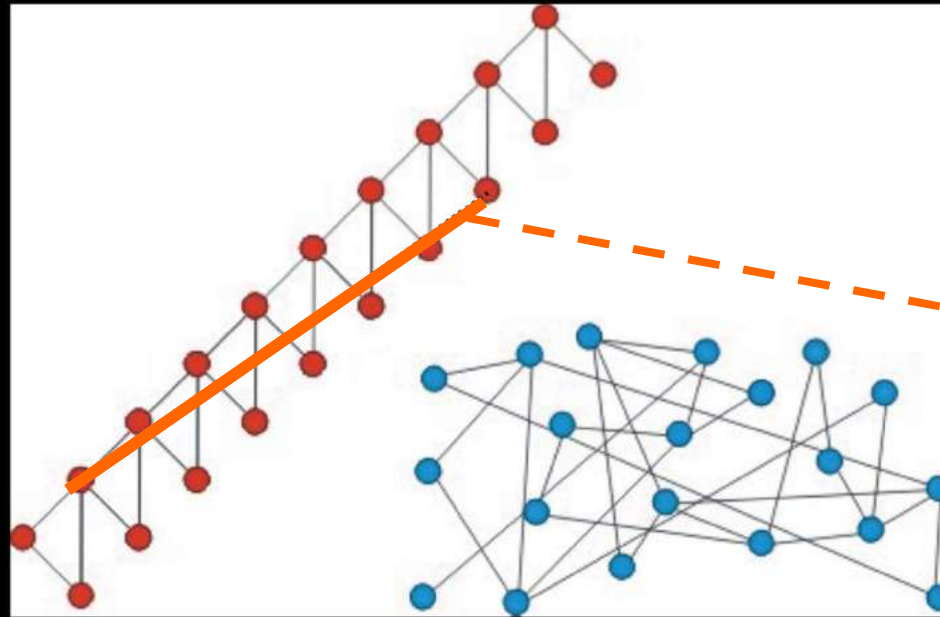


Structured graphs (Crystals)

Very high clustering (A is my friend and B is my friend then A and B are friends)

Random graphs are not clustered (there is no notion of proximity, of neighborhoods)

A very simple idea...



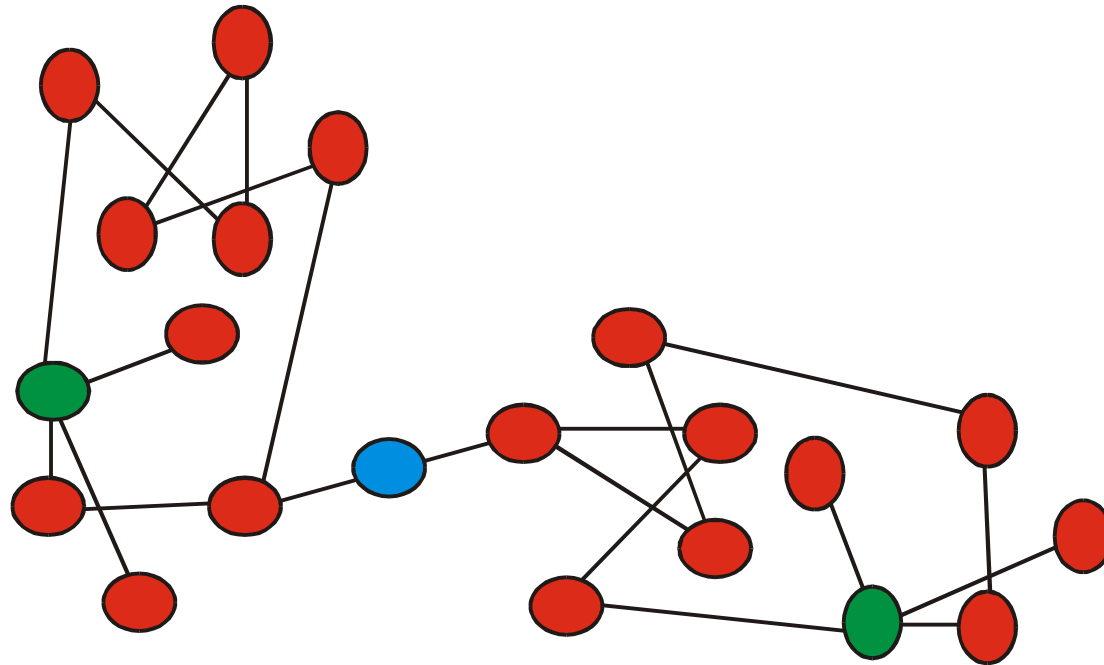
With this single link diameter is shortened by about one half, and clustering changes moderately.

A generator of small worlds:

- 1) Start with a nicely clustered graph
- 2) Make it short by adding a few random links

