COLIN ALLEN
HPS & COGNITIVE SCIENCE
INDIANA UNIVERSITY

MODELING MEANING AT MULTIPLE SCALES

DEPARTMENT OF HISTORY AND PHILOSOPHY OF SCIENCE
INDIANA UNIVERSITY
College of Arts and Sciences
Bloomington

Cognitive Science

InPhO
the Indiana Philosophy Ontology project

Center for the Integrative Study of Animal Behavior
Indiana University

“In the beginning was the word.”

AUTHOR UNKNOWN

λόγος

“You shall know a word by the company it keeps.”

–J.R. FIRTH 1957, 11

THENCE CAME WORDNET

wordnetweb.princeton.edu

WordNet Search - 3.1

- WordNet home page - Glossary - Help

Word to search for: meaning Search WordNet

Display Options: (Select option to change) Change

Key: "S:" = Show Synset (semantic) relations, "W:" = Show Word (lexical) relations

Display options for sense: (gloss) "an example sentence"

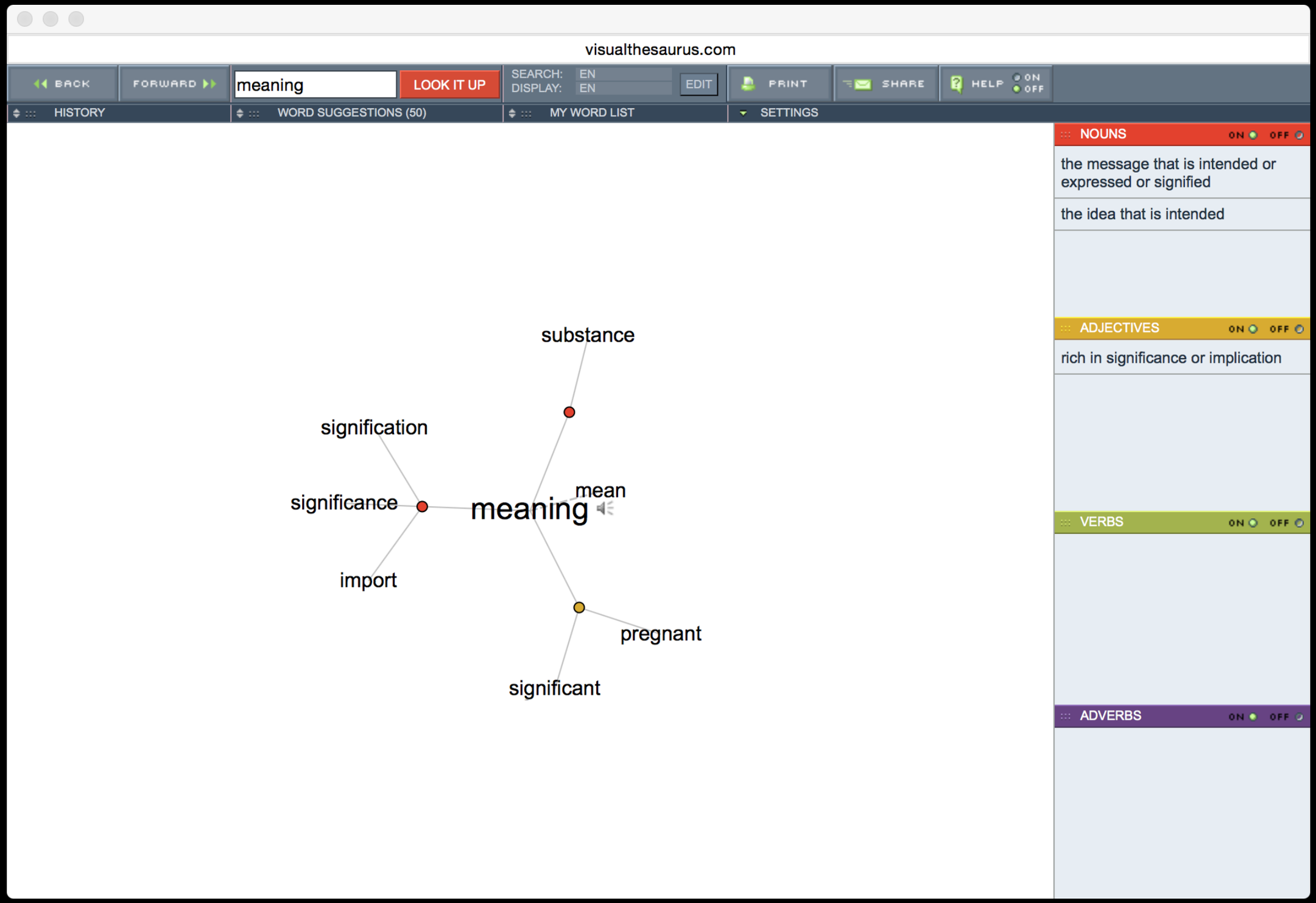
Noun

- S: (n) **meaning**, significance, signification, import (the message that is intended or expressed or signified) *"what is the meaning of this sentence"; "the significance of a red traffic light"; "the signification of Chinese characters"; "the import of his announcement was ambiguous"*
- S: (n) **meaning**, substance (the idea that is intended) *"What is the meaning of this proverb?"*

