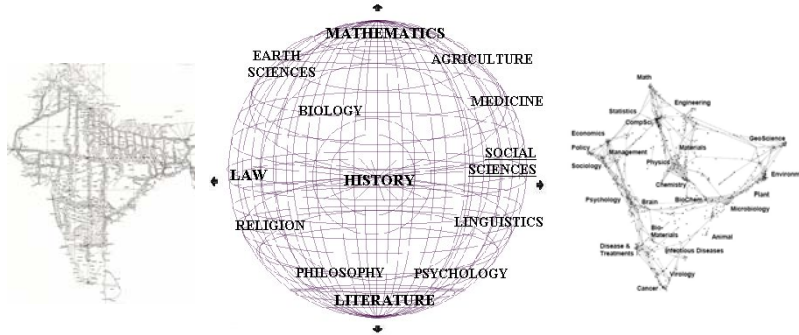


The History and Development of Domain Maps:

With a Focus on The Topic of Law



Peter A. Hook, J.D., M.S.L.I.S.
Electronic Services Librarian, Indiana University
School of Law--Bloomington
Doctoral Student, School of Library and Info. Science
<http://ella.slis.indiana.edu/~pahook>
May 11, 2007, Monroe County Public library

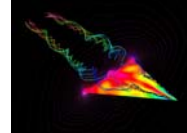
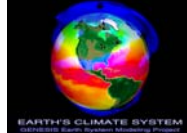


Visualization:

- The use of “the dynamic, interactive, inexpensive medium of graphical computers to devise new external aids enhancing cognitive abilities”
 - Card, S. K., Mackinlay, J. D., & Shneiderman, B. (1999). Information Visualization. In S. K. Card, J. D. Mackinlay & B. Shneiderman (Eds.), Readings in information visualization : using vision to think. San Francisco: Morgan Kaufmann Publishers.

2 Varieties

- Scientific Visualization
 - Literal, observable, experimental data not capable of being understood otherwise.



- Information Visualization
 - Using layout techniques to spatially visualize, non-spatial information.

Purposes

- (1) Discovery
- (2) Understanding
- (3) Communication
- (4) Education

These may be collapsed into two general purposes:

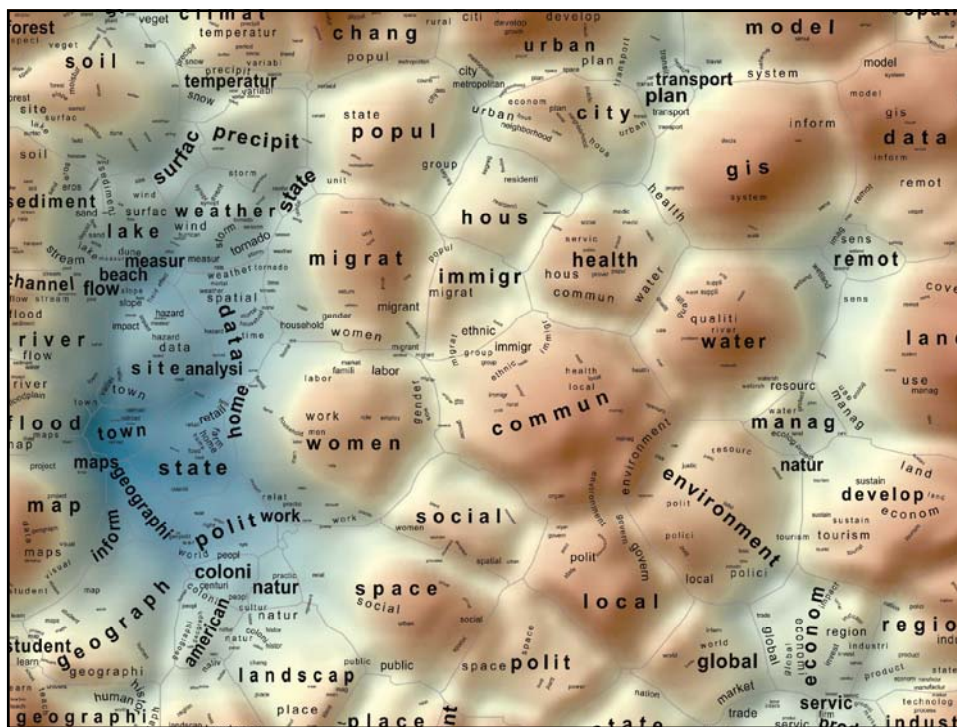
- (1) Discovery and (2) Explanation

Knowledge Domain Visualizations

- “**Knowledge domain visualizations** (KDV) are the graphic rendering of bibliometric data designed to provide a global view of a particular domain, its structural details, or its salient characteristics (most cited authors or papers, bursting concepts, etc.).”

Hook, Peter A. and Börner, Katy. (2005) Educational Knowledge Domain Visualizations: Tools to Navigate, Understand, and Internalize the Structure of Scholarly Knowledge and Expertise. In Amanda Spink and Charles Cole (eds.) New Directions in Cognitive Information Retrieval. Springer-Verlag.

- KDV are also referred to as domain maps and the process of their creation as domain mapping.
- Information Cartography
- Data Landscapes



2005



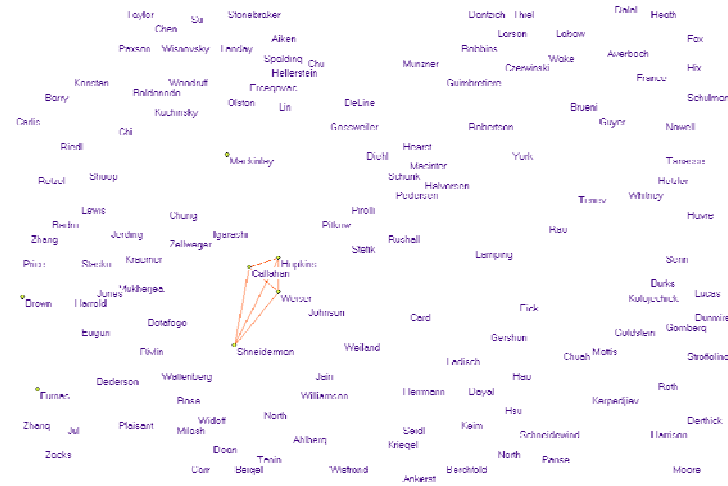
Information space of 22,000 conference abstracts submitted to the American Association of Geographers (AAG) annual meeting from 1993-2002.

Andre Skupin, April 3, 2006, Places and Spaces Exhibit, New York Public Library Science and Business Branch.

See: Skupin, A., and Hagelman, R. (2005) Visualizing Demographic Trajectories with Self-Organizing Maps. *GeoInformatica*. 9(2).

Mapping the Evolution of Co-Authorship Networks in Information Visualization, 1988 - 2004

Ke, Visvanath & Börner, (2004) Won 1st price at the IEEE InfoVis Contest.



Legend

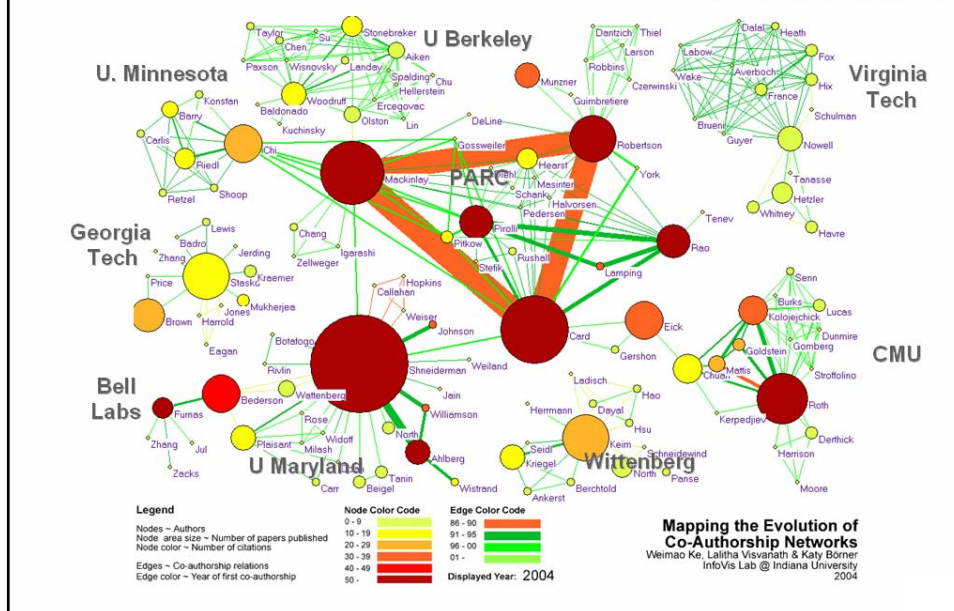
- Nodes - Authors
- Nodes - Size - Number of papers published
- Nodes - Color - Number of citations
- Edges - Co-authorship relations
- Edges - Line thickness - Number of co-authorship

| Node Color Code | Edge Color Code |
|-----------------|-----------------|
| 0 - 9 | 00 - 05 |
| 10 - 19 | 06 - 10 |
| 20 - 29 | 11 - 15 |
| 30 - 39 | 16 - 20 |
| 40 - 49 | 21 - 25 |
| 50 - 59 | 26 - 30 |
| 60 - 69 | 31 - 35 |
| 70 - 79 | 36 - 40 |
| 80 - 89 | 41 - 45 |
| 90 - 99 | 46 - 50 |
| 100 - 109 | 51 - 55 |
| 110 - 119 | 56 - 60 |
| 120 - 129 | 61 - 65 |
| 130 - 139 | 66 - 70 |
| 140 - 149 | 71 - 75 |
| 150 - 159 | 76 - 80 |
| 160 - 169 | 81 - 85 |
| 170 - 179 | 86 - 90 |
| 180 - 189 | 91 - 95 |
| 190 - 199 | 96 - 100 |
| 200 - 209 | 101 - 105 |
| 210 - 219 | 106 - 110 |
| 220 - 229 | 111 - 115 |
| 230 - 239 | 116 - 120 |
| 240 - 249 | 121 - 125 |
| 250 - 259 | 126 - 130 |
| 260 - 269 | 131 - 135 |
| 270 - 279 | 136 - 140 |
| 280 - 289 | 141 - 145 |
| 290 - 299 | 146 - 150 |
| 300 - 309 | 151 - 155 |
| 310 - 319 | 156 - 160 |
| 320 - 329 | 161 - 165 |
| 330 - 339 | 166 - 170 |
| 340 - 349 | 171 - 175 |
| 350 - 359 | 176 - 180 |
| 360 - 369 | 181 - 185 |
| 370 - 379 | 186 - 190 |
| 380 - 389 | 191 - 195 |
| 390 - 399 | 196 - 200 |

Mapping the Evolution of Co-Authorship Networks
 Wenbo Ke, Latha Visvanath & Katy Börner
 InfoVis Lab @ Indiana University
 2004

Mapping the Evolution of Co-Authorship Networks

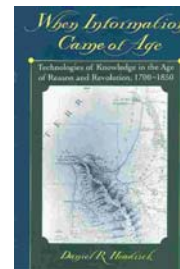
Ke, Viswanath & Börner, (2004) Won 1st price at the IEEE InfoVis Contest



Descriptive → Scientific Cartography

Prior to the 1600's cartography was merely descriptive. Advances in calculating location on the planet made it scientific.