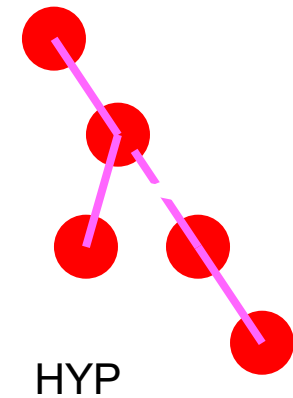
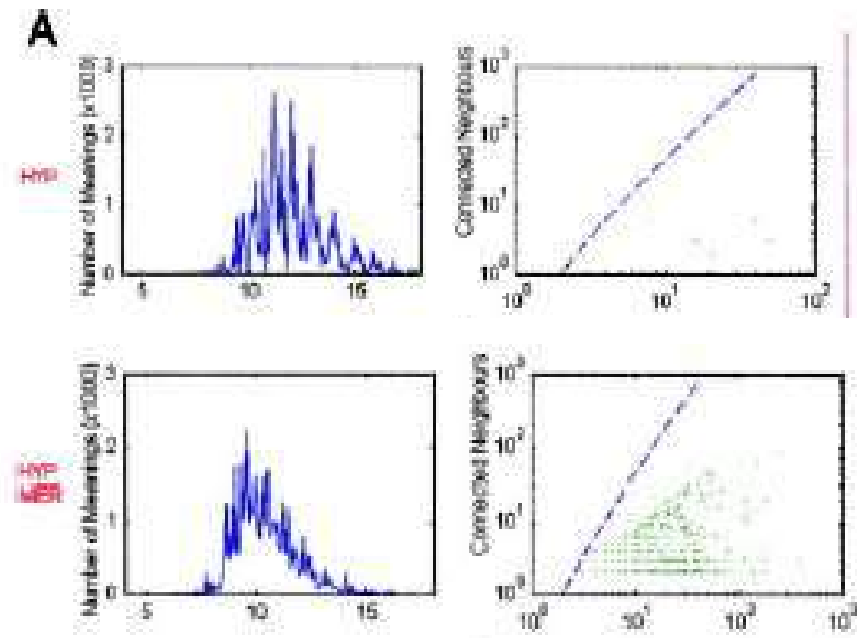
Watts and Strogatz 1998

Traffic and Connectivity



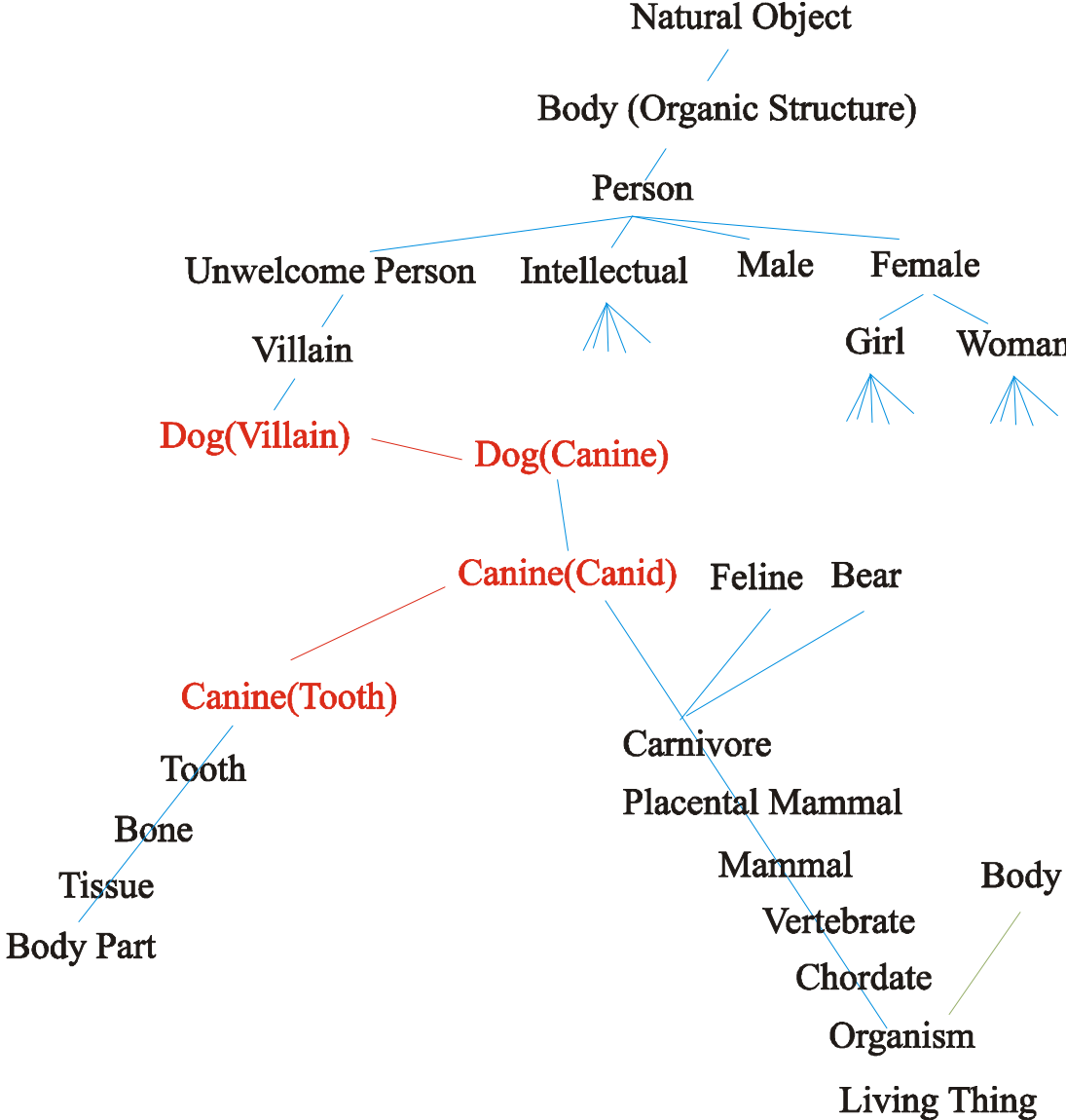
The solitary
hypernym tree

Adding
meronymy is
not much of a
solution.

