

# Exploring Disciplinarity

## Talk Series on Networks and Complex Systems

Cassidy Sugimoto  
Scott Weingart & Chaoqun Ni

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# Conceptualizations

Social	“a recognized community of researchers”
Communicative	“established manner for communication their findings”
Cognitive	“coherence of content”
Methodological	“finite set of methods of inquiry”
Institutional	“group of institution that persist and remain stable over time”
Educational	“a system for perpetuating the discipline by training new practitioners”

# Operationalizations

- Units

- Person
- Paper
- Journal
- Department
- Degree
- Institution

- Methods

- Word co-occurrence
- Topic modeling
- Citation/co-citation/bibliographic coupling
- Collaboration/co-authorship/co-worker networks
- Hybrid

- Approaches

- Top-down
- Bottom-up

"The disciplinary diversity of an article's content can be considered as an indicator of the discipline of WoS in the references of a text and therefore its disciplinary level and core." (Bartelds and Meert, 2010)

## Conceptualization



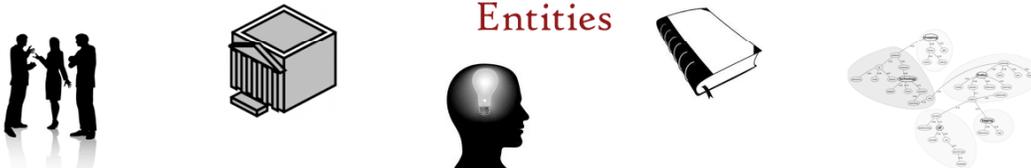
## Trace

University Website	labs/centers, faculty, syllabi, locations, course lists, research interests
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## Analysis

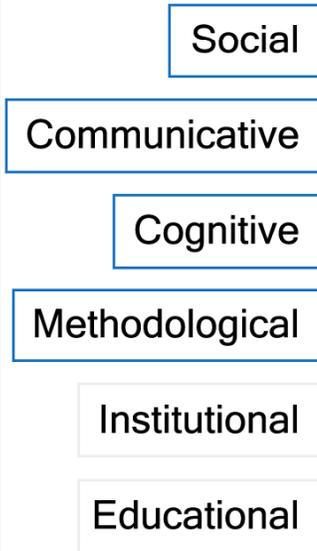


## Entities



## Conceptualization

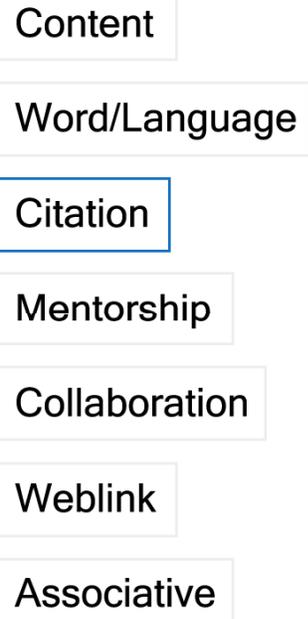
Disciplinary, Multidisciplinary, Interdisciplinary – Concepts and Indicators.  
Van den Besselaar & Heimeriks, 2001



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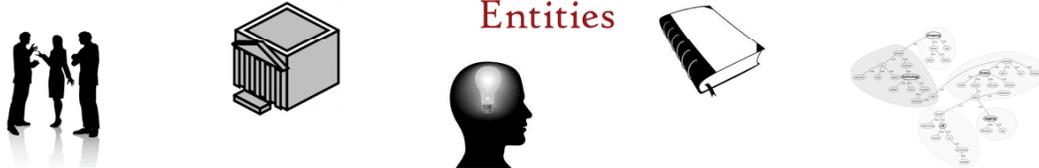