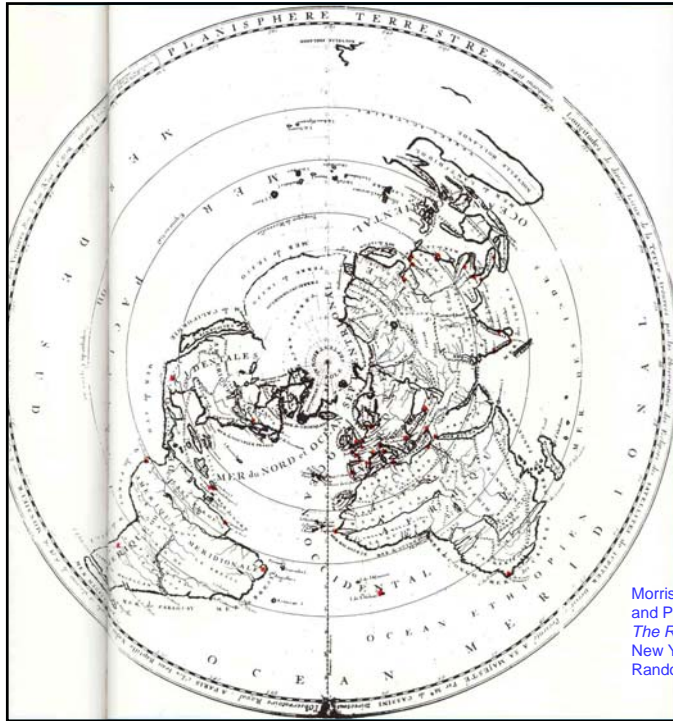
- Triangulation over large distances from a known base measure.
- Using the moons of Jupiter to establish longitude on land.
- Using accurate time pieces to establish longitude at sea.
- Accurately measuring depth and altitude, and representing them on maps.



Headrick, Daniel R. (2000). *When Information Came of Age: Technologies of Knowledge in the Age of Reason and Revolution, 1700-1850*. New York: Oxford University Press.

The same has now occurred with domain mapping.

- The descriptive has become methodologically rigorous.

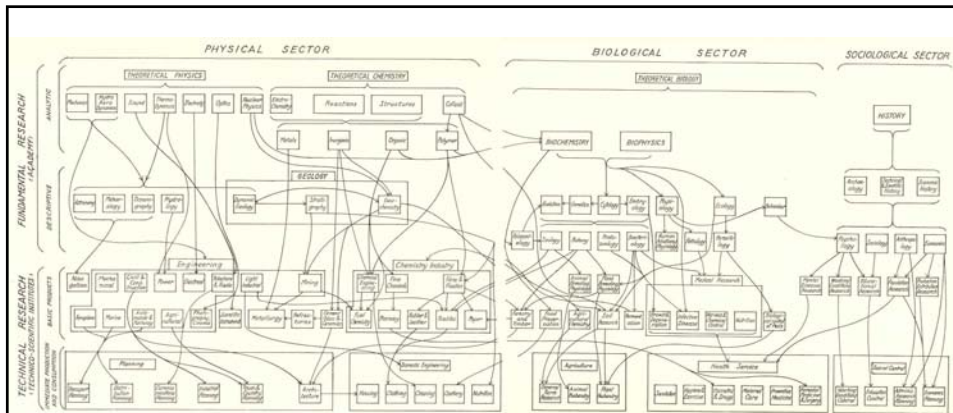


1696

- First Accurate Map of the Earth
- 40 points of accurate longitude
- Based on Moons of Jupiter to compare with local time in Paris.
- Cassini.



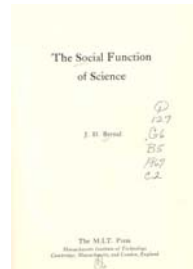
Morrison, Philip and Phylis (1987). *The Ring of Truth*. New York: Random House.

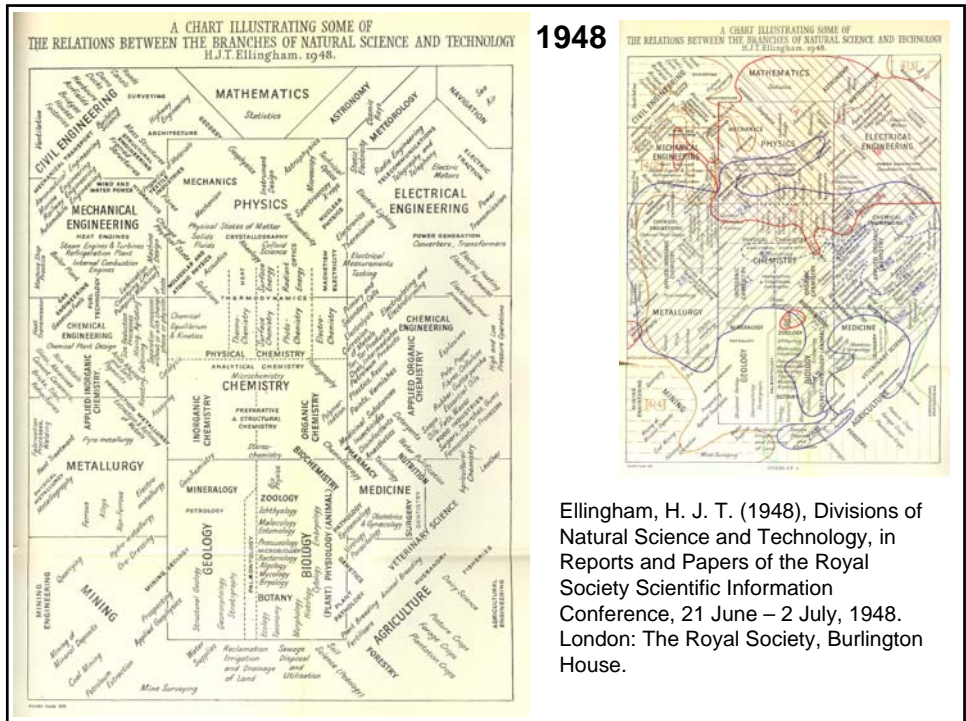


1939

John D. Bernal was a world renowned physicist, a historian of science, and a sociologist of science. He is considered to have produced one of the first 'maps' of science.

Bernal, J.D. (1939). *The Social Function of Science*. London: Routledge & Kegan Ltd.





Distance—Similarity Metaphor



1654

Madeleine de Scudéry (b. 1607-d. 1701), *Clélie, histoire romaine, première partie* (*Clélie: A Roman Story, part I*), Paris, 1654, Reserve of Rare and Precious Books, Rés. Yy. 1496

“*Carte du tendre* (*Map of Affection*), engraved by François Chauveau and inserted in the first part of the novel. A salon game, the Map sparked a fad for “amorous geography” that took the form of allegorical almanacs and imaginary maps.”

From: *Creating French Culture: Treasures from the Bibliothèque Nationale de France*, Library of Congress, Available at: <http://www.loc.gov/exhibits/bnf/bn10004.html>

Co – Discoveries / Implementation

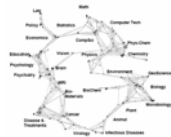
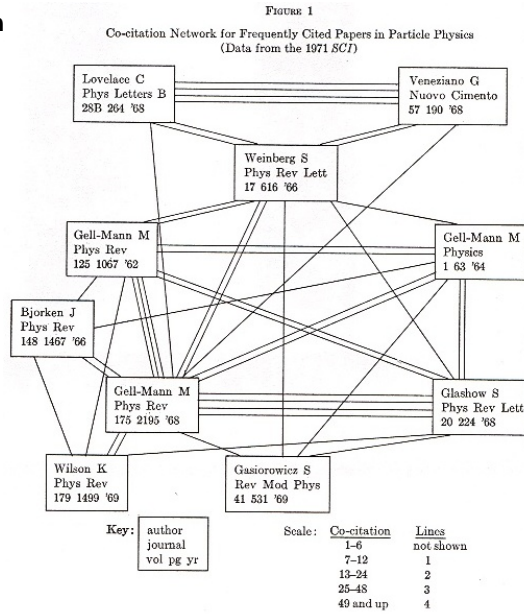
Using Co-Citation to create domain maps.

- Small, H. (1973). Co-citation in the scientific literature: A new measure of the relationship between two documents. *JASIS*, 24, 265-269.
- Marshakova, I.V. (1973). A system of document connections based on references. *Scientific and Technical Information Serial of VINITI*, 6, 3-8.



Henry Small

1973



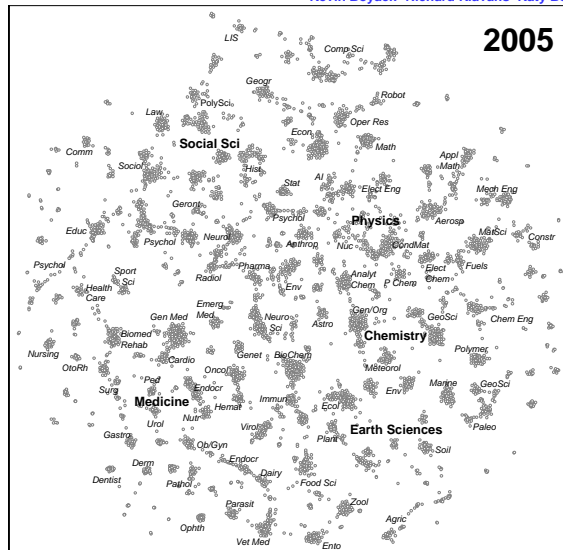
Map of all Science & Social Science



Kevin Boyack Richard Klavans Katy Börner

- The map is derived from the citation linkages between 7,121 journals from the year 2000.
- ISI Data (science citation index and the social science citation index).