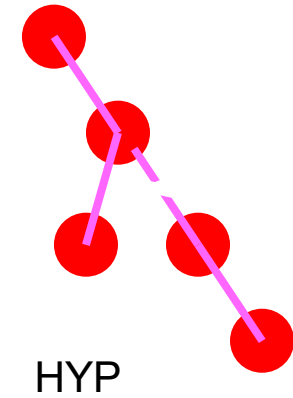
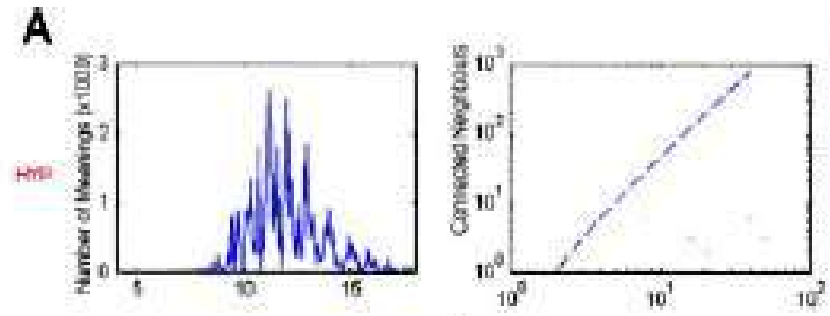


HYP +
MER

MEANINGS CAN ALSO BE RELATED THROUGH A COMMON WORD FORM (POLYSEMY)

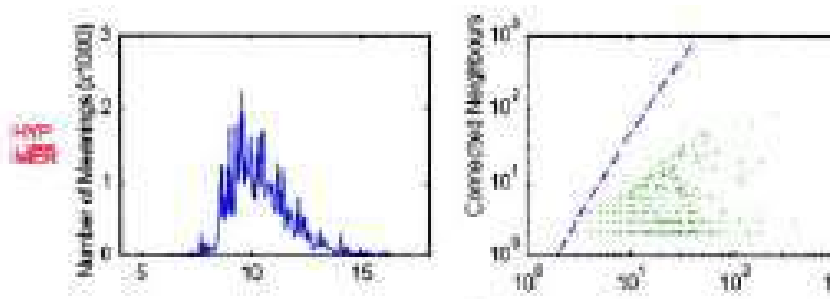


The hypernym tree is long and unclustered. Typical of a tree. Bad news



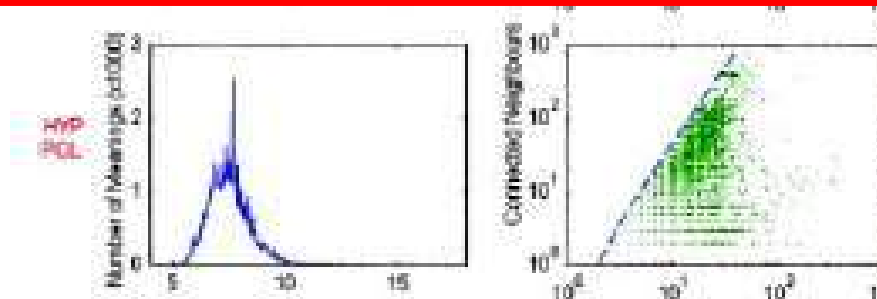
HYP

Adding meronymy is not much of a solution. The graph is still a bad space to navigate.



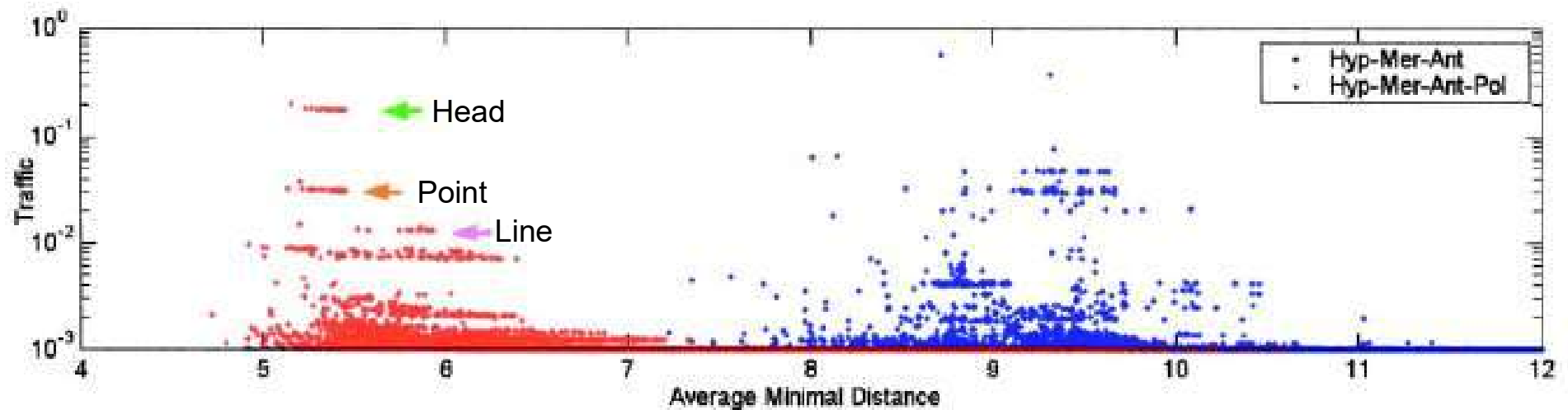
HYP +
MER

Polysemy converts it into a small world.



HYP +
POL

Metaphors: The hub of the lexicon



The most polysemous words
(metaphors) form huge clusters which
become the hubs, the centers of the
lexicon.

(meeting point... head of the group...)