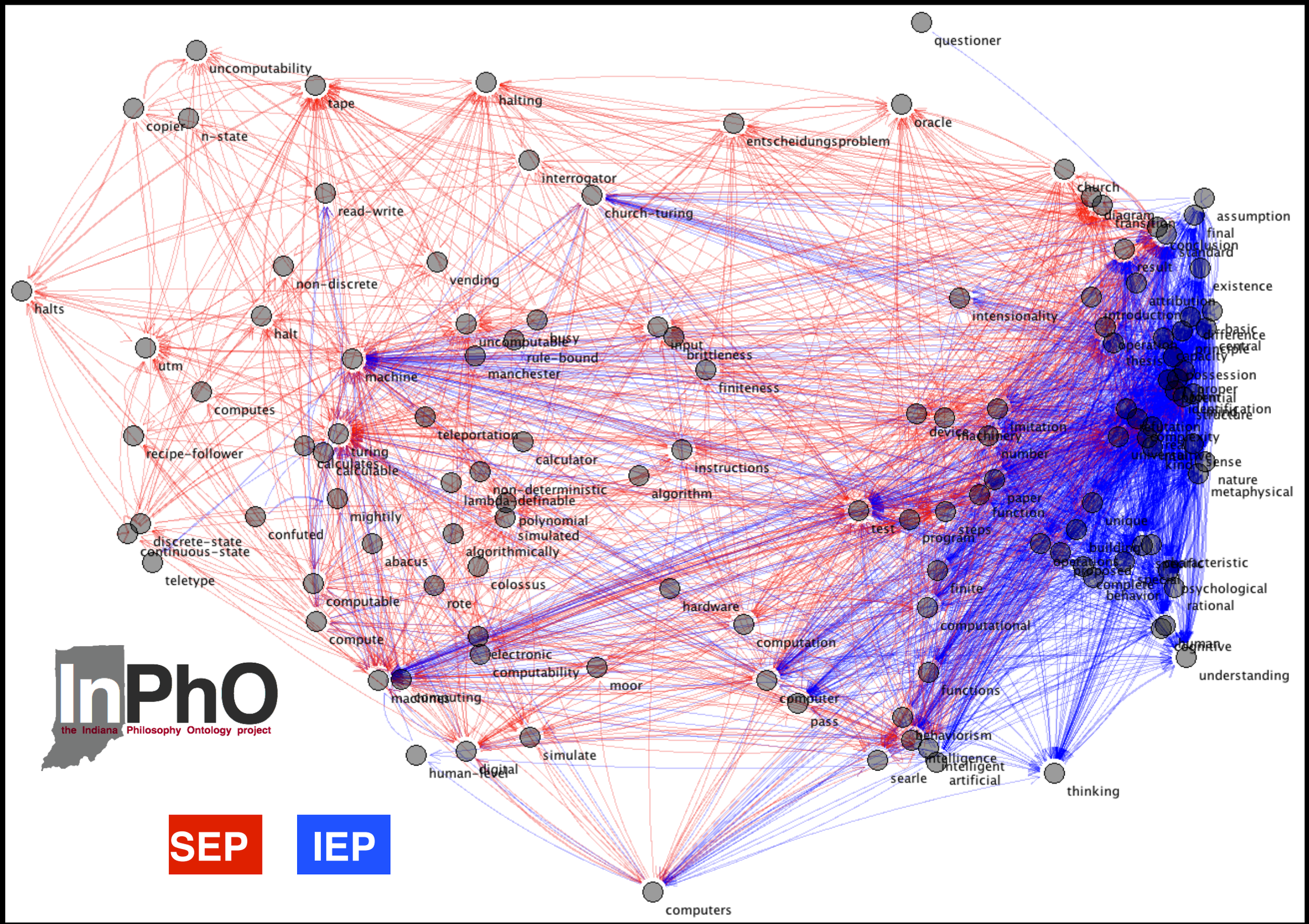
Verb

- S: (v) mean, intend (mean or intend to express or convey) *"You never understand what I mean!"; "what do his words intend?"*
- S: (v) entail, imply, mean (have as a logical consequence) *"The water shortage means that we have to stop taking long showers"*
- S: (v) mean, intend, signify, stand for (denote or connote) *"`maison' means `house' in French"; "An example sentence would show what this word means"*
- S: (v) intend, mean, think (have in mind as a purpose) *"I mean no harm"; "I only meant to help you"; "She didn't think to harm me"; "We thought to return early that night"*
- S: (v) mean (have a specified degree of importance) *"My ex-husband means nothing to me"; "Happiness means everything"*
- S: (v) think of, have in mind, mean (intend to refer to) *"I'm thinking of good food when I talk about France"; "Yes, I meant you when I complained about people who gossip!"*
- S: (v) mean (destine or designate for a certain purpose) *"These flowers were*

AND VISUAL THESAURUS



...AND A TALE OF TWO ENCYCLOPEDIAS



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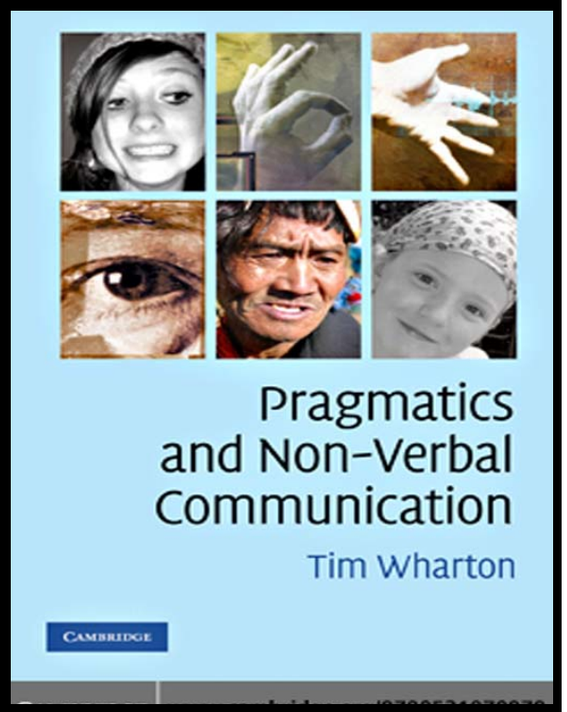
“In the beginning there was logocentrism.”

BUT WHAT IF LOGOCENTRISM IS WRONG?



CHAPTER 3

Pragmatics and the domain of pragmatic principles

There is a point where too much information and too much information processing can hurt. Cognition is the art of focusing on the relevant and deliberately ignoring the rest.
(Gigerenzer and Todd 1999, p. 21)