Boyack, K.W., Klavans, R., & Börner, K. (2005). Mapping the backbone of science. *Scientometrics*. Vol. 64, No. 3, 351-374



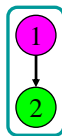


Different Similarity Metrics

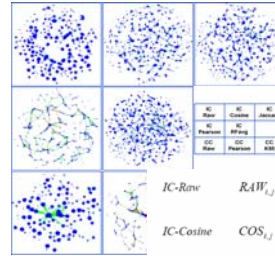
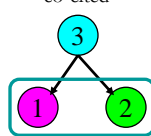
- 10 different similarity metrics

- 6 Inter-citation (raw counts, cosine, modified cosine, Jaccard, RF, Pearson)
- 4 Co-citation (raw counts, cosine, modified cosine, Pearson)

Inter-citation
1 cites 2



Co-citation
1 and 2 are co-cited



IC-Raw $RAW_{ij} = RAW_{ji} = C_{ij} + C_{ji}$

IC-Cosine $COS_{ij} = COS_{ji} = \frac{(RAW_{ij})}{\sqrt{\sum_k C_{ik} \sum_l C_{jl}}}$

IC-Jaccard $JAC_{ij} = JAC_{ji} = \frac{(RAW_{ij})}{\sum_k C_{ik} + \sum_l C_{jl} - (RAW_{ij})}$

IC-Pearson $r_{ij} = \frac{\sum_k (RAW_{ik} - \overline{RAW}_i)(RAW_{jk} - \overline{RAW}_j)}{\sqrt{\sum_k (RAW_{ik} - \overline{RAW}_i)^2 \sum_l (RAW_{jl} - \overline{RAW}_j)^2}}$

where $\overline{RAW}_i = \frac{1}{n} \sum_k RAW_{ik}$, $k \neq i$

IC-RFong $RF_{ij} = RF_{ji} = (RF_{ij} + RF_{ji}) / 2$

where $RF_{ij} = 10^4 * C_{ij} / (\sum_k C_{ik})$

Boyack, K.W., Klavans, R., & Börner, K. (2005). Mapping the backbone of science. *Scientometrics*. Vol. 64, No. 3, 351-374



1951 Visualizations (Thurston & Degan)

- Factorial / Vector Analysis of Co-Voting
- 1943 & 1944 Terms
- 9 Vectors (one for each Justice) in 3 dimensions

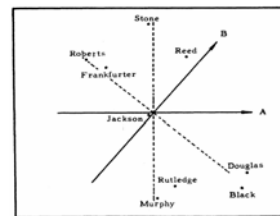


FIGURE 1

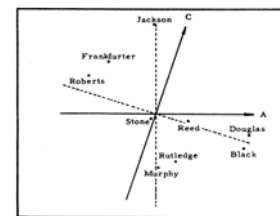


FIGURE 2

TABLE 1

INTRACLASS ϕ COEFFICIENTS R

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | |
|-------------|---|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Black | 1 | .. | 0.59 | 0.42 | 0.40 | -0.15 | -0.25 | -0.41 | -0.46 | -0.66 |
| Douglas | 2 | 0.59 | .. | 0.30 | 0.35 | -0.10 | -0.16 | -0.36 | -0.45 | -0.60 |
| Rutledge | 3 | 0.42 | 0.30 | .. | 0.46 | -0.19 | -0.21 | -0.36 | -0.38 | -0.50 |
| Murphy | 4 | 0.40 | 0.35 | 0.46 | .. | -0.25 | -0.28 | -0.42 | -0.32 | -0.39 |
| Reed | 5 | -0.15 | -0.10 | -0.19 | -0.25 | .. | -0.13 | 0.29 | 0.07 | -0.07 |
| Jackson | 6 | -0.25 | -0.16 | -0.21 | -0.28 | -0.13 | .. | -0.05 | 0.26 | 0.03 |
| Stone | 7 | -0.41 | -0.36 | -0.36 | -0.42 | 0.29 | -0.05 | .. | 0.19 | 0.23 |
| Frankfurter | 8 | -0.46 | -0.45 | -0.38 | -0.32 | 0.07 | 0.26 | 0.19 | .. | 0.40 |
| Roberts | 9 | -0.66 | -0.60 | -0.50 | -0.39 | -0.07 | 0.03 | 0.23 | 0.40 | .. |

Thurstone, L. L. & Degan, J. W. (1951) A Factorial Study of the Supreme Court, *Proceedings of the National Academy of Sciences of the United States of America*, Vol. 37, No. 9 (Sept. 15, 1951), 628-635.



1985 Diagrams

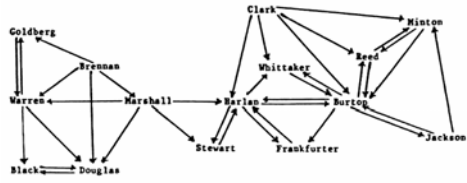


FIGURE 1. INFLUENCE RELATIONSHIPS OF THE WARREN COURT

Warren Court (1953 – 1969)

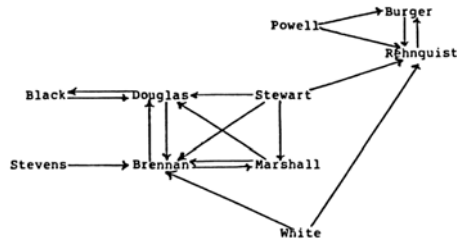
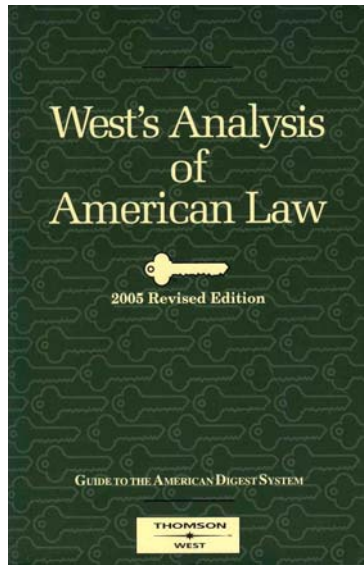


FIGURE 2. INFLUENCE RELATIONSHIPS OF THE BURGER COURT

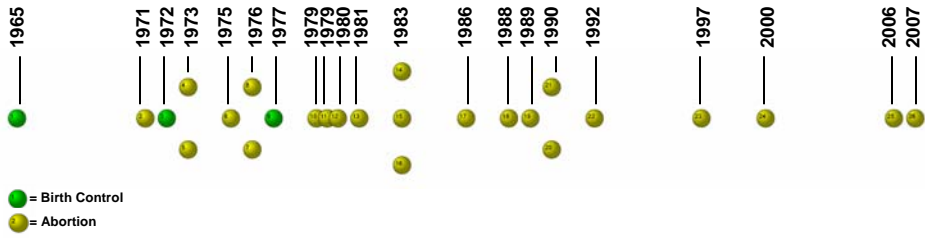
Burger Court (1969 – 1986)

Spaeth, Harold J. & Altfeld, Michael F. (1985) Influence Relationships within the Supreme Court: A Comparison of the Warren and Burger Courts, *The Western Political Quarterly*, Vol. 38., No. 1. (March 1985), pp. 70-83.

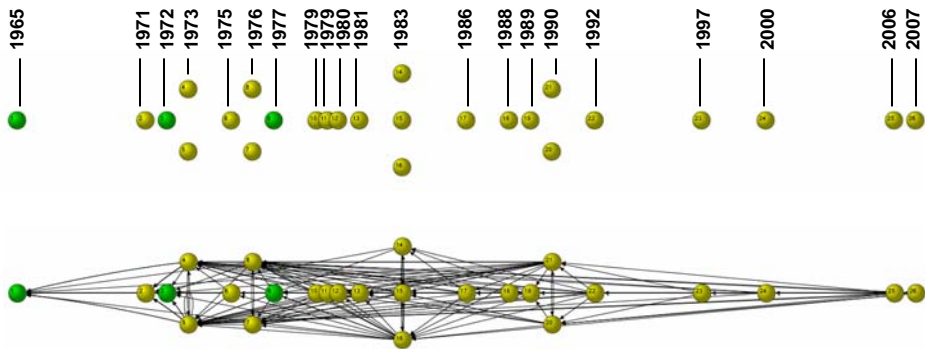
Relational Infrastructure of the Law

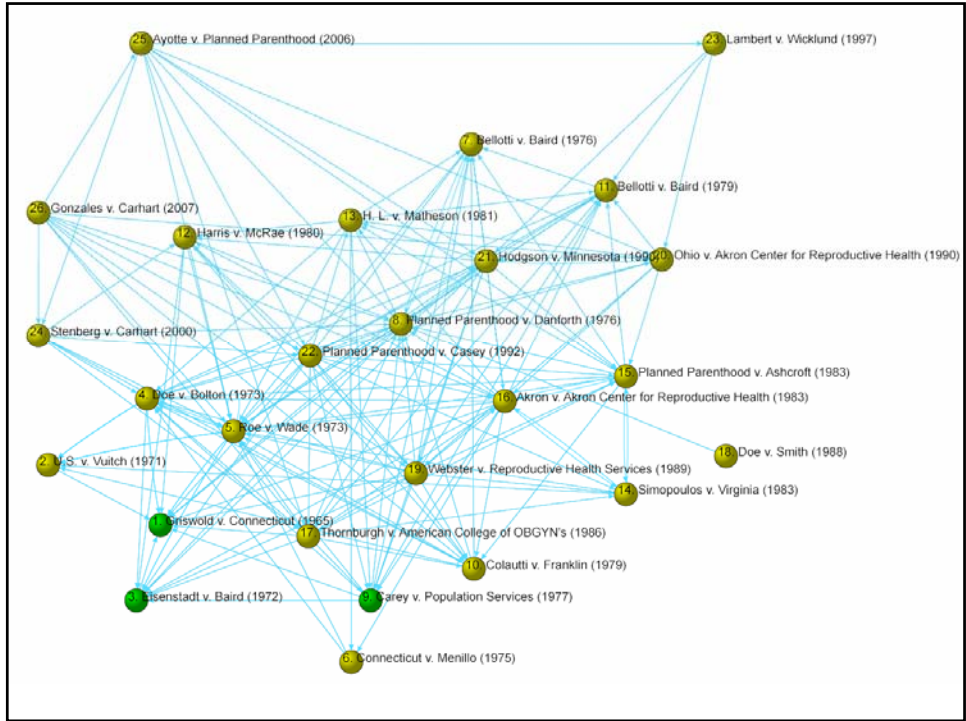


26 "Abortion and Birth Control" Cases in the S.Ct.



26 "Abortion and Birth Control" Cases in the S.Ct.