Table 1: Cognitive Science

Year	Number of factors	Number of journals	Rank of core factor	Rank of core journal	Explained variance	Explained variance factor 1	Main factors <sup>2</sup>
1982	7	21	1	3/8	26.2		CP (incl. CogS), P, CDP, Phil, AI (single)
1984	12	40	1	13/13	22.4		CP (incl. CogS), Phil, IS&CS, AI & PR, Communication
1986	11	29	1	8/8	21.5		CP, CDP, AI, EP, IS, Language, CogS
1988	11	27	3	4/4	8.6	13.1	CP, SN, AI (incl. CogS), EP, P, CS
1990	10	38	3	3/5	8.8	19.5	CP, CDP, AI (incl. CogS), BS, Linguistics, EP
1992	12	44	4	4/4	7.6	20.3	CP, AI, NN, CogS, EP, BS,
1994	17	61	5	4/4	5.4	18.2	CP, HCI/AI, EP, NN (inc SN), AI (incl CogS), CDP, Linguistics, CS/MIS
1996	18	71	12	3/3	2.9	15.8	CP, AI, NN, BBS, CDP, Instruction (incl. CogS), Ergonomics, CD.
1998	13	50	1	11/11	3.7	15.7	CP (incl CogS), AI, EP, SN, NN, CDP, HCI