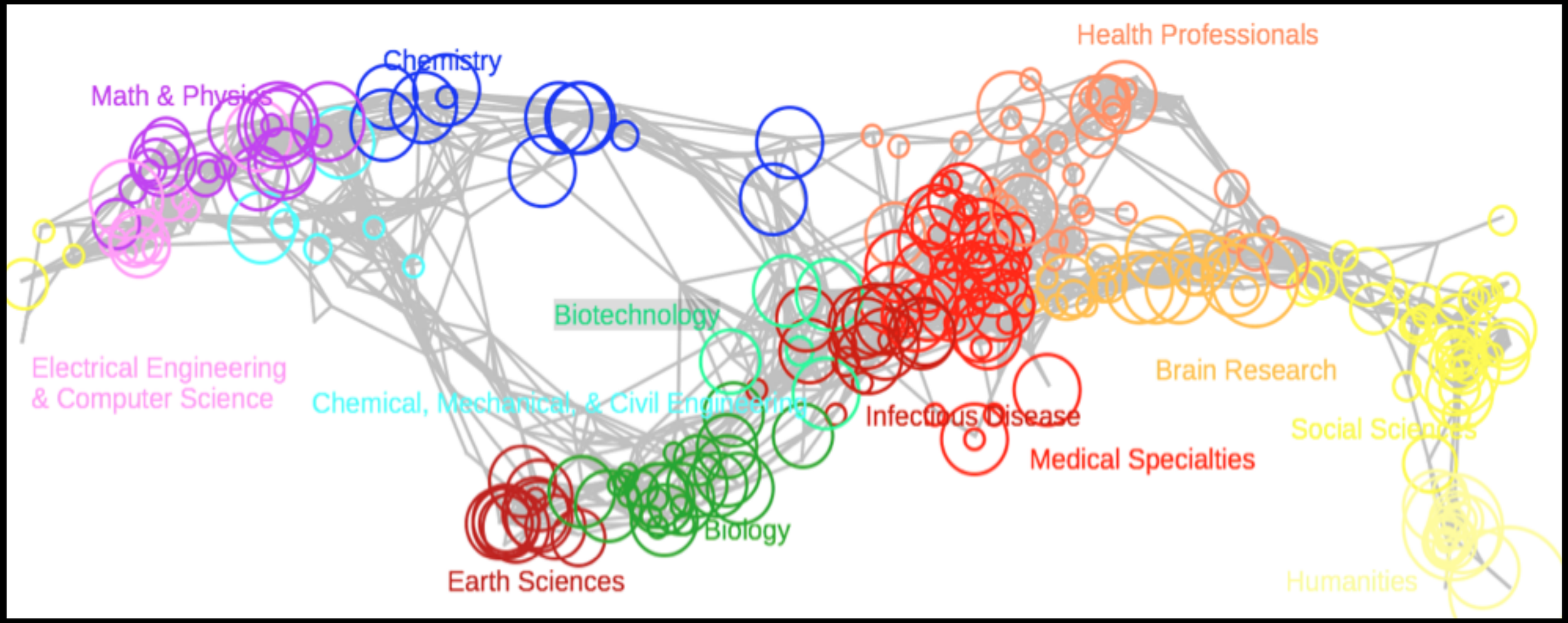
RELEVANCE THEORY AND THE SHOWING–MEANING$_{NN}$ CONTINUUM

In his William James Lectures on 'Logic and Conversation', delivered at Harvard in 1967, Grice proposed that human verbal communication is a cooperative activity driven by the mutual expectation that, in general, participants will obey a Cooperative Principle and Conversational Maxims of Quantity, Quality, Relation and Manner. In outlining his theory of conversation, one of Grice's main aims was to cast light on some of what he regarded as 'illegitimate applications' (1989, p. 3) of certain philosophical 'manoeuvres' by members of the ordinary language philosophy movement. This movement had influenced him greatly at Oxford in the nineteen-forties and fifties; in opposing the central tenets of the 'idealised' language philosophy of Frege, Russell and Carnap, it was instrumental in the birth and development of modern pragmatics.[1]

Jerry Fodor's chief objection to modern pragmatic programmes (an objection shared by Chomsky) is that the processes involved in utterance interpretation are 'global' rather than 'local': any type of information, drawn from any domain, may make a difference to the outcome of the interpretation process, and in Fodor's view such processes are not amenable to scientific study (Fodor 1983).