Relational Infrastructure of the Law

KeyCite

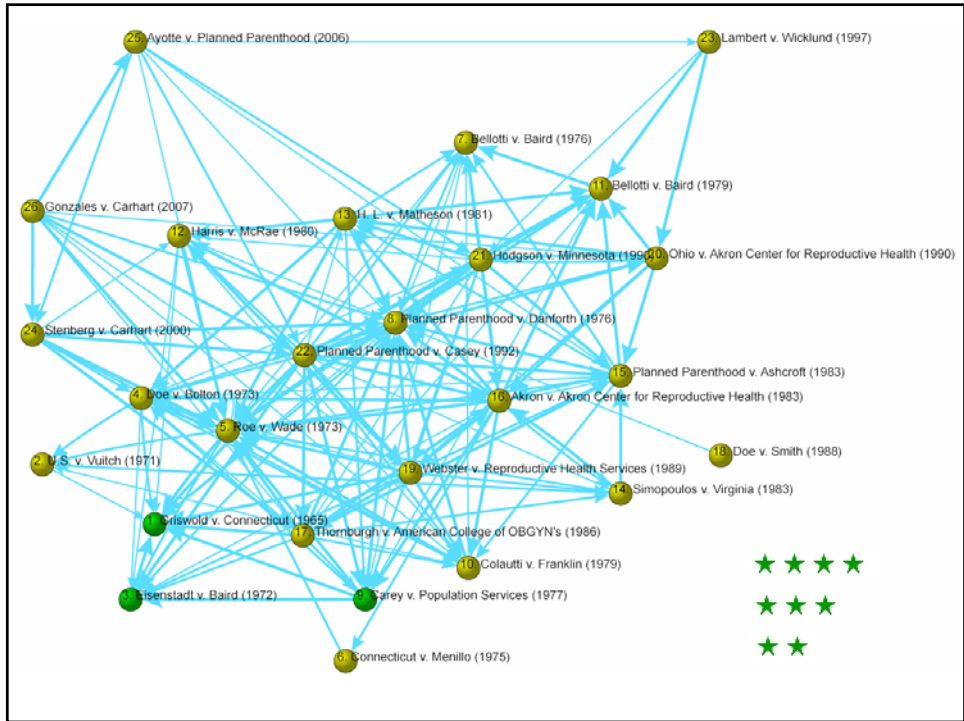
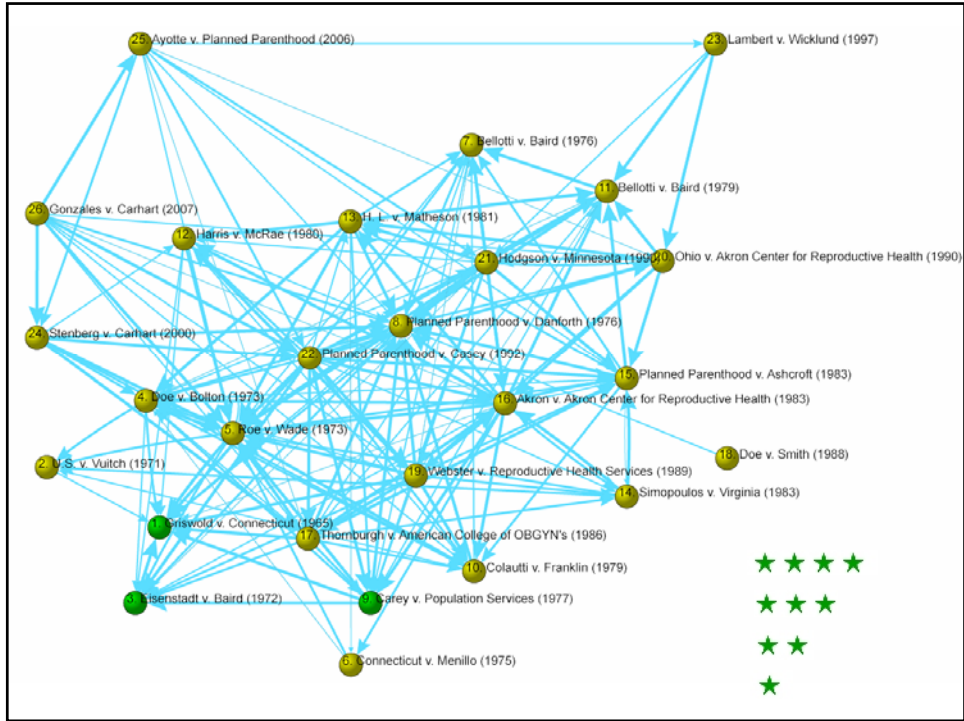
[BACK](#) [PRINT](#) [PRINT](#) [EMAIL](#) [DOWNLOAD](#) [OTHER](#)

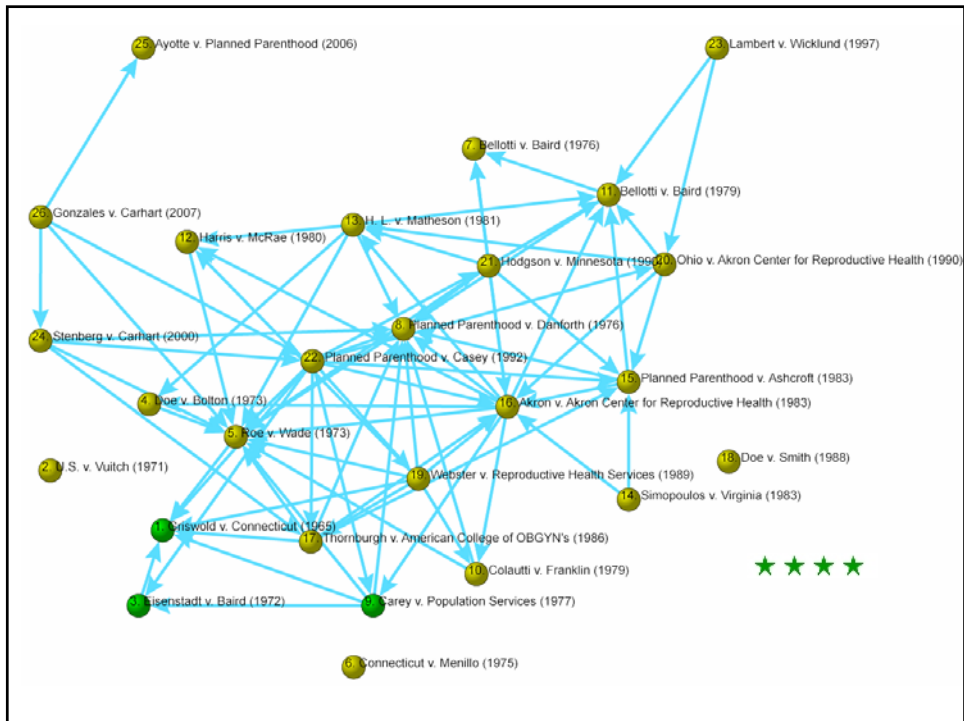
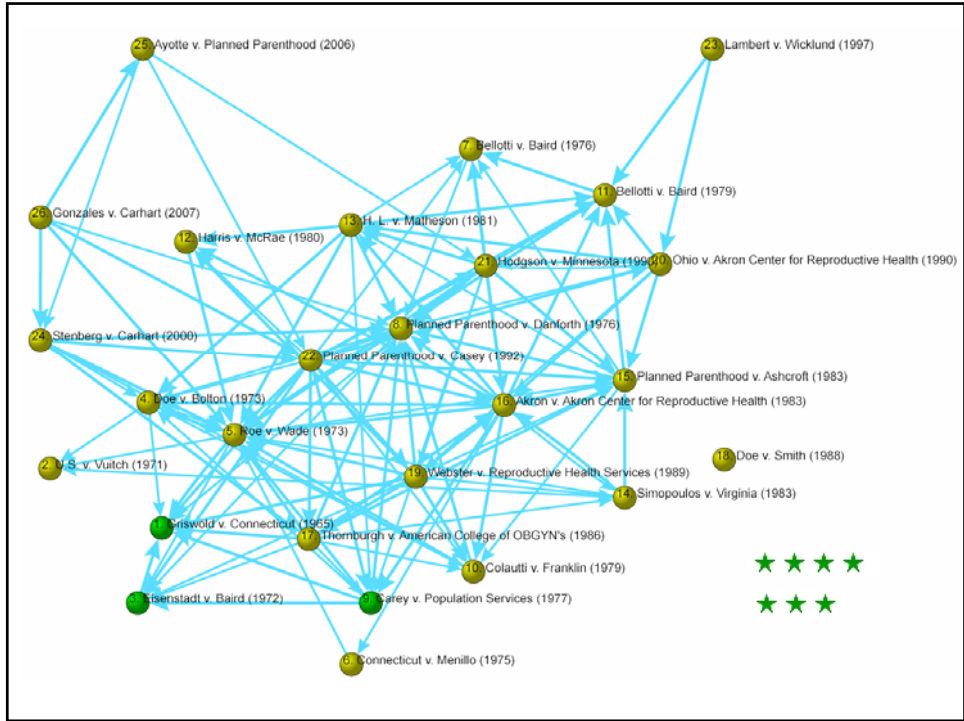
Roe v. Wade
 410 U.S. 113; 39 S.Ct. 705
 U.S.Tex., 1973.
 January 22, 1973

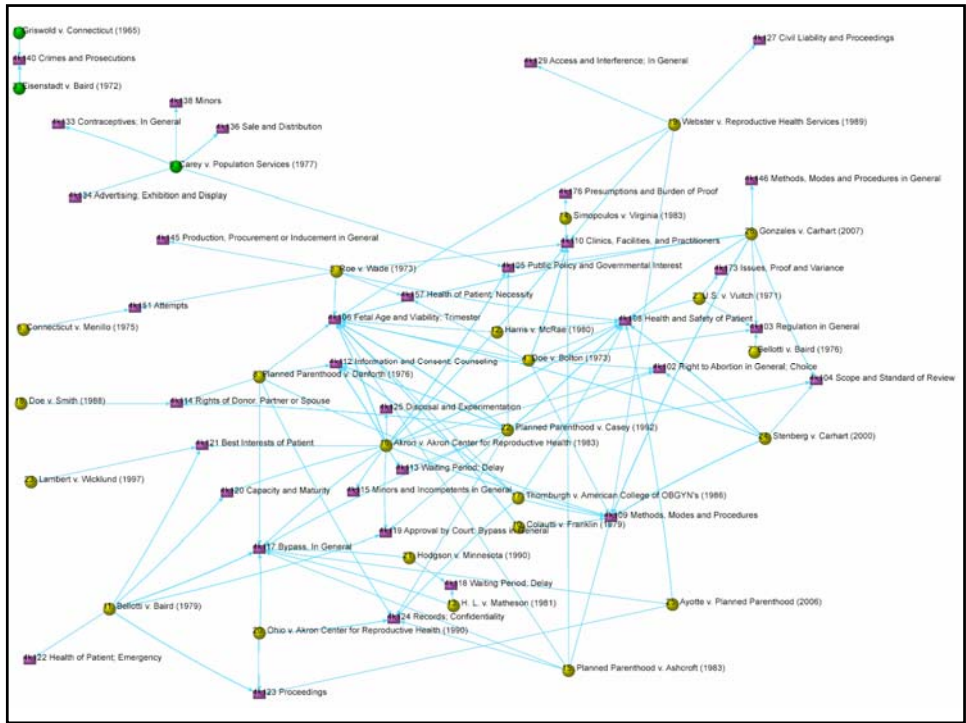
First Part | Next Part >>

125 Cases Cited in Roe v. Wade

| | | |
|----|--|------|
| 51 | Griswold v. Connecticut, 85 S.Ct. 1678 (U.S.Conn. 1965) | 715+ |
| | ★ ★ ★ ★ | |
| 52 | U.S. v. Guest, 86 S.Ct. 1170 (U.S.Ga. 1966) | 734 |
| | ★ | |
| 53 | Gunn v. University Committee to End War in Viet Nam, 90 S.Ct. 2013 (U.S.Tex. 1970) | 711 |
| | ★ | |
| 54 | Hammitt v. State, 209 S.W. 661 (Tex.Crim.App. 1919) | 726 |
| | ★ ★ | |
| 55 | Investment Co. Institute v. Camp, 91 S.Ct. 1091 (U.S.Dist.Col. 1971) | 714 |
| | ★ ★ | |
| 56 | Jackson v. State, 115 S.W. 262 (Tex.Crim.App. 1908) ⚡ | 710 |
| | ★ ★ | |
| 57 | Jacobson v. Commonwealth of Massachusetts, 25 S.Ct. 358 (U.S.Mass. 1905) | 727 |
| | ★ ★ | |
| 58 | Katz v. U.S., 88 S.Ct. 507 (U.S.Cal. 1967) | 726+ |
| | ★ ★ | |
| 59 | Keeler v. Superior Court, 470 P.2d 617 (Cal. 1970) | 729 |
| | ★ | |







1. **Griswold v. Connecticut**, 381 U.S. 479 (June 07, 1965)

92k82(7) Constitutional Law, Privacy In General

1 Griswold v. Connecticut (1965)

4k140 Crimes and Prosecutions

“The First Amendment has a penumbra where privacy is protected from governmental intrusion.”
– West Publishing

“Connecticut law forbidding use of contraceptives unconstitutionally intrudes upon the right of marital privacy.”
– West Publishing

1675 80 SUPREME COURT REPORTER 381 U.S. 479

These further questions should await an appropriate case. The Court should proceed only step by step in this important field. The dissent of the Chief Justice accordingly poses no barrier, for only the free answers of the majority who conscientiously join the Court's opinion would resolve these questions now." *Id.*, p. 485. (Emphasis supplied.)