1. Core journal is *Cognitive Science*. Threshold = 0.5%; this means that all journals are included with at least either 0.5% of the total number of references in that year to the core journal, or 0.5% of all citations by the core journal. Analysis: Principal component analysis, Varimax, Kaiser rotation.
2. AI = Artificial Intelligence, BS = Brain Research, CP = Cognitive Psychology, CDP = Child & Developmental Psychology, CS = Computer Science, CogS = Cognitive Science, EP = Educational Psychology, HCI = Human-Computer Interaction, P = Psychology, PA = Pattern Analysis and Vision, Phil = Philosophy & Discourse, NN= Neural Networks, IS = Information Science, SN = Science and or Nature etc.

# Conceptualization

# Trace

# Analysis

Betweenness Centrality as an Indicator of the Interdisciplinarity of Scientific Journals.  
Leydesdorff, 2007

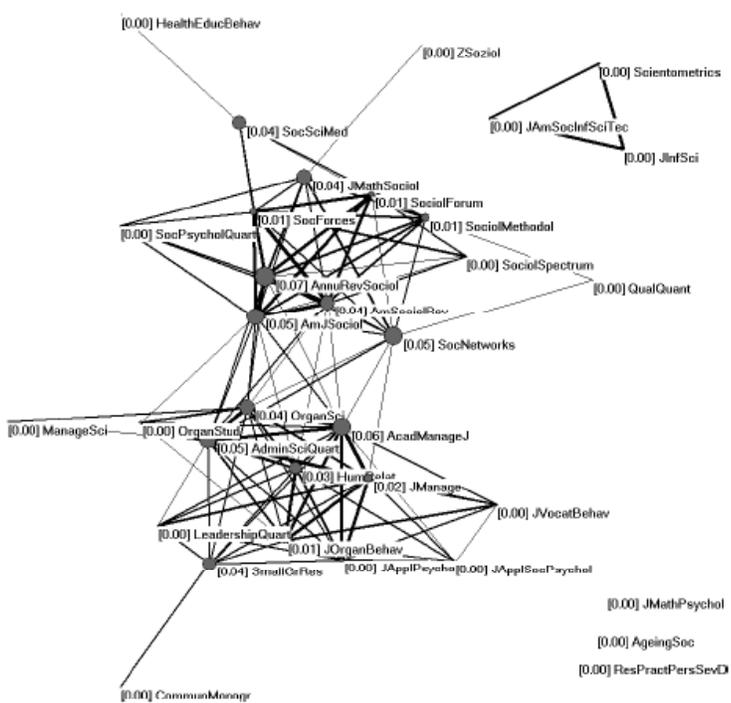
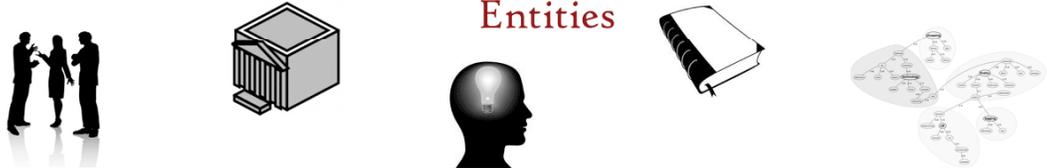
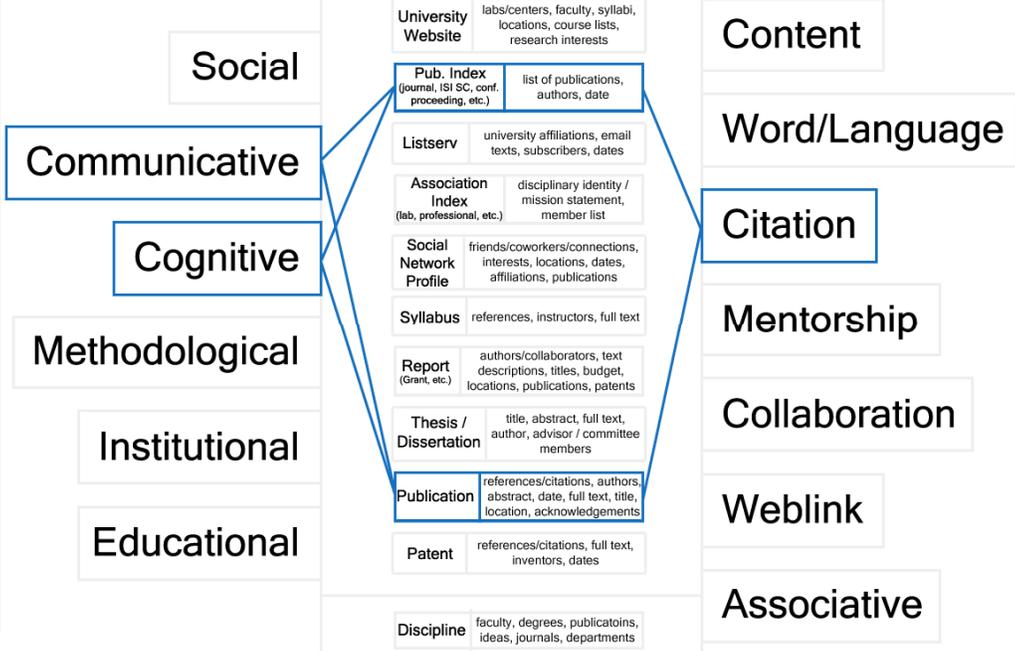