Sigman and Cecchi PNAS (2001)

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button
monitor keyboard
computer
key arm finger
head neck peach
hand eye orange
nose banana apple
face chili pear
feet carrot tomato
light
nucleus sun night lettuce
planet star
atom moon earth
molecule sky
astronomy
electron
proton mars

chemistry
physics
biology
science
geology

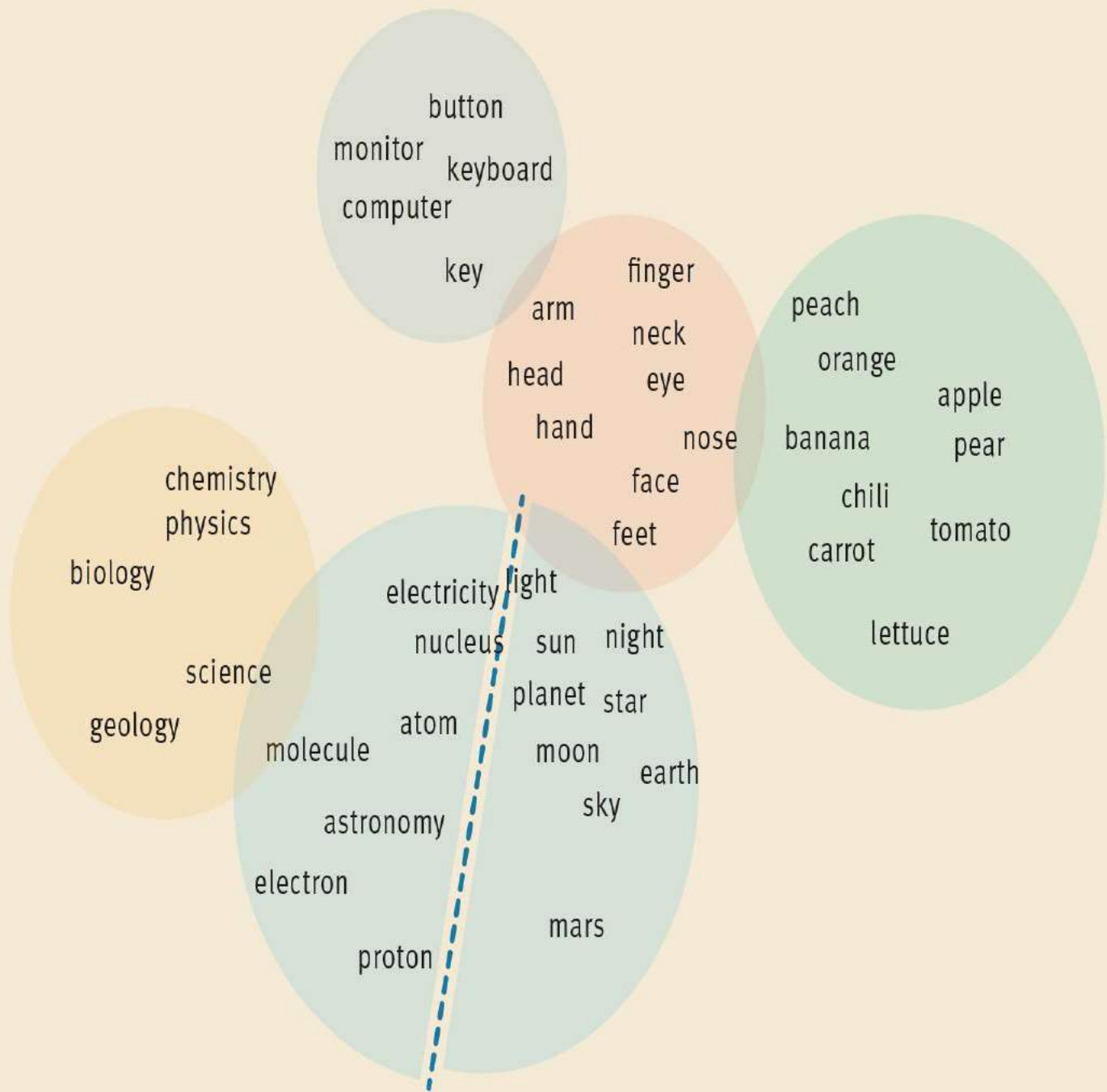
button
monitor
keyboard
computer
key

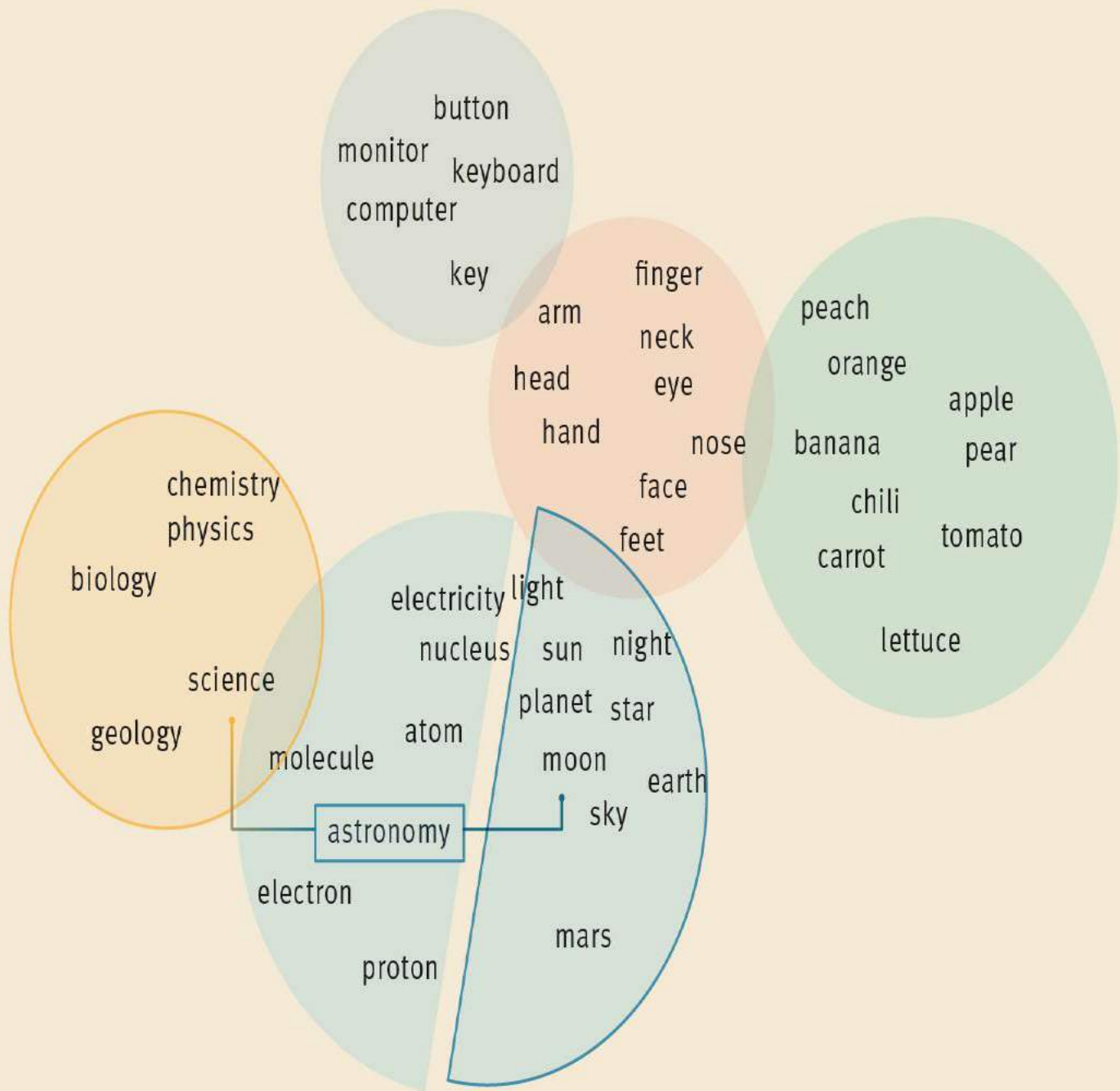
finger
neck
eye
nose
face
feet
arm
head
hand