These today's decision is not a blanket constitutional prohibition against the advertising of state-licensed birth control.

While I join the dissent of my Brother STEWART and WHITE, I do so on the understanding that their use of the expression "the Court's opinion" or "the opinion of the Court" refers only to those views of our four Brothers which my Brother HARLAN explicitly states he shares.

1. **Constitutional Law 494g**
Planned Parenthood League's executive director and medical director who had been convicted as accessories for giving information, instruction, and medical advice to married persons, as to means of preventing conception had standing to question constitutionality of Connecticut law forbidding use of non-sterile, C.G.S.A. §§ 53-38, 54-104; U.S.C.A. Const., art. I, § 10.

2. **Constitutional Law 494g(3)**
The Supreme Court does not sit as a super-legislature to determine the wisdom, need, and propriety of laws that touch economic problems, business affairs, or social conditions.

3. **Constitutional Law 494g**
The state may act, consistently with the spirit of the First Amendment, to limit the quantity of available knowledge. U.S.C.A. Const., Amend. I.

4. **Constitutional Law 494g**
The right of freedom of speech and press includes not only right to utter or to print, but right to distribute, right to receive, right to read and freedom of inquiry, freedom of thought, and freedom to teach. U.S.C.A. Const., Amend. I.

5. **Constitutional Law 494g**
The First Amendment has a penumbra where privacy is protected from governmental intrusion. U.S.C.A. Const., Amend. I.

6. **Constitutional Law 494g**
The right of assembly extends to all irrespective of their race or ideology. U.S.C.A. Const., Amend. I.

381 U.S. 479
GRISWOLD et al.
STATE OF CONNECTICUT.
No. 406.
Argued March 26, 1965.
Decided June 7, 1965.

Defendants were convicted of violating the Connecticut birth control law. The Circuit Court in the Sixth Circuit, Connecticut, rendered judgments, and defendants appealed. The Appellate Division of the Circuit Court affirmed, and defendants appealed. The Connecticut Supreme Court of Errors, 181 Conn. 344, 200 A.2d 478, affirmed, and the de-

3. **Eisenstadt v. Baird**, 405 U.S. 438 (March 22, 1972)

4k140 Crimes and Prosecutions

“Massachusetts statute permitting married persons to obtain contraceptives to prevent pregnancy but prohibiting distribution of contraceptives to single persons for that purpose violates equal protection clause.” – West Publishing

1 Griswold v. Connecticut (1965)

92k82(10) Constitutional Law, Privacy In General

“Under right of privacy, individual, married or single, has right to be free from unwarranted governmental intrusion into matters so fundamentally affecting a person as decision whether to bear or beget a child.” – West Publishing

Eisenstadt v. Baird text snippet:

405 U.S. 438

EISENSTADT v. BAIRD

certiorari to the Supreme Court of the State of Massachusetts from the Supreme Court of the Commonwealth of Massachusetts.

Mr. Justice Brennan delivered the opinion of the Court.

The State of Massachusetts has a statute which prohibits the distribution of contraceptives to single persons for that purpose. The statute is unconstitutional under the Equal Protection Clause of the Fourteenth Amendment.

The State of Massachusetts has a statute which prohibits the distribution of contraceptives to single persons for that purpose. The statute is unconstitutional under the Equal Protection Clause of the Fourteenth Amendment.

The State of Massachusetts has a statute which prohibits the distribution of contraceptives to single persons for that purpose. The statute is unconstitutional under the Equal Protection Clause of the Fourteenth Amendment.

4. **Doe v. Bolton**, 410 U.S. 179 (Jan. 22, 1973)

5. **Roe v. Wade**, 410 U.S. 113 (Jan. 22, 1973)

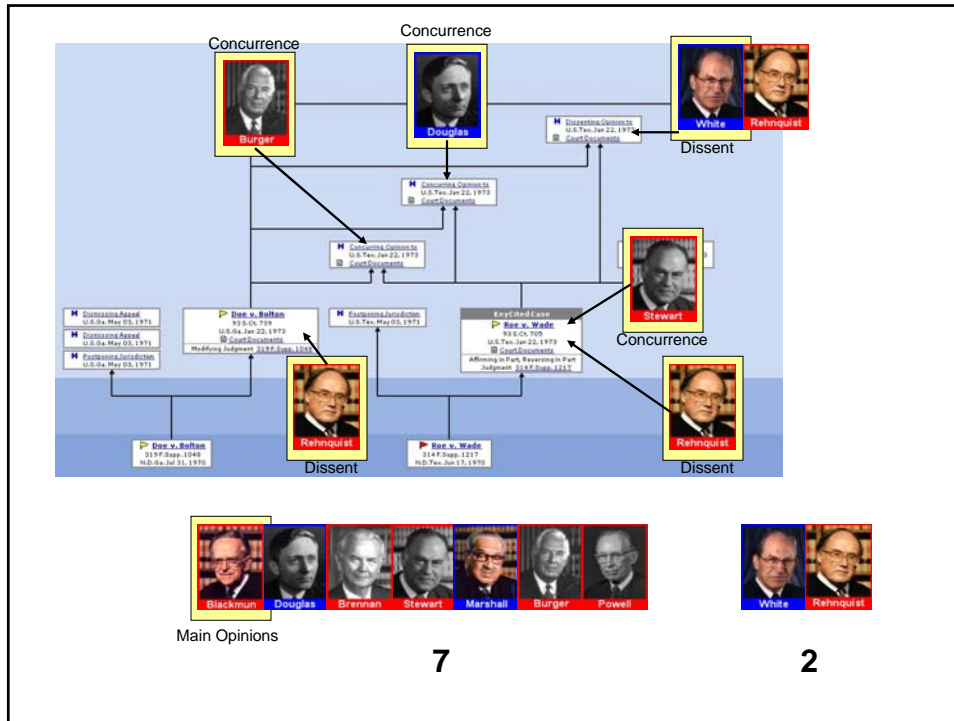
Full History (Text) | Show Negative Treatment | View All Citing Cases | Monitor With KeyCite Alert | State Court Orig. Charts
Direct History for *Roe v. Wade*, 93 S.Ct. 705 (January 22, 1973)

U.S. Supreme Court

Intermediate Court

Trial Court

(c) 2007 Thomson/West



5. *Roe v. Wade*, 410 U.S. 113 (Jan. 22, 1973)

4k145 Production, Procurement or Inducement in General

4k110 Clinics, Facilities, and Practitioners

5k106 Fetal Age and Viability; Trimester

4k157 Health of Patient; Necessity

4k108 Health and Safety of Patient

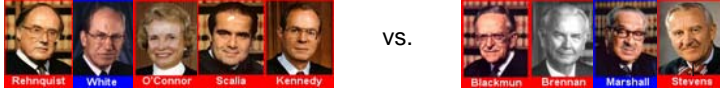
4k151 Attempts

5k106 Fetal Age and Viability: Trimester

- “Prior to approximately the end of the first trimester of pregnancy, the attending physician in consultation with his patient is free to determine, without regulation by state, that in his medical judgment the patient’s pregnancy should be terminated, and if that decision is reached such judgment may be effectuated by an abortion without interference by the state.”
- “From and after approximately the end of the first trimester of pregnancy, a state may regulate abortion procedure to extent that the regulation reasonably relates to preservation and protection of maternal health.”
- “If state is interested in protecting fetal life after viability, it may go so far as to proscribe abortion during that period except when necessary to preserve the life or the health of the mother.”

— West Publishing

19. *Webster v. Reproductive Health Services*, 492 U.S. 490 (July 03, 1989)



492 U.S. 490 (1989) 100 SUPREME COURT REPORTS 492 U.S. 490

Justice **William L. WEBSTER**, Attorney General of Missouri, et al., Appellants.

REPRODUCTIVE HEALTH SERVICES, INC., et al., Respondents.

Argued April 26, 1989. Decided July 3, 1989.

State-employed health care professionals and facilities offering abortion counseling and services through their state medical boards and agencies relief childbearing responsibility of their mother-regulating abortions. The United States District Court for the Western District of Missouri, Scott O. Wright, Chief Justice, 852 F.2d 1011, declared several portions of statute unconstitutional and permanently enjoined their enforcement. On appeal, the Court of Appeals, Jay Chief Judge, 855 F.2d 1015, affirmed in part and reversed in part. On appeal, the Supreme Court, Chief Justice Blackmun, held that: (1) Court need not pass on constitutionality of statute's provisions; (2) necessary law on use of public employees and facilities for performance of abortions; (3) constitutionality of abortion; and (4) issue of constitutionality of statute's provisions on use of public funds to encourage or reward women to have nontherapeutic abortions was moot.

Reversed.

Justice O'Connor and Justice White filed opinions concurring in part and dissenting in part.

Justice Blackmun filed opinion concurring in part and dissenting in part, in which Justice Brennan and Marshall joined.

Justice Stevens filed opinion concurring in part and dissenting in part.

1. Constitutional Law 490(1) Provisions of state statute regulating performance of abortions which are both "feeling" that "life of each human being begins at conception," and that "human children have prenatally interests in life, health and well-being," did not by its terms regulate abortions but rather constituted moral judgments of state having children over abortion and thus, Supreme Court was not required to pass on constitutionality of statute's provisions. (1) Court need not pass on constitutionality of statute's provisions; (2) necessary law on use of public employees and facilities for performance of abortions; (3) constitutionality of abortion; and (4) issue of constitutionality of statute's provisions on use of public funds to encourage or reward women to have nontherapeutic abortions was moot.

2. Abortion and Birth Control 492(2) Constitutional Law 492(2) Restrictions in state statute on use of public employees and facilities to perform abortions did not place unconstitutional pressure upon women to abort or women who choose to terminate their pregnancies perform abortions in public hospitals (all pregnant women with choice as if state had chosen not to operate any public hospitals). U.S.C.A. Const.Amend. 14, U.S.S. § 198.125, 198.125.

3. Abortion and Birth Control 492(3) Constitutional Law 492(3) Restrictions in state statute on use of public funds to encourage or reward women to have nontherapeutic abortions did not place unconstitutional pressure upon women to abort or women who choose to terminate their pregnancies perform abortions in public hospitals (all pregnant women with choice as if state had chosen not to operate any public hospitals). U.S.C.A. Const.Amend. 14, U.S.S. § 198.125, 198.125.

4. Federal Courts 492(4) Controversy over state's statutory prohibition on use of public funds to encourage or reward women to have nontherapeutic abortions was moot. In light of state's claim that statute was not directed at primary conduct of physicians or

vs.

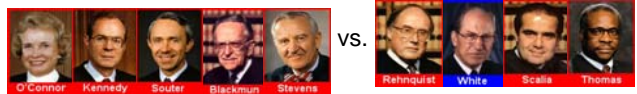
"State's interest in protecting potential human life does not come into existence only at point of viability and thus, there should not be rigid line allowing state regulation of abortion after viability but prohibiting regulation before viability. (Per Chief Justice with two Justices concurring.)."