FIG. 8. Betweenness centrality among the 40 journals in the citation environment of *Social Networks* using exclusively the *Social Sciences Citation Index* as a database (cosine  $\geq 0.2$ ).

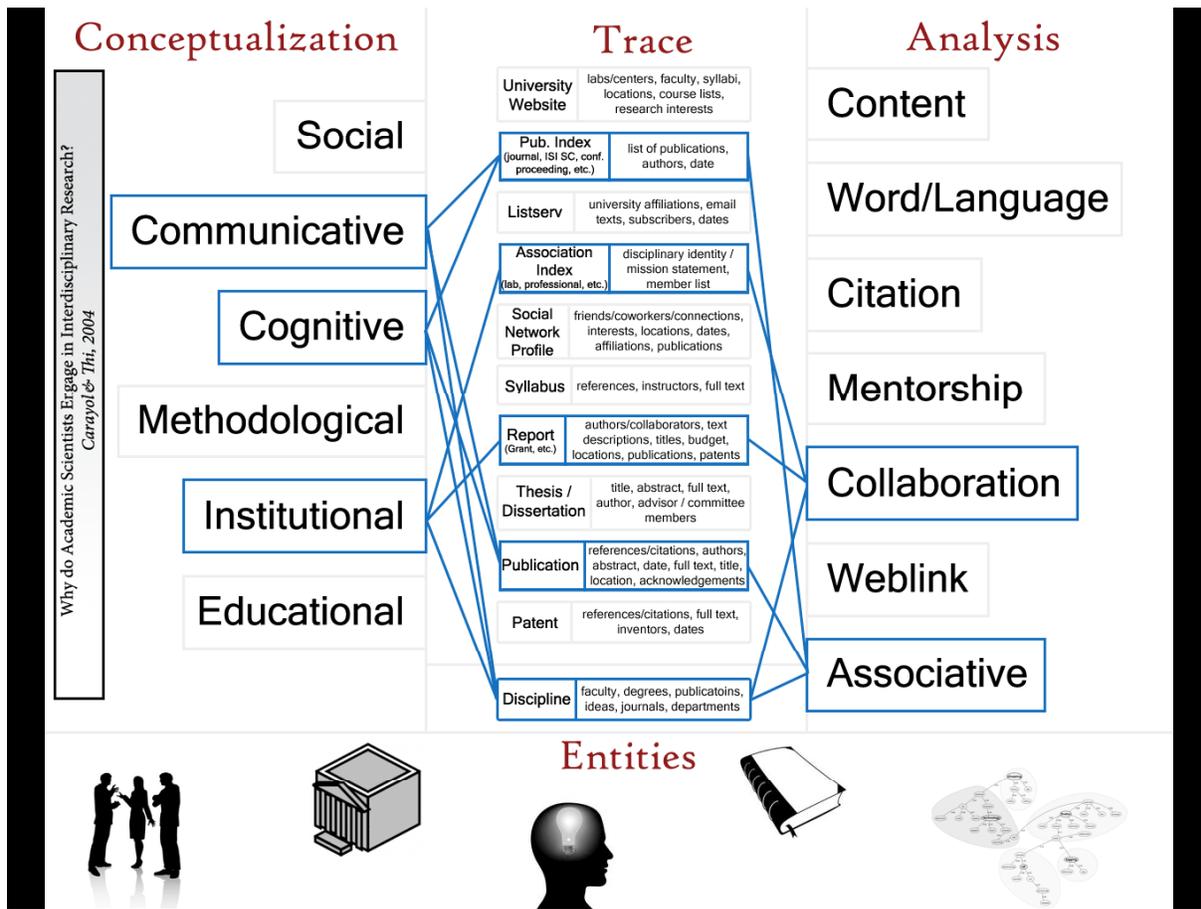
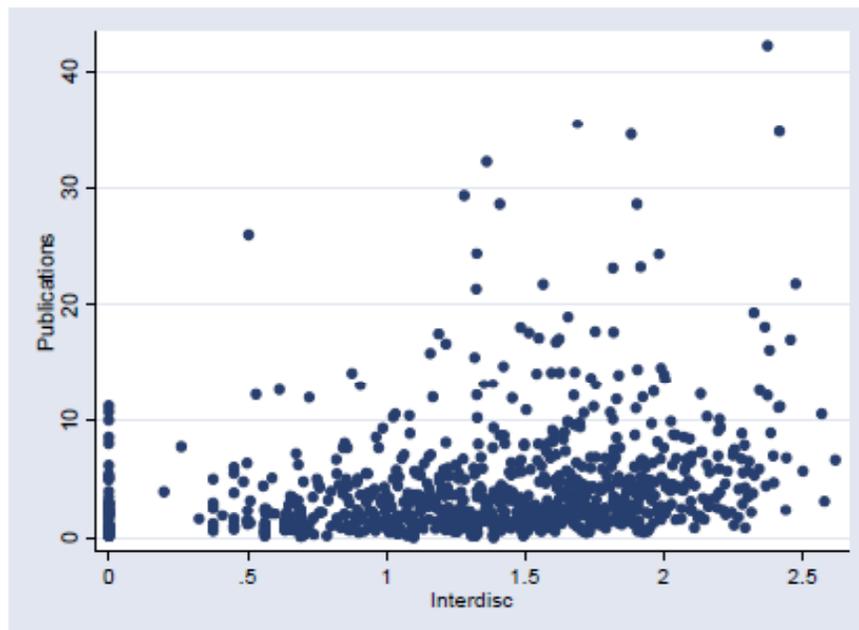


Figure 2. Two way plot of *Interdisc* × *Perf* (Publication Performance)



## Conceptualization

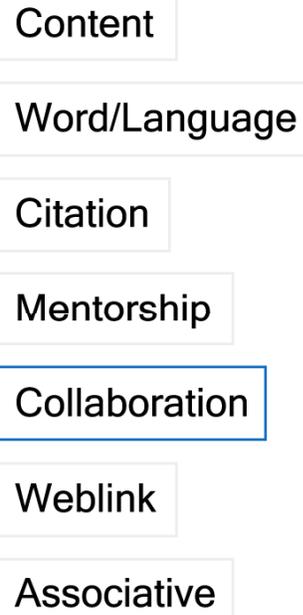
Measuring interdisciplinary collaboration within a university: the effects of the multidisciplinary research programme. *Bordons, Zulueta, Romero, & Barrigón, 1999*