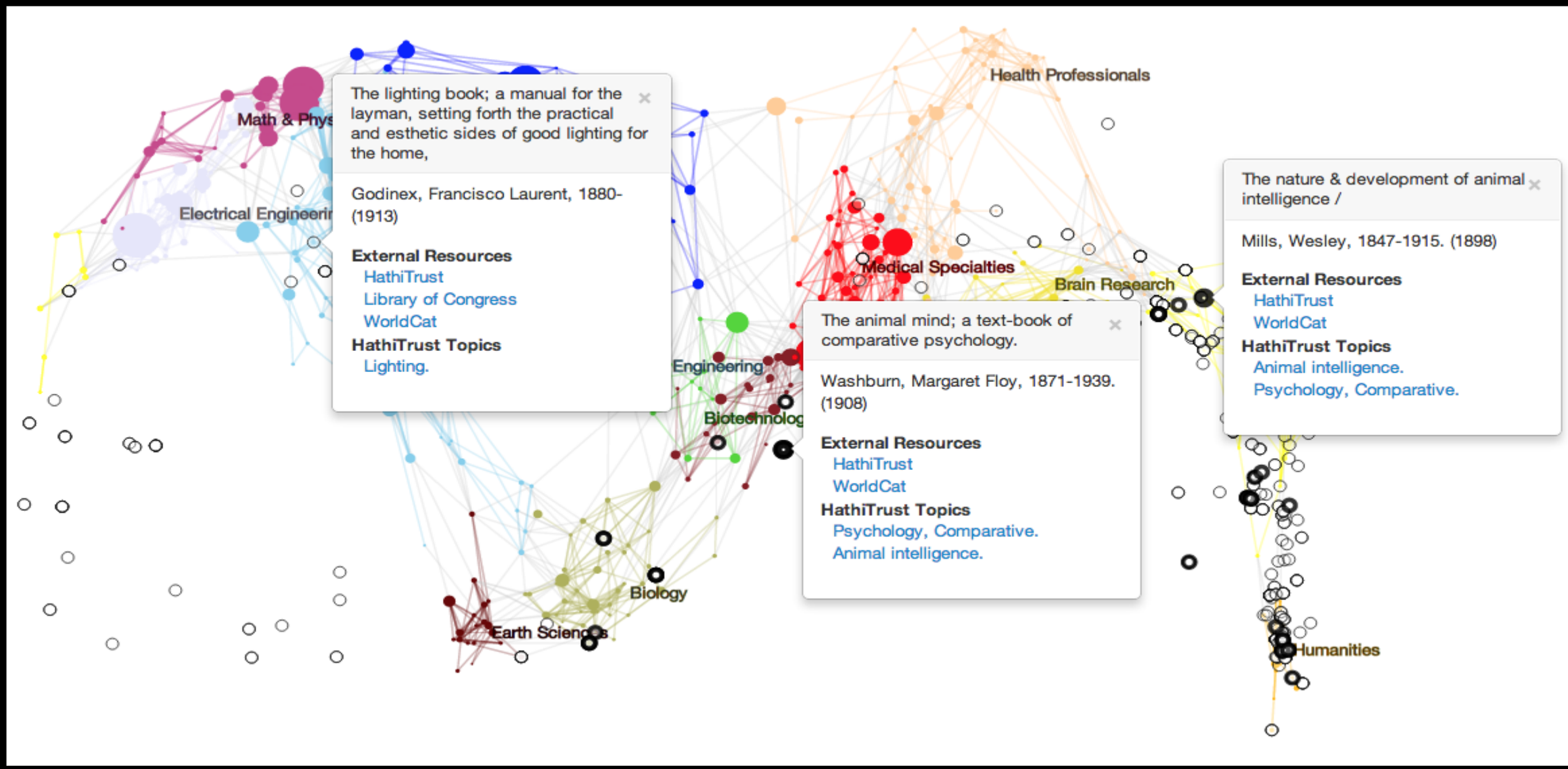
MEANING AT MULTIPLE SCALES

PHILOSOPHY: THE BIG PICTURE

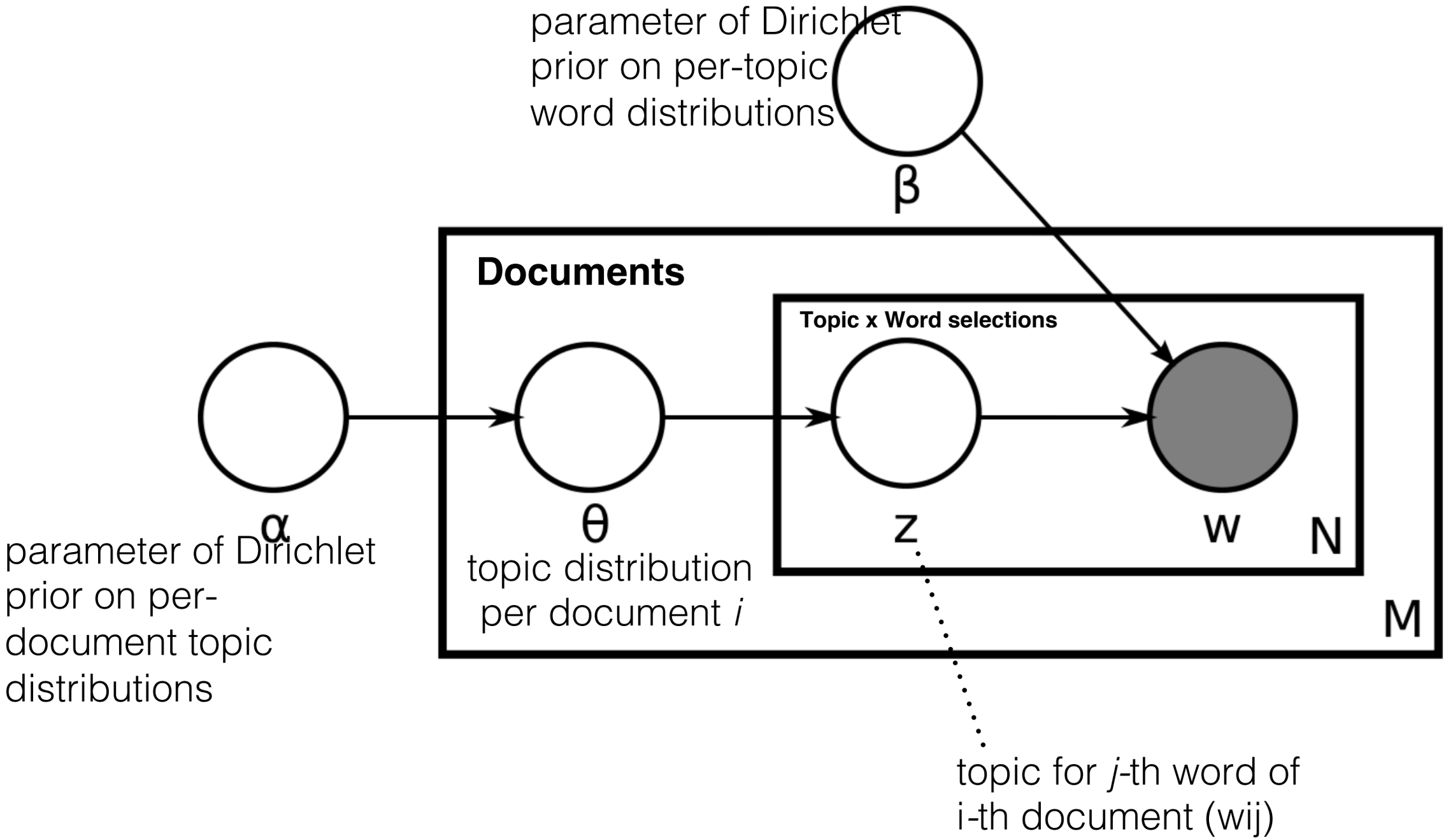


SEP citation patterns

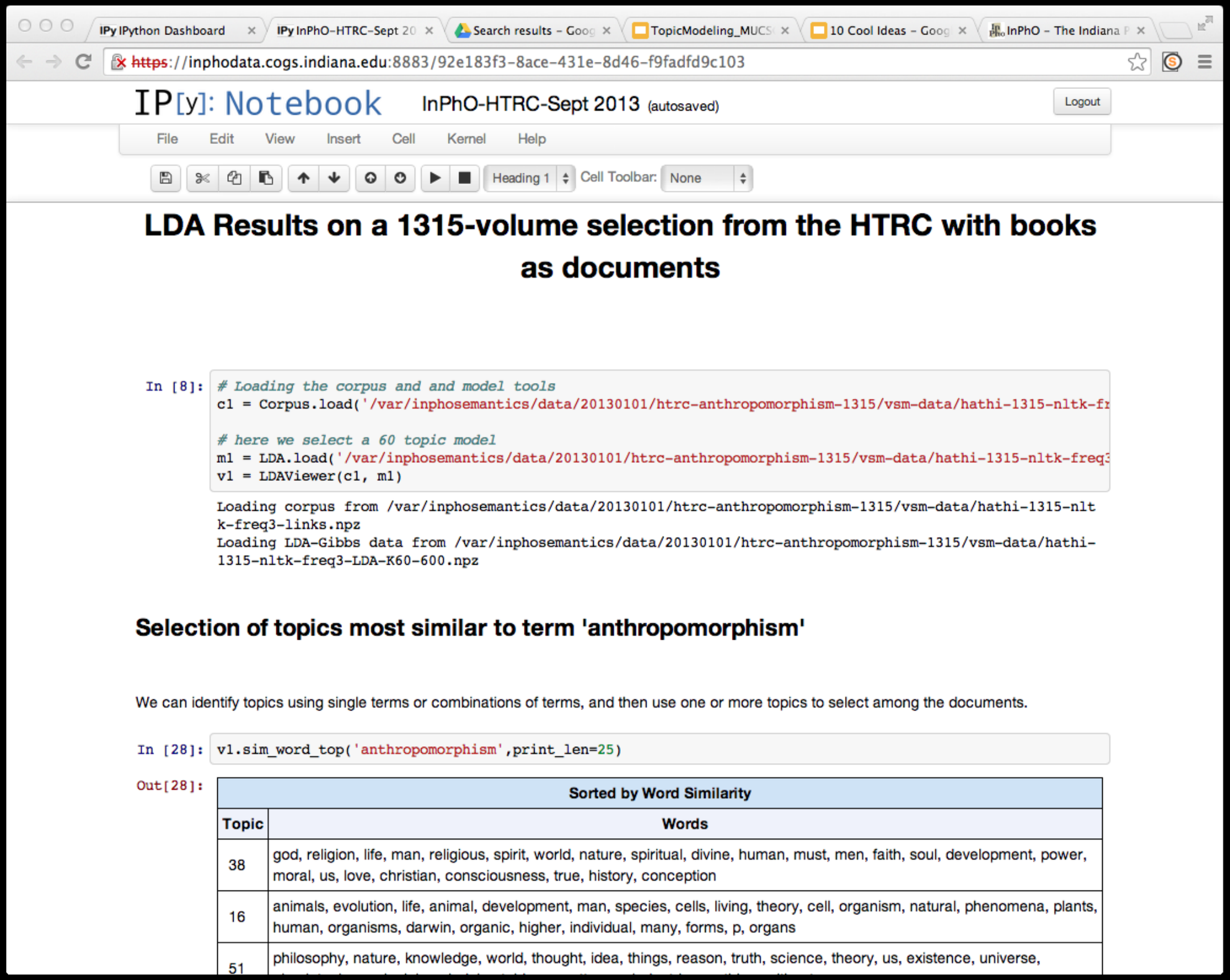
FROM MACRO TO MICRO



LATENT DIRICHLET ALLOCATION (LDA) TOPIC MODEL (Blei et al 2003)



DRILLING DOWN…



TOPIC NETWORKS?