Justice **Blackmun**

"Today, *Roe v. Wade*, and the fundamental constitutional right of women to decide whether to terminate a pregnancy, survive but are not secure."

"I fear for the future. I fear for the liberty and equality of the millions of women who have lived and come of age in the 16 years since *Roe* was decided. I fear for the integrity of, and public esteem for, this Court."

22. *Planned Parenthood of SE Penn. v. Casey*, 492 U.S. 490 (June 29, 1992)

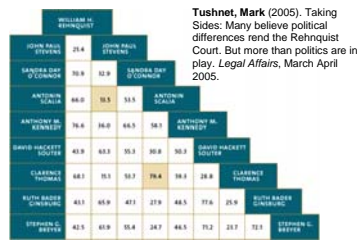
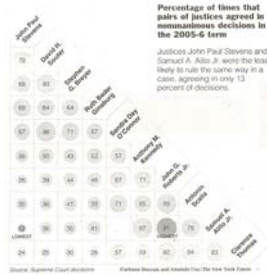
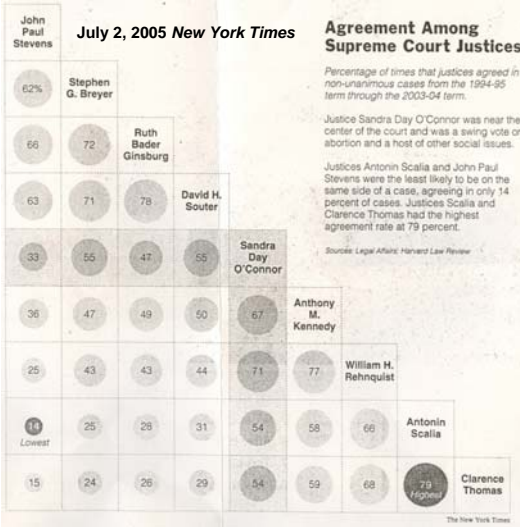


"Reliance on *Roe v. Wade* rule's limitation on state power required reaffirmance of *Roe*'s essential holding under doctrine of stare decisis; for two decades of economic and social developments, people organized intimate relationships and made choices that defined their views of themselves and their places in society in reliance on availability of abortion in event of contraceptive failure."



Mania for Co-Voting Data

THE NEW YORK TIMES NATIONAL SUNDAY, JULY 2, 2006



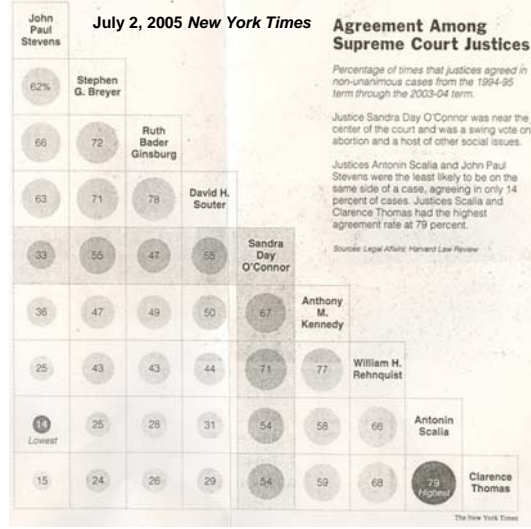
Visualizing the Harvard Law Review Supreme Court Statistics



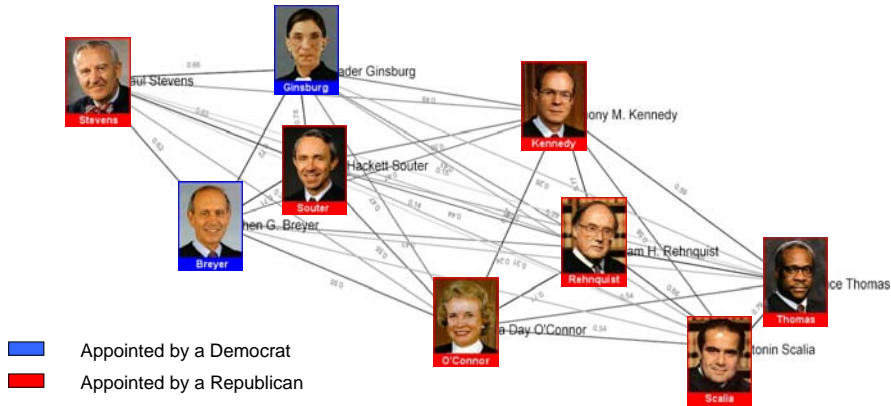
500 [Vol. 114:487]

TABLE 1 (continued)
(B2) VOTING ALIGNMENTS—NON-UNANIMOUS CASES*

| | Rehnquist | Stevens | O'Connor | Scalia | Souter | Thomas | Ginsburg | Breyer |
|---|-----------|---------|----------|--------|--------|--------|----------|--------|
| O | 17 | 36 | 22 | 33 | 20 | 24 | 24 | 26 |
| S | 0 | 6 | 8 | 8 | 0 | 10 | 0 | 0 |
| D | 17 | 42 | 30 | 41 | 20 | 38 | 24 | 28 |
| N | 55 | 53 | 54 | 55 | 55 | 55 | 55 | 54 |
| P | 30.9 | 79.2 | 55.6 | 74.5 | 36.4 | 61.8 | 43.6 | 51.9 |
| O | 17 | 22 | 6 | 20 | 28 | 8 | 29 | 26 |
| S | 0 | 0 | 1 | 2 | 14 | 1 | 12 | 9 |
| D | 17 | 32 | 1 | 22 | 42 | 9 | 49 | 35 |
| N | 55 | 51 | 53 | 54 | 55 | 55 | 55 | 54 |
| P | 30.9 | 41.5 | 48.1 | 65.0 | 49.1 | 43.4 | 52.8 | 65.4 |
| O | 22 | 6 | 22 | 19 | 80 | 20 | 12 | 12 |
| S | 8 | 1 | 3 | — | 5 | 1 | 15 | 1 |
| D | 30 | 7 | 25 | — | 23 | 11 | 35 | 13 |
| N | 54 | 54 | 52 | — | 54 | 54 | 54 | 53 |
| P | 55.6 | 13.0 | 48.1 | — | 42.6 | 70.4 | 64.8 | 24.1 |
| O | 33 | 20 | 32 | 19 | 24 | 23 | 21 | 23 |
| S | 8 | 2 | 4 | 5 | — | 2 | 6 | 0 |
| D | 30 | 28 | 30 | 21 | — | 13 | 12 | 14 |
| N | 55 | 55 | 53 | 54 | — | 55 | 55 | 55 |
| P | 74.5 | 40.0 | 66.0 | 42.6 | — | 45.5 | 49.1 | 41.8 |
| O | 20 | 28 | 28 | 10 | 21 | — | 13 | 12 |
| S | 10 | 14 | 9 | 1 | 2 | — | 1 | 15 |
| D | 34 | 9 | 33 | 25 | 21 | — | 15 | 10 |
| N | 55 | 55 | 53 | 54 | 55 | — | 55 | 55 |
| P | 36.4 | 78.4 | 49.1 | 20.4 | 45.5 | — | 23.6 | 81.8 |
| O | 14 | 8 | 21 | 21 | 12 | — | 14 | 12 |
| S | 10 | 1 | 2 | 15 | 6 | — | 0 | 1 |
| D | 34 | 9 | 33 | 25 | 21 | — | 15 | 10 |
| N | 55 | 55 | 53 | 54 | 55 | — | 55 | 54 |
| P | 61.8 | 18.4 | 43.4 | 64.8 | 49.1 | 23.6 | — | 25.5 |
| O | 14 | 28 | 28 | 12 | 23 | — | 14 | 13 |
| S | 10 | 12 | 9 | 1 | 0 | — | 15 | 10 |
| D | 34 | 40 | 28 | 13 | 23 | — | 45 | 14 |
| N | 55 | 55 | 53 | 54 | 55 | — | 55 | 55 |
| P | 43.6 | 72.7 | 52.8 | 24.1 | 41.8 | 81.8 | 25.5 | — |
| O | 25 | 26 | 32 | 21 | 14 | — | 13 | 12 |
| S | 12 | 9 | 2 | 10 | 1 | — | 10 | 1 |
| D | 38 | 35 | 34 | 13 | 25 | — | 33 | 44 |
| N | 54 | 54 | 52 | 53 | 54 | — | 54 | 54 |
| P | 51.9 | 64.8 | 65.4 | 22.6 | 46.3 | 64.8 | 24.1 | 81.5 |



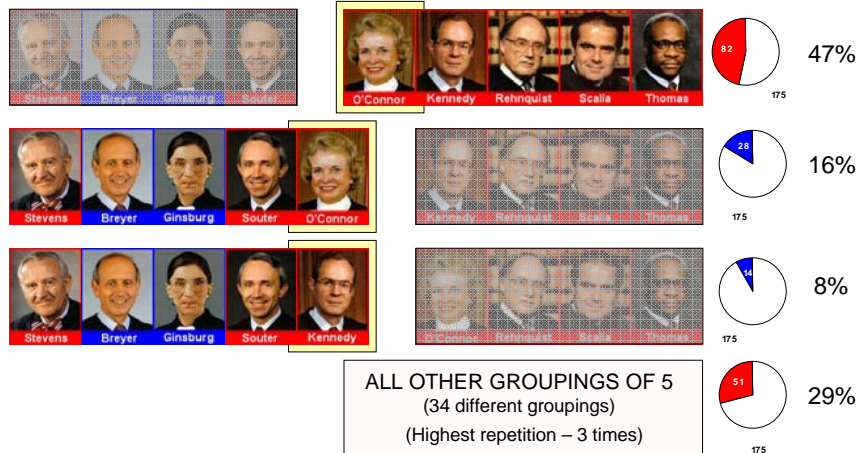
Ideological Landscape of the Justices (1994 – 2003)



Voting frequencies represented as the edge weight between nodes and presented visually as a graph. (Rendered with Pajek using a stochastic, spring force algorithm.)