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## Entities

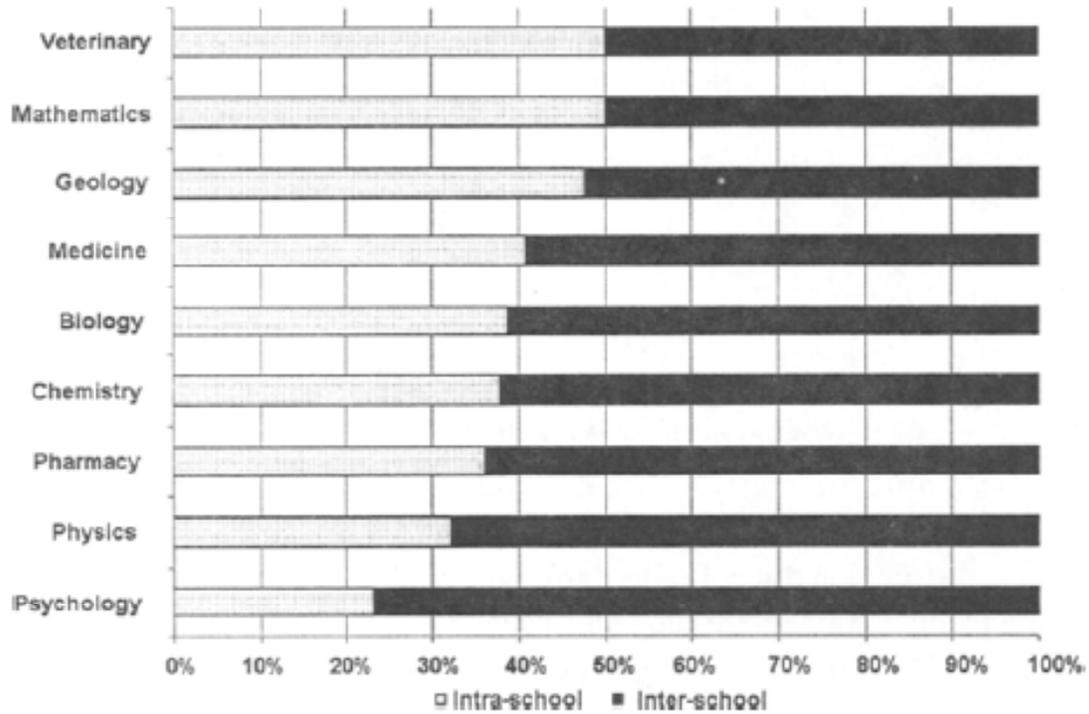
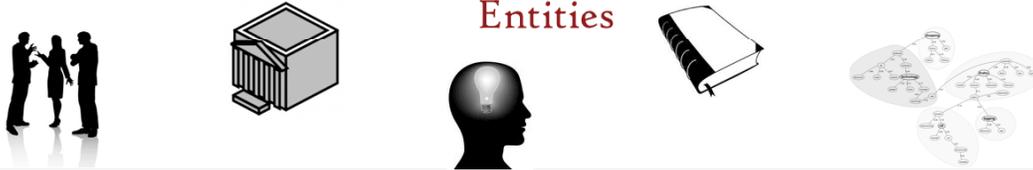
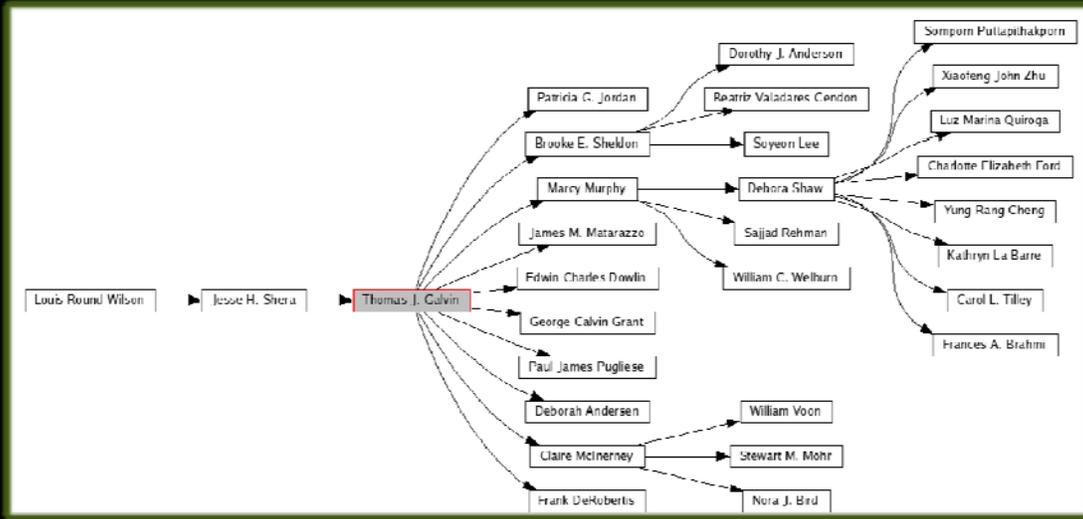
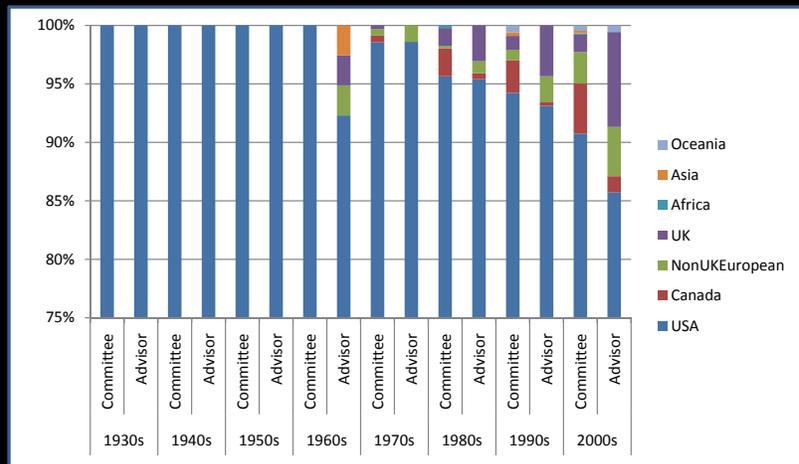