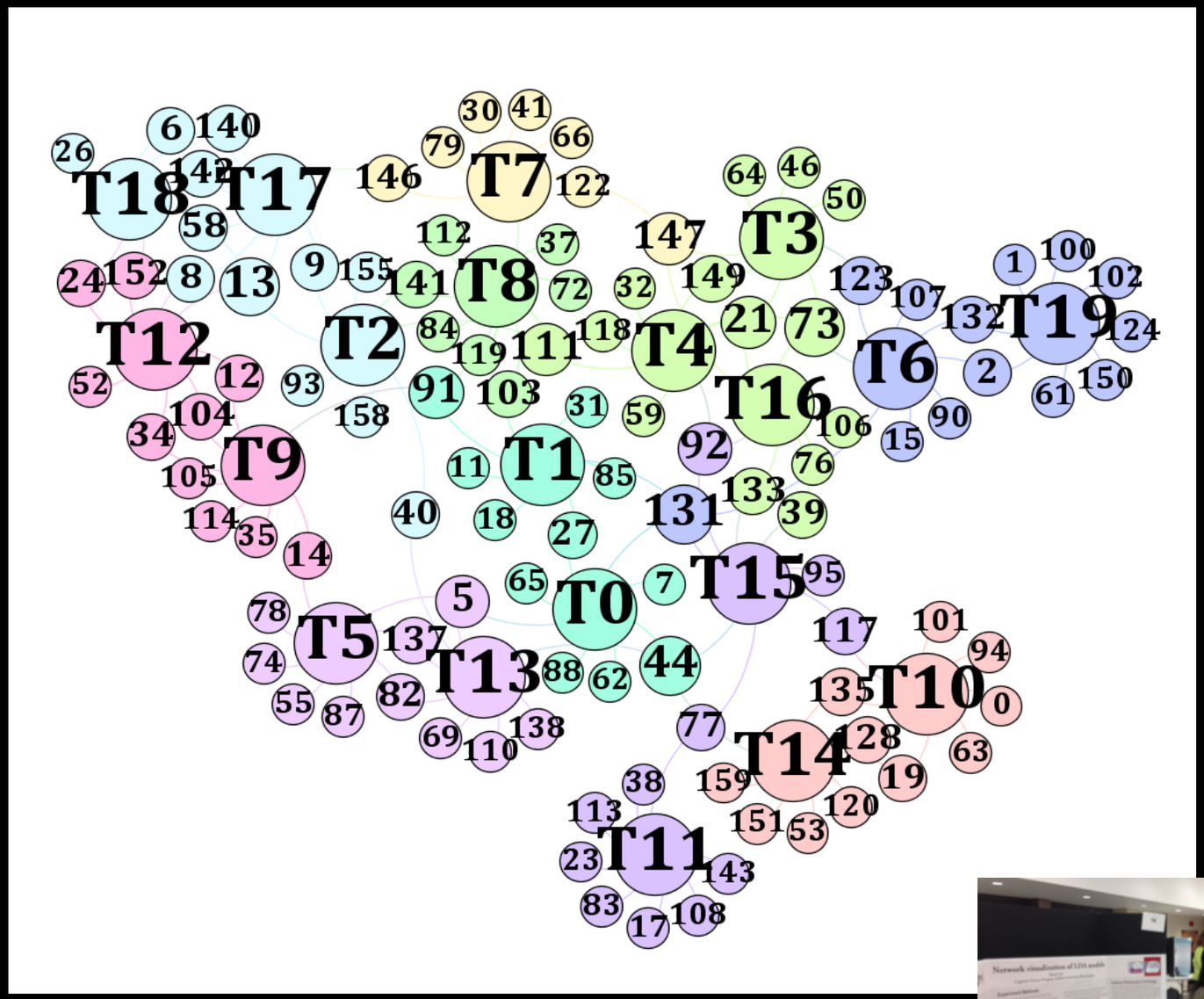


Table 1. *K=20,160 LDA models*

T10	among, also, name, gods, people
T14	religion, church, christian, spirit, christ
0	shall, said, lesous, seven, earth
19	**sacrifice, magic, religion, among, gods**
53	jesus, christian, paul, christ, testament
63	also, practical, demy, press, university
94	among, people, also, races, tribes
101	name, gods, called, also, ancient
120	religion, religious, world, life, human
128	**lord, thou, shall, good, world**
135	**israel, jewish, spirit, jews, people**
151	church, catholic, century, roman, england
159	bible, christ, divine, church, revelation
117	social, primitive, among, group, culture

...AND DOWN...

Selection of topics by multiple terms

```
In [19]: v2.sim_word_top(['anthropomorphism', 'animal','psychology'])
```

Out[19]:

Sorted by Word Similarity	
Topic	**Words**
1	animal, animals, may, stimulus, experience, would, instinct, reaction, one, stimuli
47	animals, animal, upon, wild, man, many, one, among, food, elephant
19	life, animal, nature, animals, living, may, one, every, form, forms
37	water, body, food, animal, mouth, surface, may, small, eggs, fish
59	animals, man, dog, language, certain, animal, dogs, may, lower, many
34	light, eyes, animal, eye, one, movements, sense, food, smell, reaction
49	mind, mental, consciousness, soul, psychology, states, intellect, life, pp, p
42	animals, organs, hydra, fig, one, animal, class, worms, different, body
52	theory, evolution, man, development, life, great, history, soul, first, century
20	nervous, brain, nerve, system, organs, movements, action, matter, nerves, cells
45	science, study, physiology, work, upon, may, one, knowledge, many, anatomy
3	mind, man, facts, life, evolution, instinct, subjective, instincts, organic, development
53	laws, phenomena, nature, law, science, mind, cause, causes, knowledge, principles