peach
orange
apple
pear
banana
chili
tomato
carrot
lettuce

chemistry
physics
biology
science
geology

electricity
light
nucleus
sun
night
planet
star
moon
earth
sky
atom
molecule
astronomy
electron
proton
mars



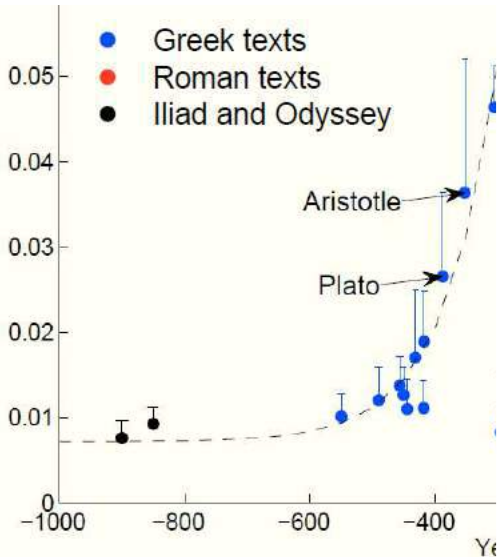


chemistry
physics
biology
geology
science

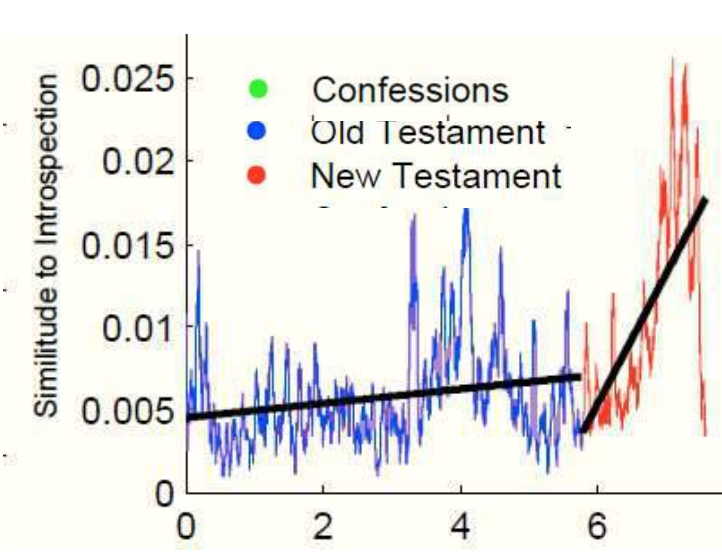
astronomy

Axial Age: A shift in attribution from divine intervention to individual's volition?