Fig. 1. Intra-UCM collaboration rate in the scientific publications of the main schools (1994-96)

# Academic Genealogy



# Internationality in LIS



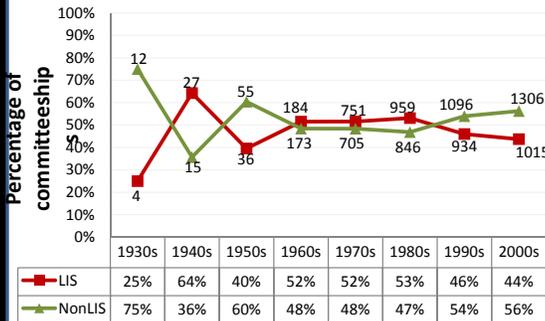
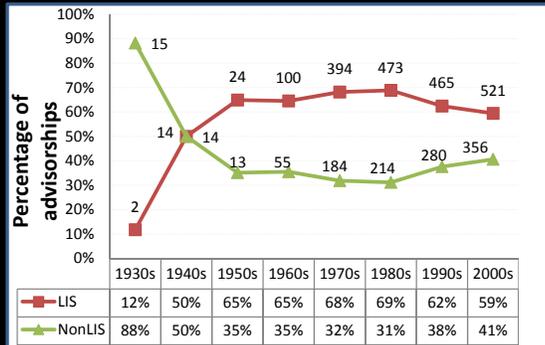
## Advisor Institutions