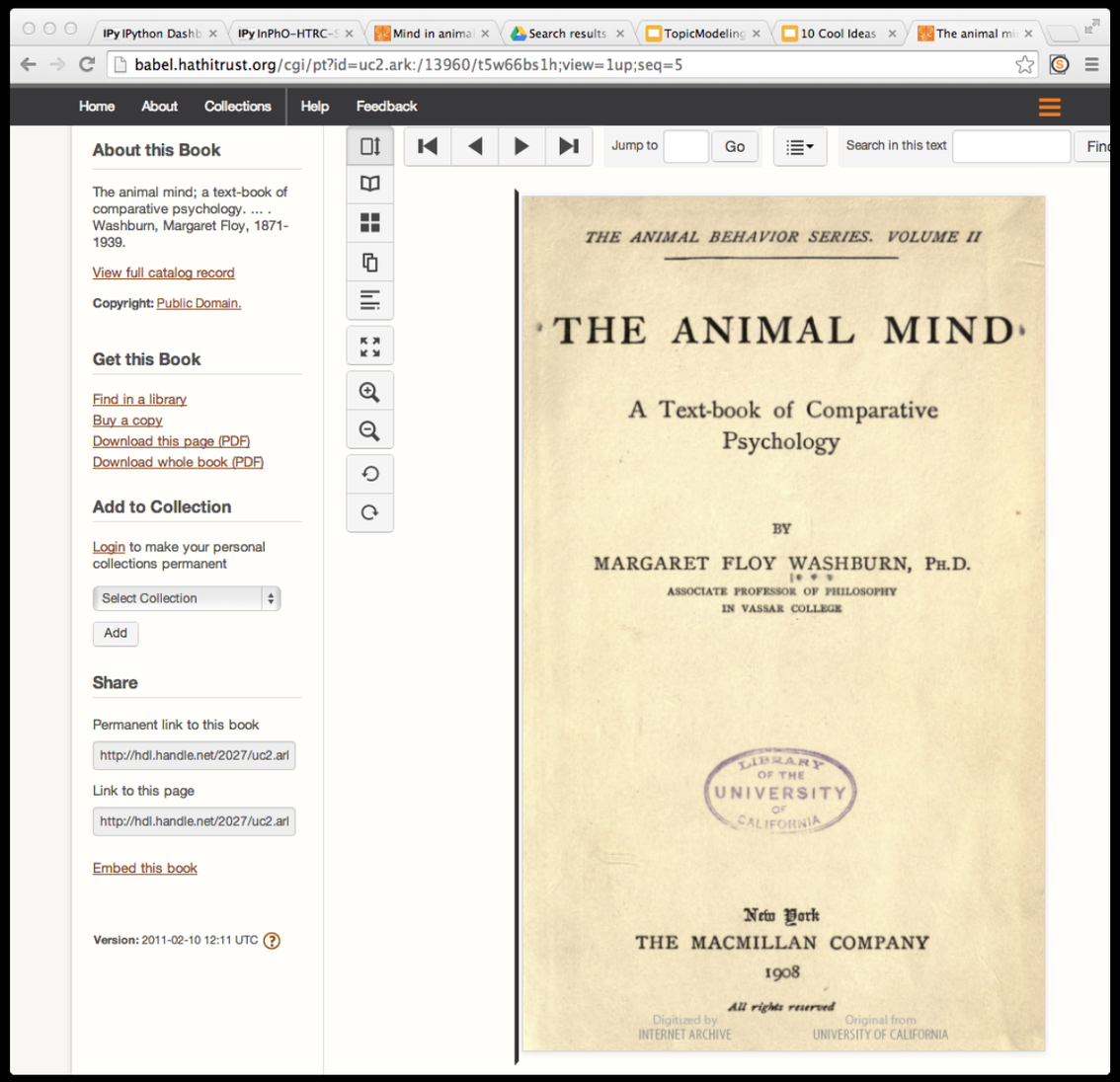
Selection of pages by topic

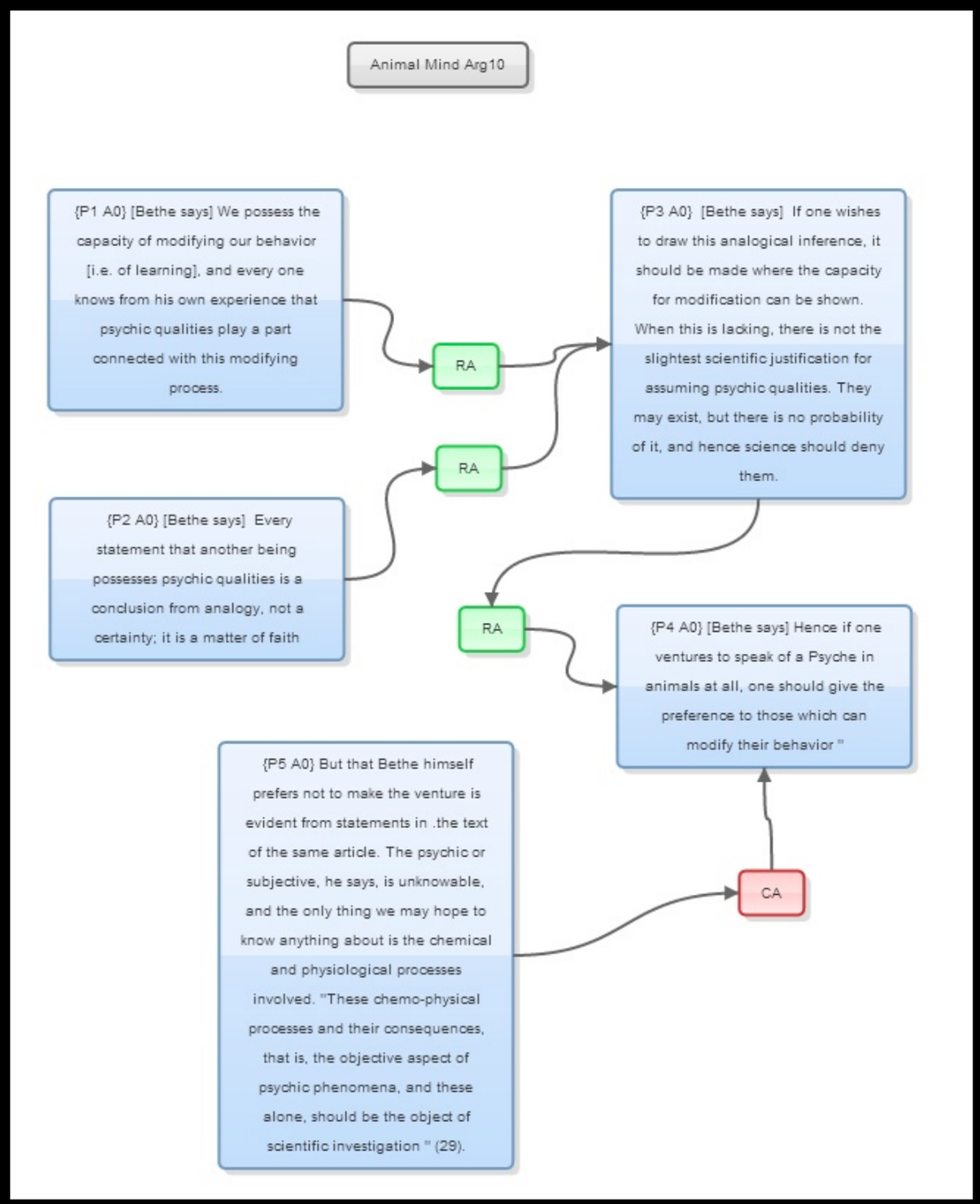
```
In [20]: v2.sim_top_doc(1, print_len=100, label_fn=htrc_label_fn_86)
```

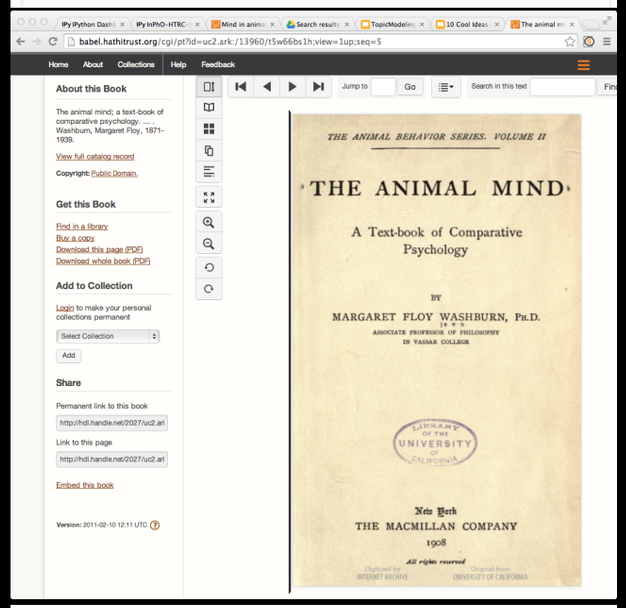
Out[20]:

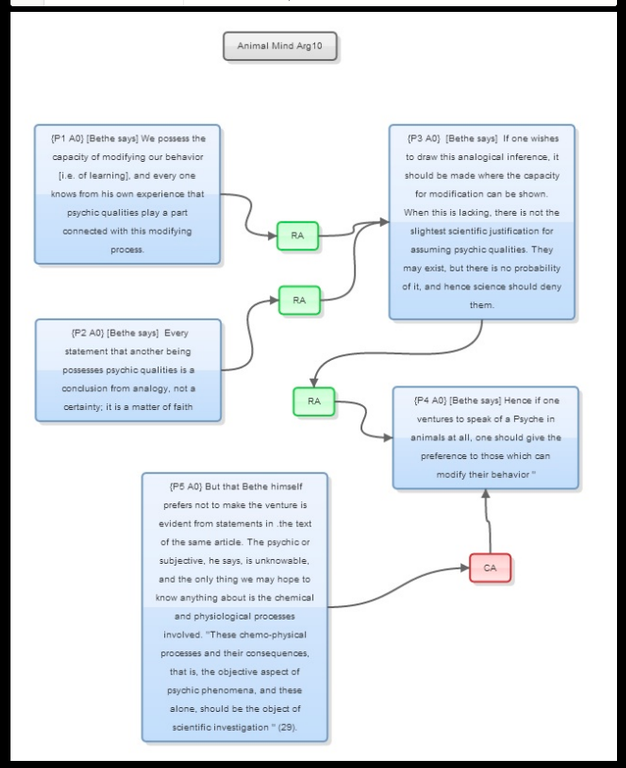
Topics: 1	
Document	**Prob**
The animal mind, uc2.ark+=13960=t5w66bs1h/00000043.txt	1.00000
The animal mind, uc2.ark+=13960=t7gq6st77/00000047.txt	1.00000
The animal mind, uc2.ark+=13960=t7gq6st77/00000016.txt	0.99999
The animal mind, uc2.ark+=13960=t7gq6st77/00000263.txt	0.99993
Mind in the low, uc2.ark+=13960=t59c6tb7t/00000179.txt	0.99988
The animal mind, uc2.ark+=13960=t5w66bs1h/00000219.txt	0.99937
The animal mind, uc2.ark+=13960=t7gq6st77/00000071.txt	0.99893
The animal mind, uc2.ark+=13960=t5w66bs1h/00000232.txt	0.99887
The animal mind, uc2.ark+=13960=t5w66bs1h/00000057.txt	0.99778
The animal mind, uc2.ark+=13960=t7gq6st77/00000048.txt	0.99700