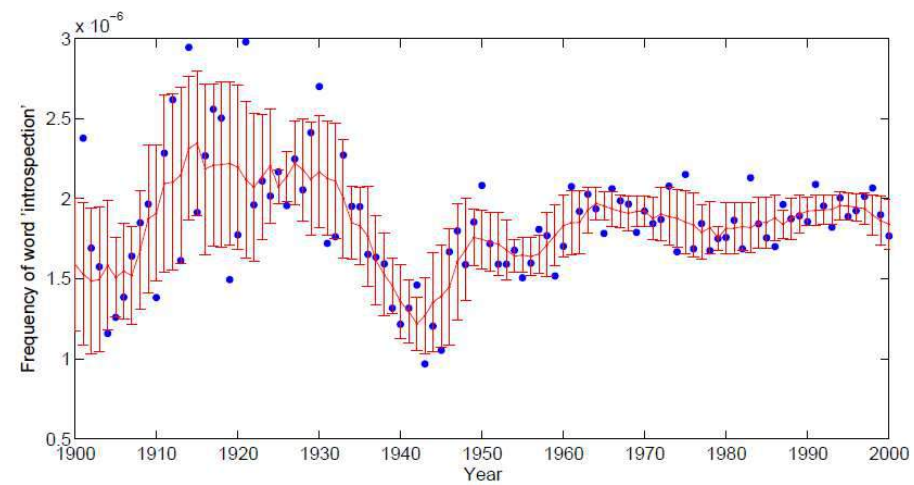
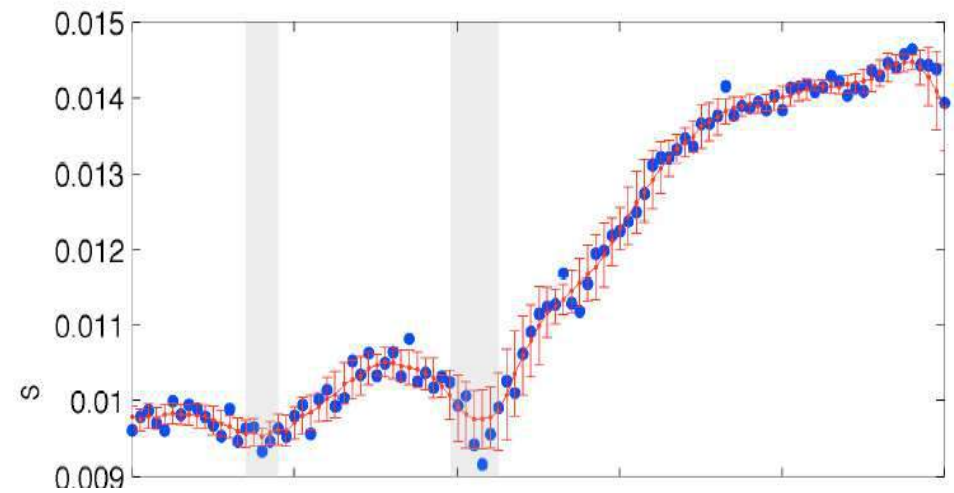
Greco-Roman Tradition



Judeo-Christian Tradition



Evolution of introspection in the Modern Cultural Record



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I can't think of them all offhand. They were the ones I always considered my best songs. They were the ones I really wrote from experience.

...

I know we developed our own style but we still in a way parodied American music. This is interesting, in the early days in England, all the groups were like Elvis and a backing group.

Split into n
sentences

[I can't think of them all offhand.]₁
[They were the ones I always considered my best songs.]₂ [They were the ones I really wrote from experience.]₃

...

[... but we still in a way parodied American music.]_{n-1} [This is interesting, in the early days in England, all the groups were like Elvis and a backing group.]_n

LSA Vectorial
representation

[\ / = / =]₁ [\ /
= \]₂ [/ = / = \]
= / = \]₃ [\ \ /]
...

[/ = / = \ \ / =
=]_{n-1} [\ / = / =]_n

Summary Vector

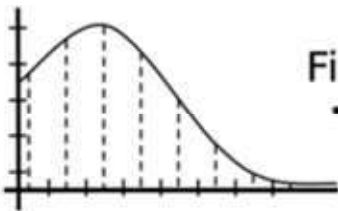
[=]₁ [\]₂
[\]₃
...