Frequency of Voting Blocks in 5-4 Cases

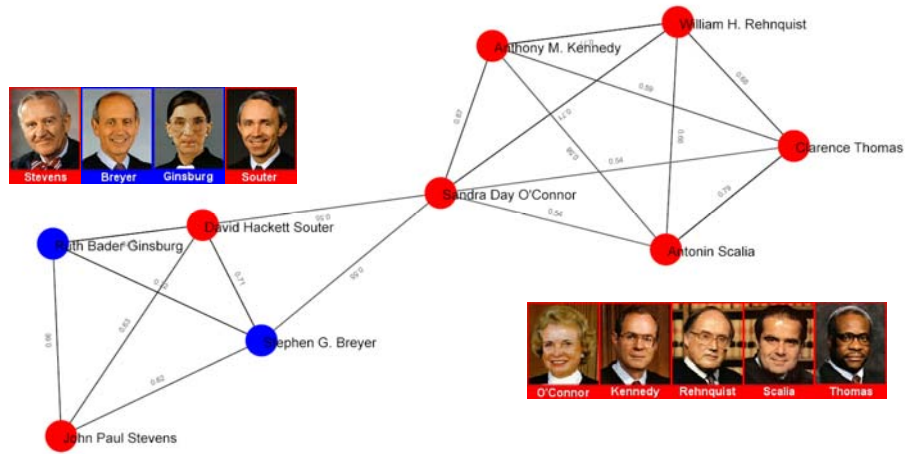
(1994 -2003 Supreme Court Terms)



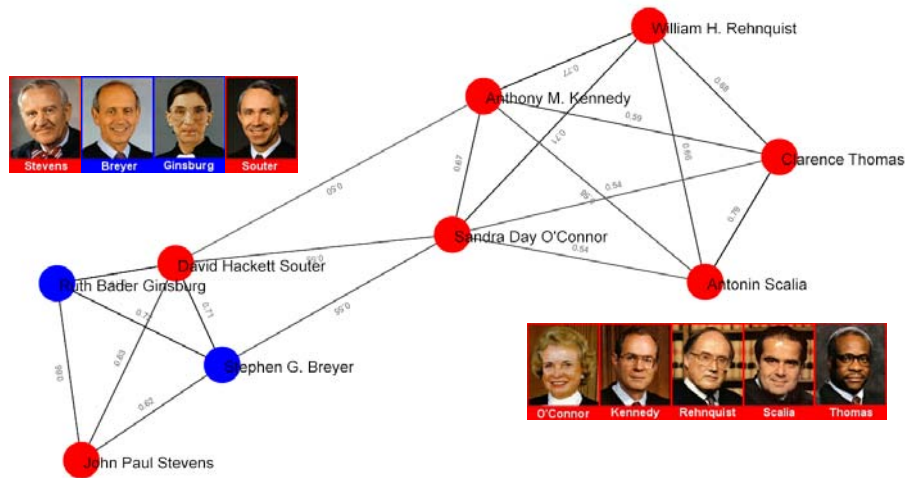
Total 5 to 4 Cases = 175

Source: Statistics harvested from the Harvard Law Review

Thresholding (Voting Together > 50%) Reveals Ideological Cliques

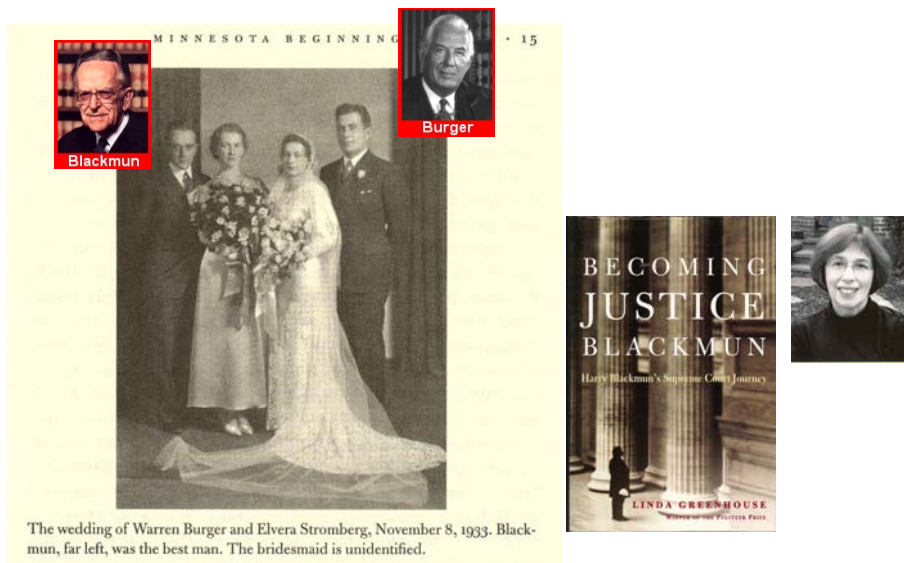


Thresholding (Voting Together > 49%) Reveals Ideological Cliques

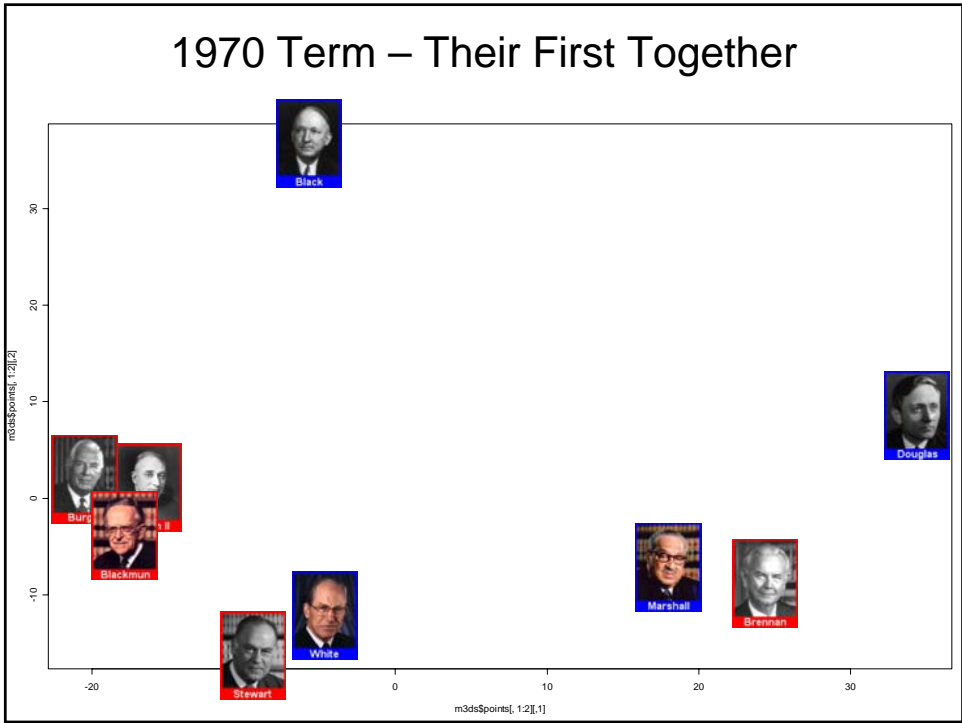
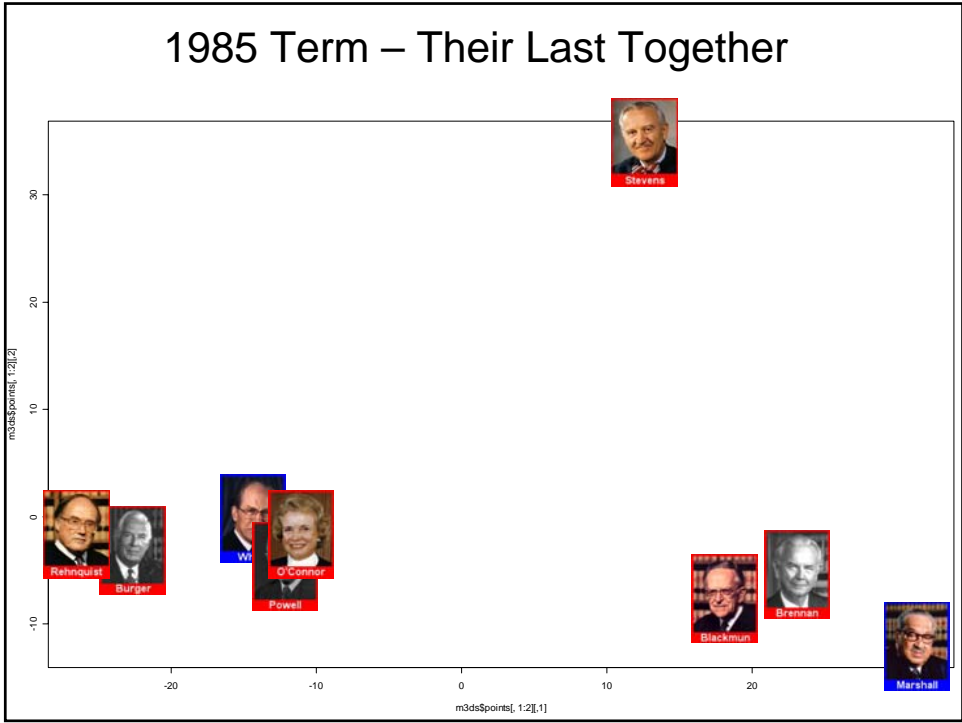


The Minnesota Twins Story

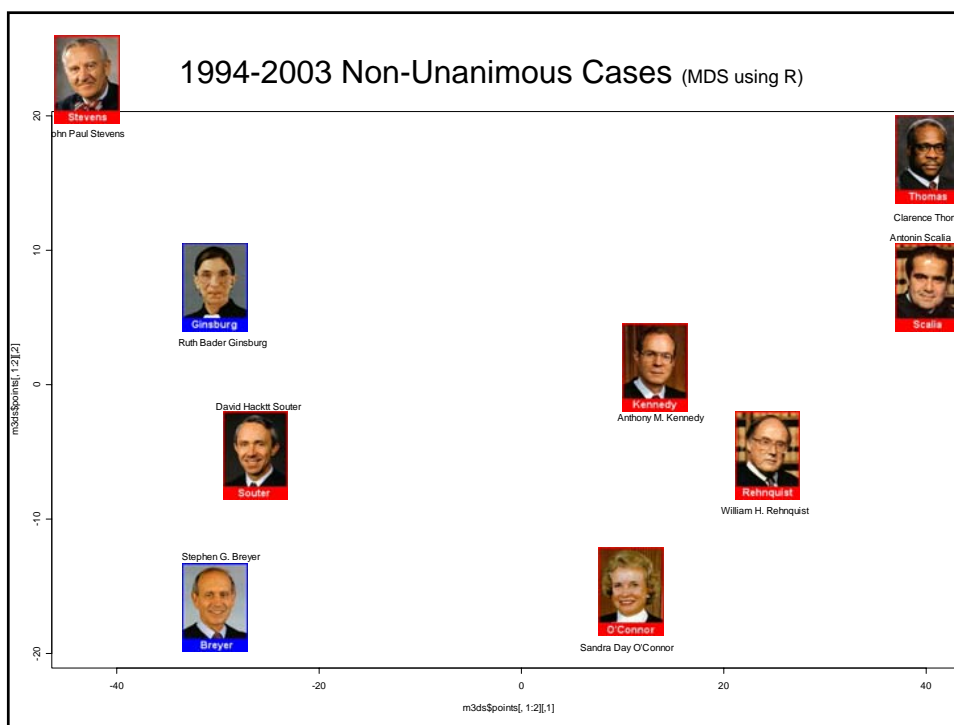
Two Friends End Up on the Supreme Court



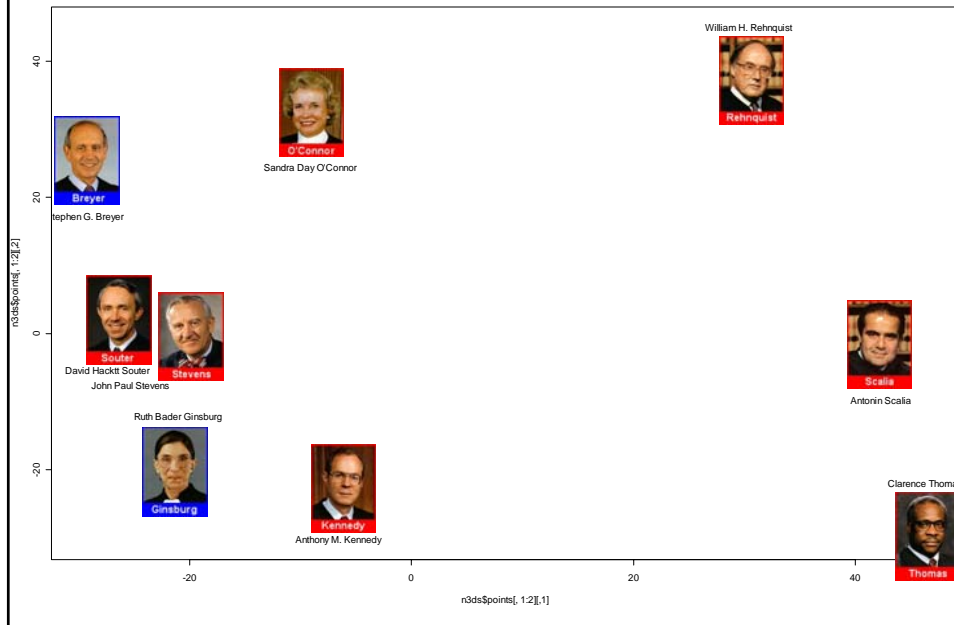
The wedding of Warren Burger and Elvera Stromberg, November 8, 1933. Blackmun, far left, was the best man. The bridesmaid is unidentified.