1930s (100%)		1940s (100%)		1950s (100%)		1960s (68%)	
School	#	School	#	School	#	School	#
Hartford Seminary	2	U. of Chicago	4	U. of Chicago	6	U. of Chicago	9
U. of Chicago	1	Hartford Seminary	2	Columbia U.	1	Columbia U.	8
U. of North Carolina	1	U. of North Carolina	1	Cornell U.	1	U. of Illinois	4
U. of Pennsylvania	1	U. of Pennsylvania	1	Hartford Seminary	1	U. of Michigan	3
				U. of Illinois	1	Harvard U.	2
				U. of Michigan	1		
1970s (52%)		1980s (44%)		1990s (30%)		2000s (34%)	
School	#	School	#	School	#	School	#
U. of Chicago	19	U. of Michigan	21	U. of Pittsburgh	21	Syracuse U.	23
U. of Michigan	18	Case Western	17	Case Western	17	U. of Pittsburgh	23
Columbia U.	13	U. of Illinois	17	Columbia U.	17	UC, Berkeley	19
U. of Illinois	13	U. of Pittsburgh	16	U. of Michigan	15	U. of Illinois	16
Case Western	12	Columbia U.	15	U. of Chicago	14	U. of Michigan	13
						U. of Toronto	13
						U. of W. Ontario	13

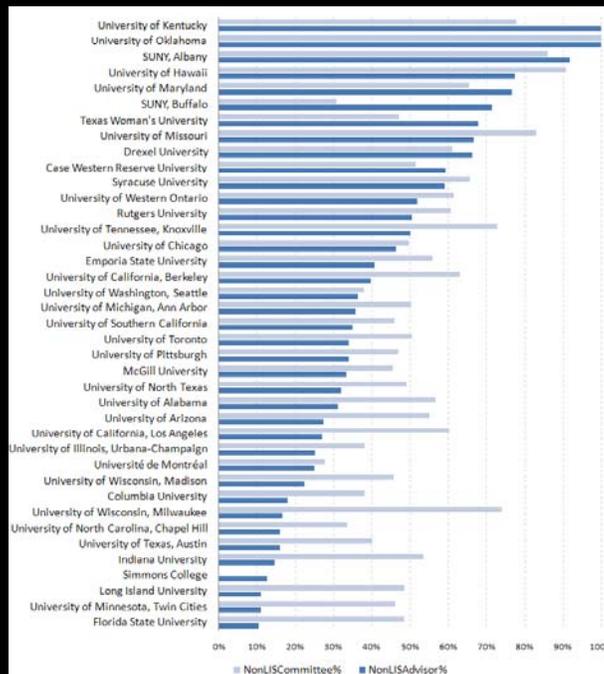
## Committee Institutions

1930s (100%)		1940s (100%)		1950s (100%)		1960s (56%)	
School	#	School	#	School	#	School	#
U. of Chicago	3	U. of Chicago	6	U. of Chicago	10	U. of Michigan	17
		U. of Illinois	1	U. of Michigan	8	U. of Chicago	11
				Columbia U.	2	Columbia U.	9
				Cornell U.	1	U. of Illinois	9
				Harvard U.	1	UC, Berkeley	7
				Indiana U.	1		
				Stanford U.	1		
				Ohio State U.	1		
				U. of Illinois	1		
				U. of Pennsylvania	1		
				U. of Wisconsin	1		
				Yale U.	1		
1970s (28%)		1980s (30%)		1990s (27%)		2000s (18%)	
School	#	School	#	School	#	School	#
Columbia U.	34	U. of Chicago	31	U. of Michigan	33	U. of Pittsburgh	39
U. of Michigan	28	U. of Michigan	31	UC, Berkeley	32	U. of Wisconsin	26
U. of Chicago	25	U. of Pittsburgh	27	Columbia U.	31	Rutgers U.	25
U. of Pittsburgh	24	Indiana U.	25	Indiana U.	28	Columbia U.	24
U. of Wisconsin	19	UC, Berkeley	22	U. of Illinois	28	Stanford U.	24
				U. of Pittsburgh	28	UT, Austin	24