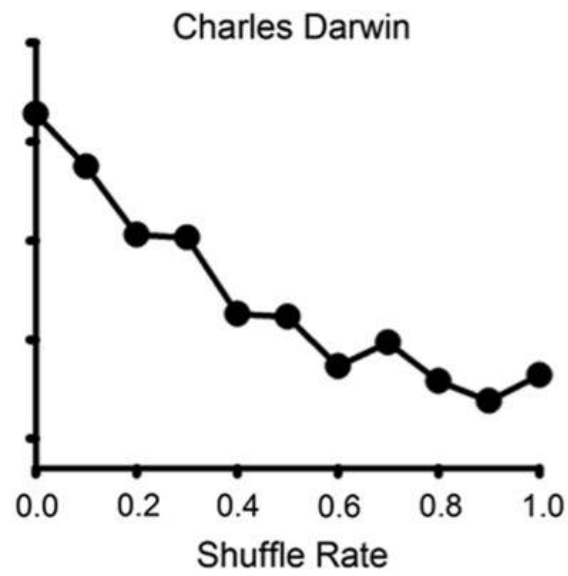
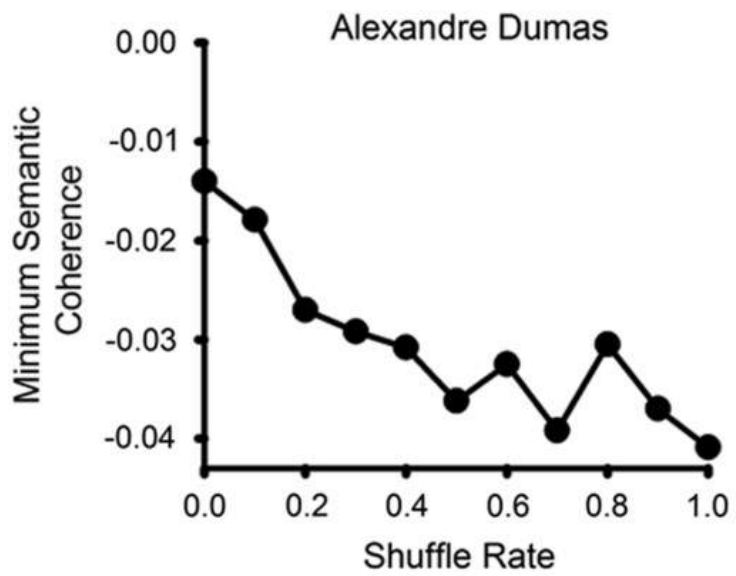
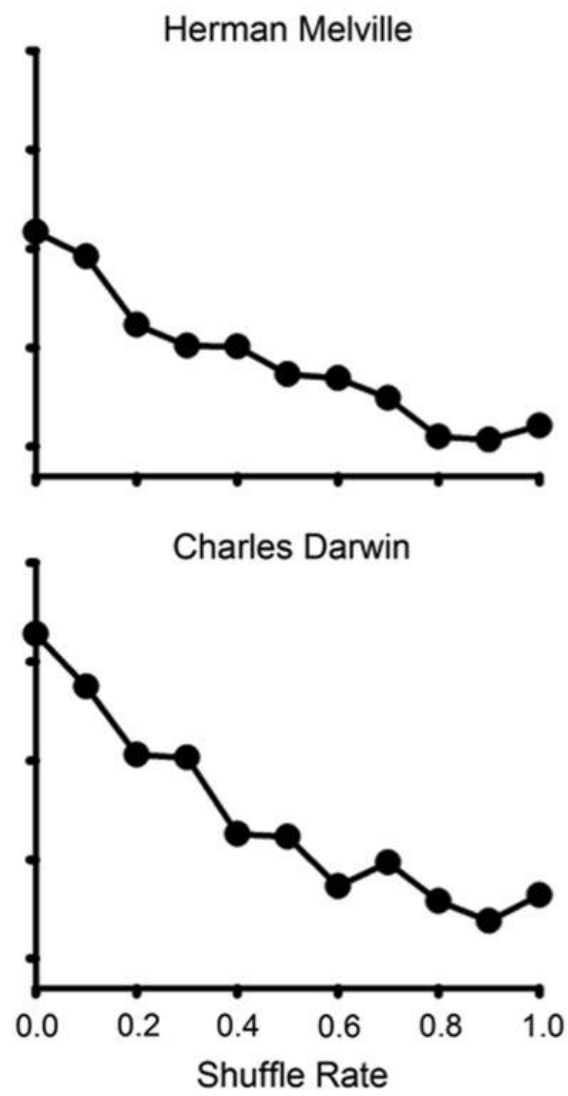
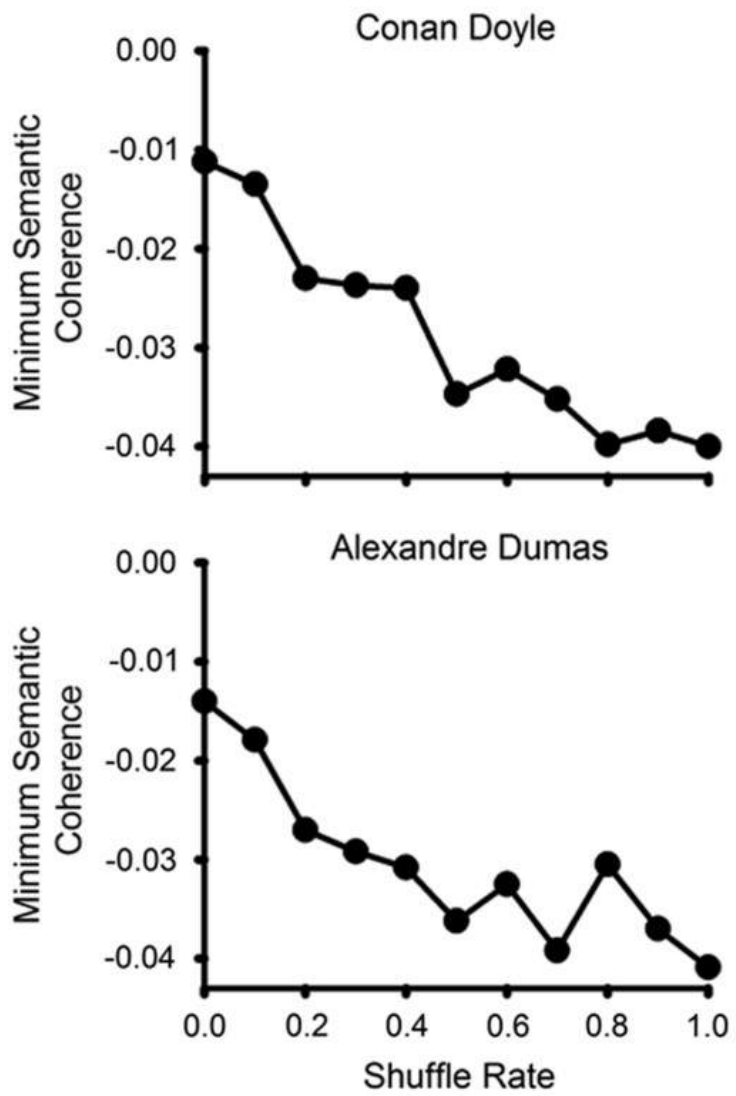
[=]_{n-1}
[/]_n