...TO ARGUMENTS



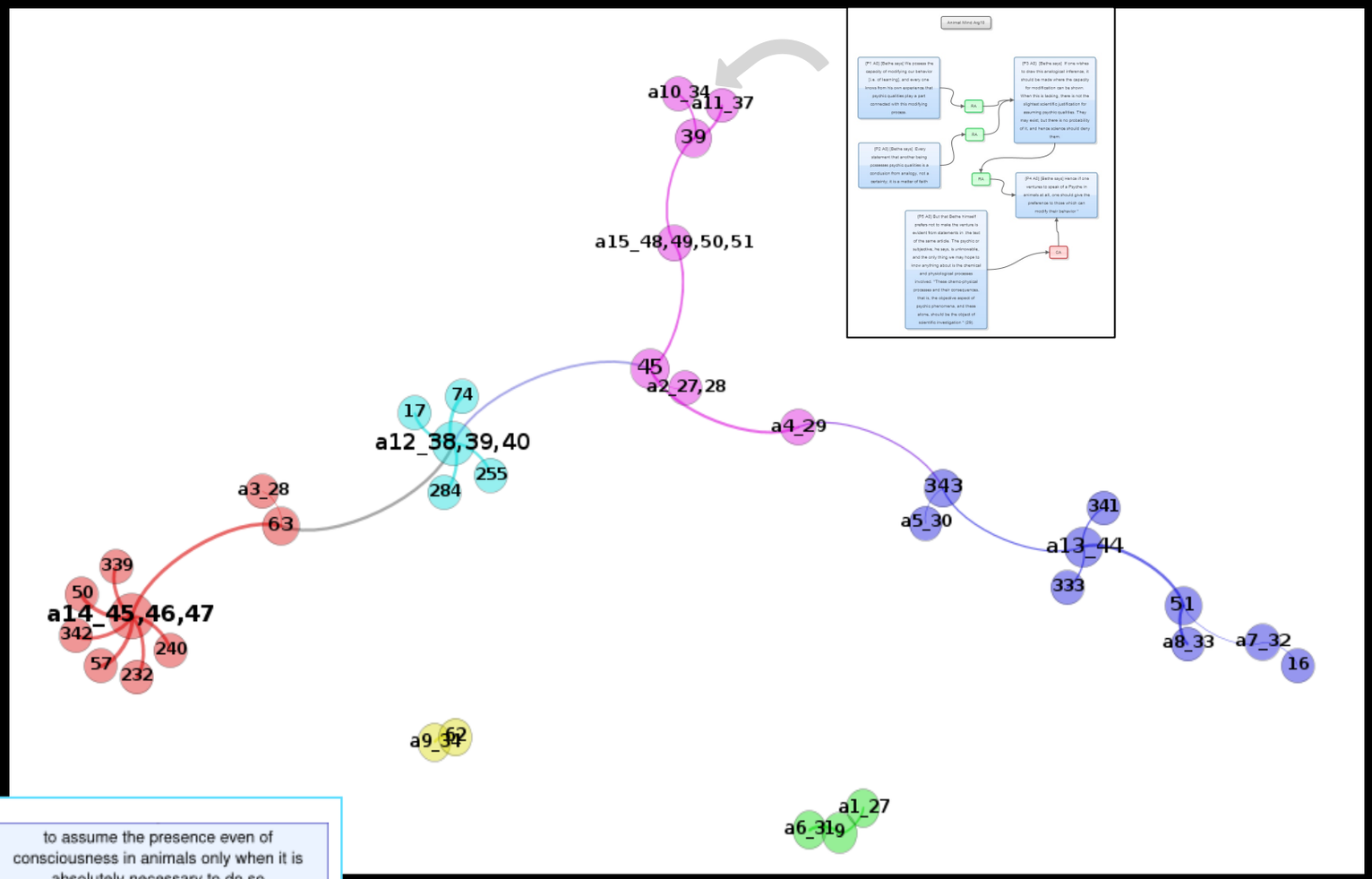


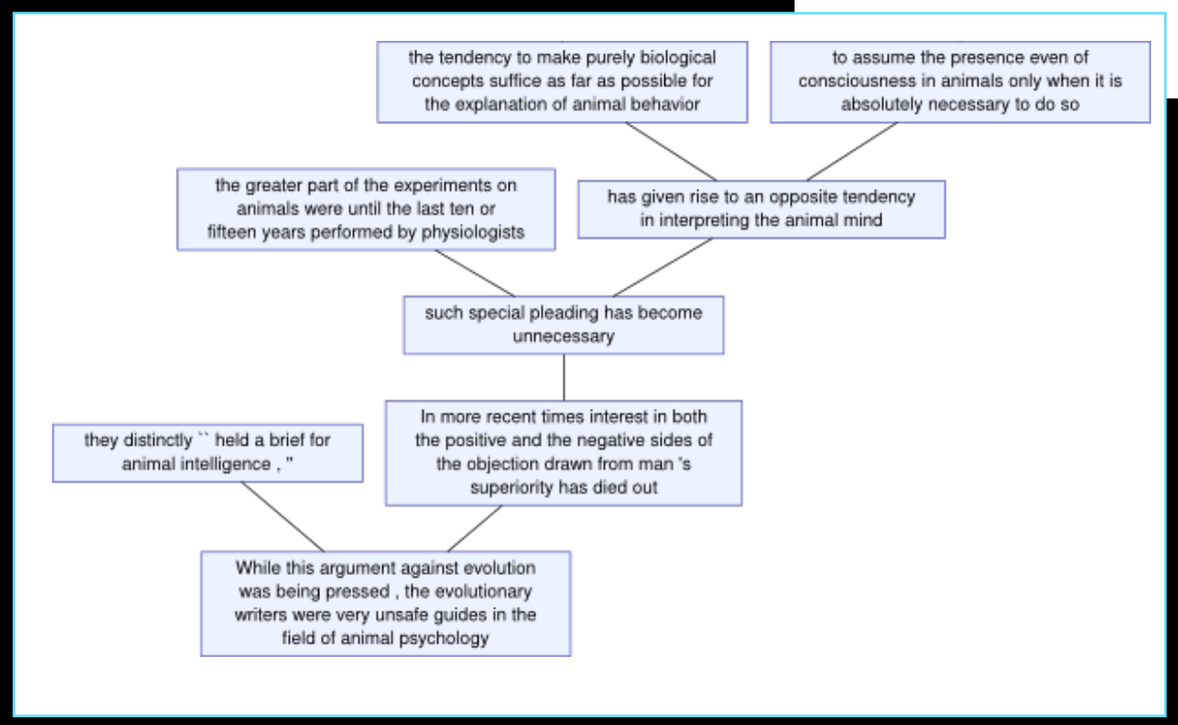




AND SENTENCES	√(JSD)
EVERY STATEMENT THAT ANOTHER BEING POSSESSES PSYCHIC QUALITIES IS A CONCLUSION FROM ANALOGY, NOT A CERTAINTY; IT IS A MATTER OF FAITH.	1.0000
IF ANY CONSCIOUSNESS ACCOMPANIES IT, THEN THE NEAREST HUMAN ANALOGY TO SUCH CONSCIOUSNESS IS TO BE FOUND IN ORGANIC SENSATIONS, AND THESE, AS HAS JUST BEEN SAID, MUST NECESSARILY BE IN THE HUMAN MIND WHOLLY DIFFERENT IN QUALITY FROM ANYTHING TO BE FOUND IN AN ANIMAL WHOSE STRUCTURE IS AS SIMPLE AS THE AMOEBA'S.	0.8413
FANCY, FOR EXAMPLE, ONE OF US ENTERING A ROOM IN THE DARK AND GROPING ABOUT AMONG THE FURNITURE.	0.8239
THIS, OF COURSE, DOES NOT REFER TO THE POWER TO JUDGE DISTANCE.	0.8235
AGAIN, A BODILY STRUCTURE ENTIRELY UNLIKE OUR OWN MUST CREATE A BACKGROUND OF ORGANIC SENSATION WHICH RENDERS THE WHOLE MENTAL LIFE OF AN ANIMAL FOREIGN AND UNFAMILIAR TO US.	0.8224
SHE DISPOSES OF THE PSYCHIC LEARNING BY EXPERIENCE THEORY OF NAGEL BY SAYING THAT THE ONLY EXPERIENCE UPON WHICH THE ANIMAL COULD REJECT THE FILTER PAPER	0.8198

INTERROGATING ARGUMENTS ACROSS EDITIONS





DEMONSTRATING UNDERSTANDING

- describing appropriately
- paraphrasing
- giving examples
- acting appropriately

CAN THIS BE MADE MORE ACCESSIBLE?

InPhO Topic Explorer

the Indiana Philosophy Ontology project

This interactive visualization displays information from the LDA topic models generated using the InPhO VSM module. Live demos trained on the Stanford Encyclopedia of Philosophy, a selection of books from the HathiTrust Digital Library, and the original LDA training set of Associated Press articles are available below for several different numbers of topics.

See Wikipedia: Latent Dirichlet Allocation for more on the LDA topic modeling approach or "Probabilistic Topic Models" (Blei, 2012) for a recent review.

Contact Jaimie Murdock (jammurdo@indiana.edu) with further comments.
Source code and issue tracking for this page available at GitHub.

Tweet 24

SEP Demo

Document [shuffle] Visualize

The Stanford Encyclopedia of Philosophy (SEP) is the leading digital philosophy authority with over 1.2 million weekly article downloads of the more than 1,200 articles written by 1,600 authors and editors. It provides a comprehensive view of philosophy, and is ripe for topic exploration at a variety of levels. Clicking the [shuffle] button will populate the box with a random SEP article.

HTRC-1315 Demo

Document [shuffle] Visualize

The HTRC-1315 collection comprises 1,315 full text volumes retrieved from HathiTrust Research Collection in 2013 with a search for the terms "anthropomorphism", "comparative psychology", and "Darwin". This corpus is meant to show how topic modeling can be used to improve corpus curation and is guided by real-world research practice for the history of comparative psychology. Use the search box to select a volume or click the [shuffle] button to populate the box with a random volume.

AP Demo

Document [shuffle] Visualize

This corpus of 2,246 Associated Press articles is the original sample dataset for LDA, released by Blei (2003). It consists of short news stories from 1988-1990. Clicking the [shuffle] button will populate the box with a random AP article.

inphodata.cogs.indiana.edu

Apple Yahoo Google Maps YouTube Wikipedia News Popular The Prisoner's Dilemma .Mac Amazon SEP OntoTree SEP search eBay wiki

InPhO - The Indiana Philosophy Ontology Project | InPhO Topic Explorer

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AP Demo

Document | Visualize

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0.0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0

THE ANIMAL MIND; A TEXT-BOOK OF COMPARATIVE PSYCHOLOGY.
The animal mind; a text-book of comparative psychology.
The synaesthesia of a blind subject with comparative data from an asynaesthetic blind subject,
Physiology of the special senses,
Principles of physiological psychology.
Ants and some other insects; an inquiry into the psychic powers of these animals, with an appendix on the peculiarities of their olfactory sens
A course in experimental psychology,
Retrograde degeneration in the spinal nerves.
An introduction to the study of colour vision,
The Mechanism of the brain and the function of the frontal lobes /
Vegetative neurology; the anatomy, physiology, pharmaco-dynamics and pathology of the sympathetic and autonomic nervous systems,
Physiology and histology of the cerebral convolutions. Also, Poisons of the intellect,
The mechanism of the brain and the function of the frontal lobes;
Physiology of the nervous system, by J.P. Morat ...
An introduction to psychology,
The anatomy of the central nervous system of man and of vertebrates in general/
The physiology of the senses,
The physiology of the senses,
On certain electrical processes in the human body and their relation to emotional reactions,
Psychology,
Comparative physiology and psychology. A discussion of the evolution and relations of the mind and body of man and animals.
Sight: an exposition of the principles of monocular and binocular vision.
Sight: an exposition of the principles of monocular and binocular vision.
The American encyclopedia and dictionary of ophthalmology /
A text-book of comparative physiology for students and practitioners of comparative (veterinary) medicine,
The evolution and function of living purposive matter,
The internal secretions and the nervous system /
The American journal of psychology.
Brain & its functions.
Growth during school age,
The soul of man; an investigation of the facts of physiological and experimental psychology,
Growth during school age,
The human species considered from the standpoints of comparative anatomy, physiology, pathology and bateriology,
Diseases of the nervous system.
The evolution and function of living purposive matter,
The delayed reaction in animals and children

40 Topics ordered by P(T | uc2.ark+=13960=t7gq6

27	22
3	23
9	24
37	31
25	36
20	13
29	0
28	1
15	2
12	5
11	7
21	8
38	16
19	26
6	30
4	32
10	33
14	34
17	35
18	39

Display Options

- [ ] Alphabetical sort
- [ ] Normalize topic bars

Reset Topic Sort

THANKS TO...

- InPhO Group Members
  - Jaimie Murdock
  - Robert Rose
  - Doori Lee
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- InfoVis Lab
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  - Robert Light
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  - Simon MacAlister
  - Chris Reed