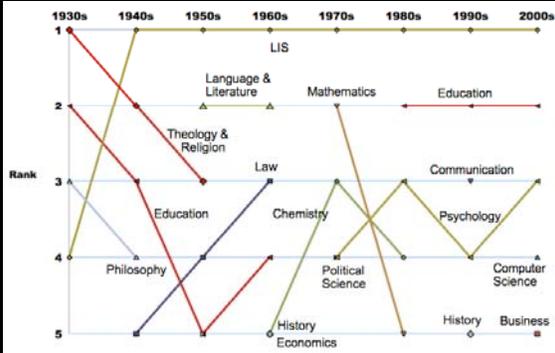
# Interdisciplinarity in LIS



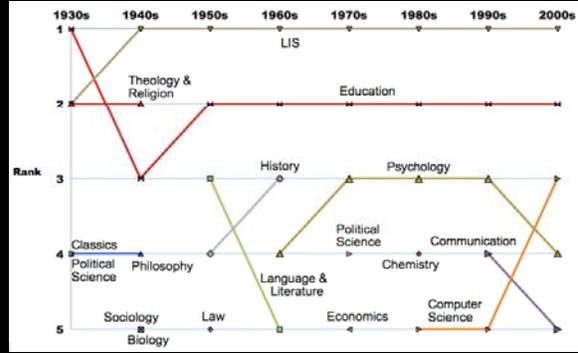
# Interdisciplinarity by institution



# Top imported disciplines

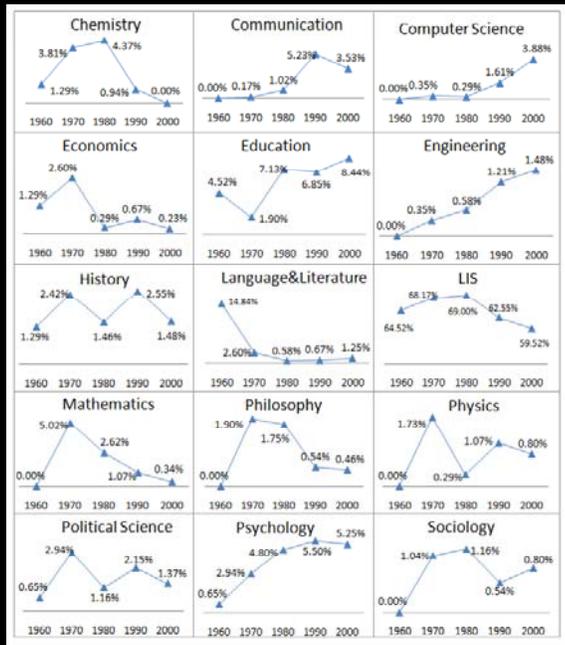


Advisors

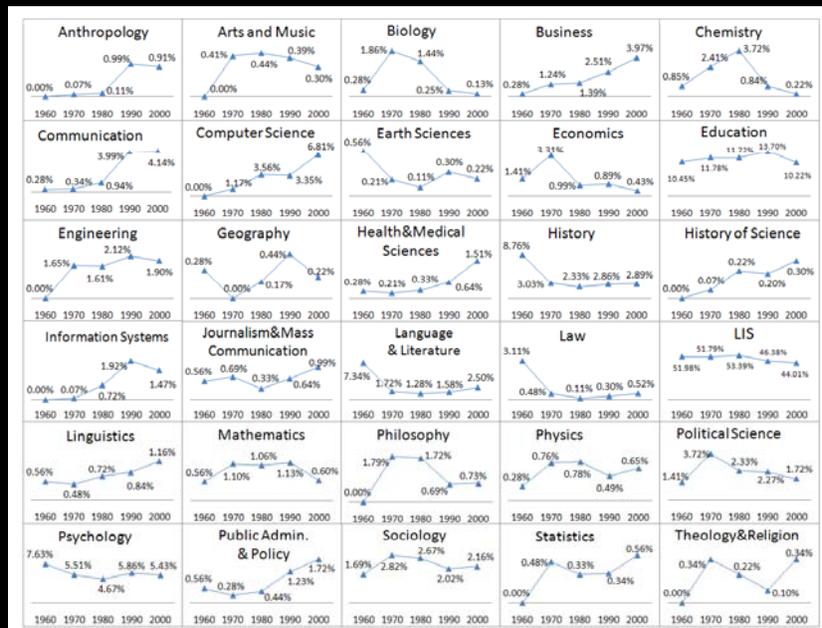


Committee members

# Advisor trends



# Committee member trends



## The vision

- 1 Improved connections between conceptualizations and operationalizations in science of science
- 2 Large-scale utilization of academic genealogy as an indicator for the birth, maturation, and interaction of disciplines
- 3 Mapping of doctorates and transfer of people between institutions and countries by time and discipline