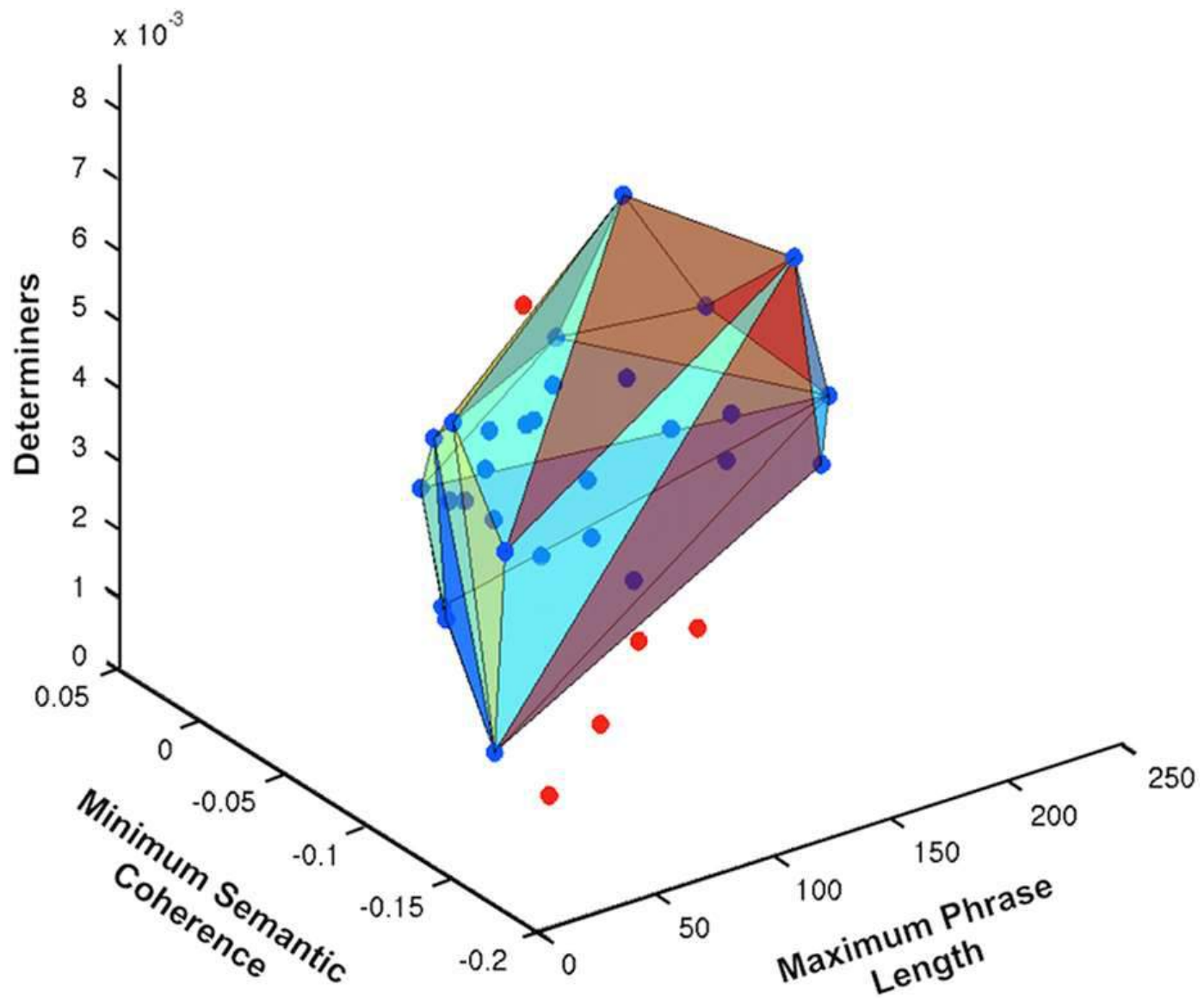
First-order coherence

$\cosine ([]_i, []_{i+1})$

min








Bedi et al (Schizophrenia 2015)

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Director's Blog: Look who is getting into mental health research

RECENT POSTS

-  [Look who is getting into mental health research](#)
August 31, 2015

By [Thomas Insel](#) on **August 31, 2015**

In the U.S., biomedical research funding has been estimated at \$117 billion, following a rough law of thirds: about one-third government (mostly NIH), slightly more than one-third pharmaceutical companies, and the remainder a mix of biotech, foundations, and philanthropy.

Publications by the Director

Selected publications by NIMH Director Thomas Insel

Here are two fascinating previews of this new world I noted during my travels last week.

One was the publication of results from a collaboration between Columbia University and IBM.⁴ The team, led by Gillinder Bedi and Cheryl Corcoran, was looking for a biomarker to predict which clinically high-risk youth would convert to psychosis over a two- to three-year follow up period from an initial interview. Rather than depend on a protein in blood or a brain scan, they used an innovative big data approach to analyze the speech from the initial interview. The



THE NEW OLD AGE
Near the End, It's Best to Be 'Friended'

Obama Tackles Poverty and Sexism in U.N. Speech



Partnership Aims to Bolster Local Health Care Providers



The Fragile Patchwork of Care for New York's Oldest Old



New Efforts to Kick Financial Markets

HEALTH

Head of Mental Health Institute Leaving for Google Life Sciences

By BENEDICT CAREY SEPT. 15, 2015

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Dr. Thomas R. Insel, the director of the National Institute of Mental Health, announced on Tuesday that he planned to step down in November, ending his 13-year tenure at the helm of the world's leading funder of behavioral-health research to join [Google Life Sciences](#), which seeks to develop technologies for early detection and treatment of health problems.

The announcement is no small personnel matter for the behavioral sciences.

Losing [Dr. Insel](#) leaves the agency — which is growing in importance and visibility in the wake of the Obama administration's brain initiative — with a large hole, [mental health](#) experts in and out of government said. Dr. Insel has been an agreeable, determined, politically shrewd presence at an agency that has often taken fire



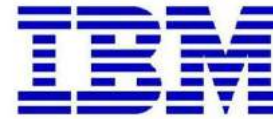
Dr. Thomas R. Insel is leaving the National Institute of Mental Health after 13 years. Lexey Swall for The New York Times



laschool4education.com
James McDonnell Foundation



JAMES S.
MCDONNELL
FOUNDATION



CONICET



Tree.



Tree2.



Martin Elias Costa
Flavia Bonomo

Facundo Carrillo (UBA)
Diego F Slezak (UBA)
Guillermo Cecchi (IBM)



Carlos Diuk (Facebook)
Ivan Raskovsky (UBA)



Gillinder Bedi Natália B Mota
Sidarta Ribeiro , Mauro Copelli
Daniel C Javitt Cheryl M Corcoran