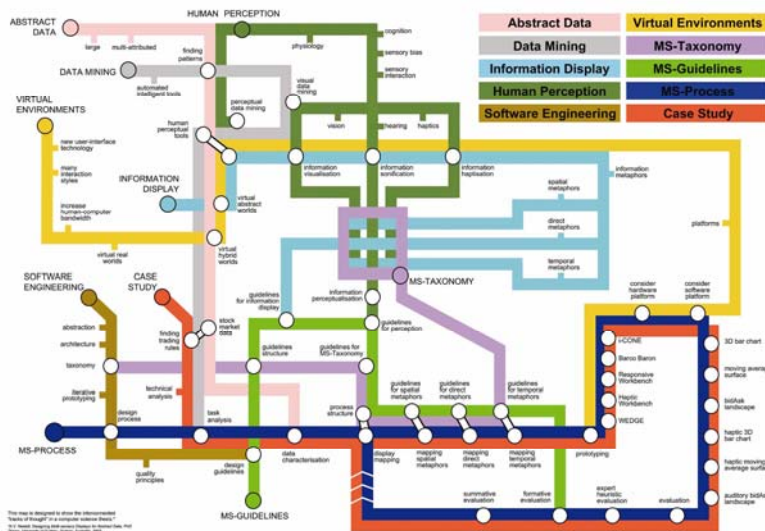
Aggregate vs. Specific Topics (Potential for different spatial distributions)



1994-2003 Freedom of Speech Cases (MDS using R, O method)



2004



Intersecting threads of thought of Keith Nesbitt's doctoral dissertation. Employing the metro map metaphor.



Nesbitt (2004). "Getting to more Abstract Places using the Metro Map Metaphor," IV'04, 8th International Conference on Information Visualisation London, 2004.

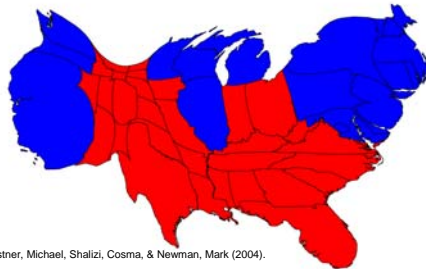
DC BLOGS

- The DC Metro map became a navigational front end to D.C. related blogs.
- People self associated with stops both literally based on geography
- and metaphorically based on the reputation of the place.
- Alas, it died sometime during or after 2005.



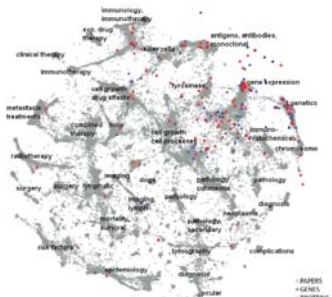
<http://www.reenhead.com/map/metroblogmap.html>

Thematic Map



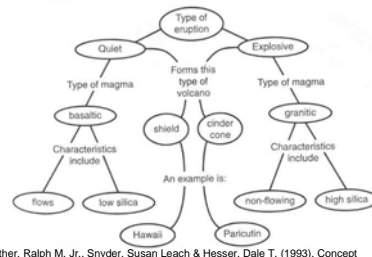
Gastner, Michael, Shalizi, Cosma, & Newman, Mark (2004).

KDVs



Boyack, Kevin W., Mane, Ketan K. and Börner, Katy. (2004). Mapping Medline Papers, Genes, and Proteins Related to Melanoma Research. IV2004 Conference, London, UK, pp. 965-971

Concept Map

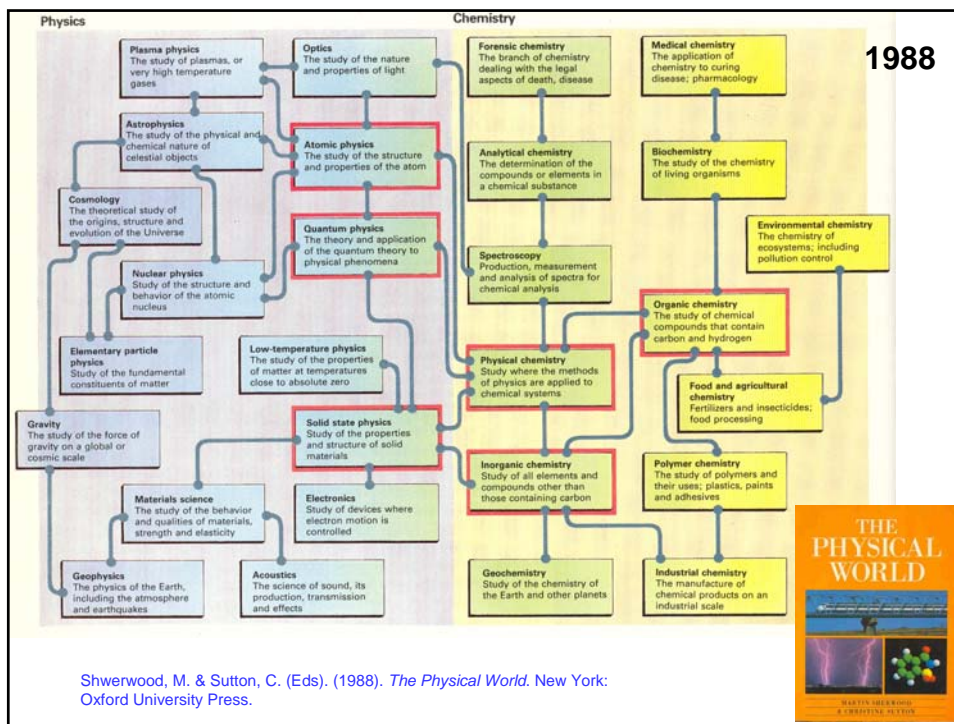


Feather, Ralph M. Jr., Snyder, Susan Leach & Hesser, Dale T. (1993). Concept Mapping, workbook to accompany, Merrill Earth Science. Lake Forest, Illinois: Glencoe.

Metro Map Metaphor



Nesbitt, Keith V. (2004). Getting to more Abstract Places using the Metro Map Metaphor. (IV'04). IEEE.



Benefits of Domain Maps

- Provides a structure or scaffolding that students may use to organize the details of a particular subject.
- Information is better assimilated with the student's existing knowledge.
- Visualization enhances recall.
- Makes explicit the connections between conceptual subparts and how they are related to the whole.
- Helps to signal to the student which concepts are most important to learn.

Hook, Peter A. and Börner, Katy. (2005) Educational Knowledge Domain Visualizations: Tools to Navigate, Understand, and Internalize the Structure of Scholarly Knowledge and Expertise. In Amanda Spink and Charles Cole (eds.) *New Directions in Cognitive Information Retrieval*. Springer-Verlag.

Dual Coding Theory of Memory

- Humans store textual and visual information in different areas of the brain. (Paivio, 1987; Kulhavy & Stock, 1994).
- Visual/spatial images trigger memory of textual elements, and text triggers memory of images and locations.

Semantic Network Theory of Learning

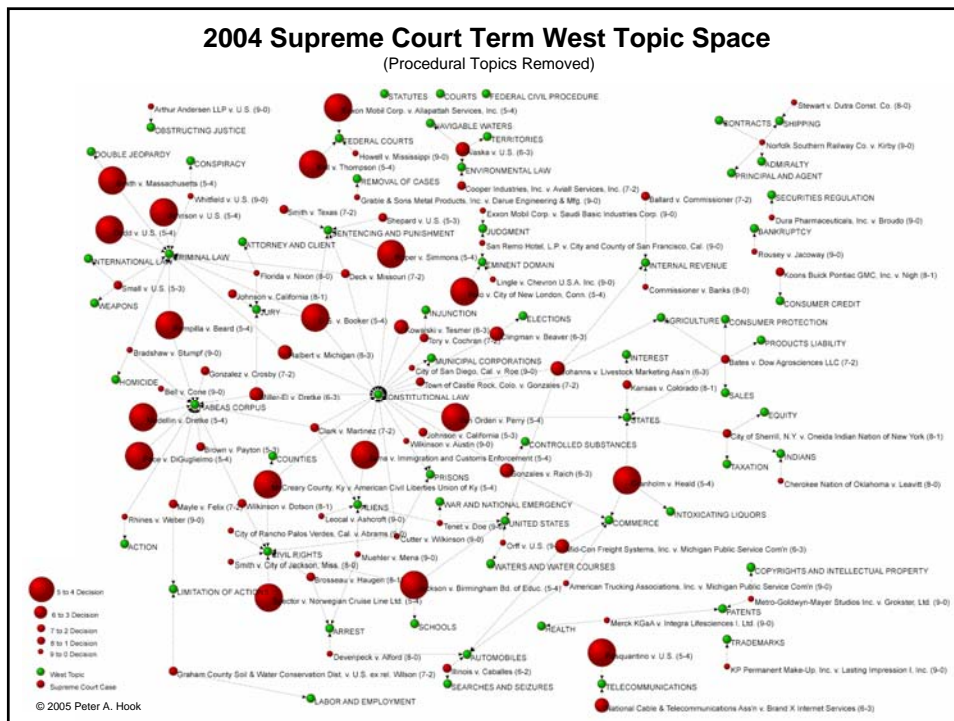
- Human memory is organized into networks consisting of interlinked nodes.
- Nodes are concepts or individual words.
- The interlinking of nodes forms knowledge structures or schemas.
- Learning is the process of building new knowledge structures by acquiring new nodes.
- When learners form links between new and existing knowledge, the new knowledge is integrated and comprehended.

Jonassen, D. H., Beissner, K., & Yacci, M. (1993). *Structural Knowledge: Techniques for Representing, Conveying, and Acquiring Structural Knowledge*. Hillsdale, New Jersey: Lawrence Erlbaum Associates.

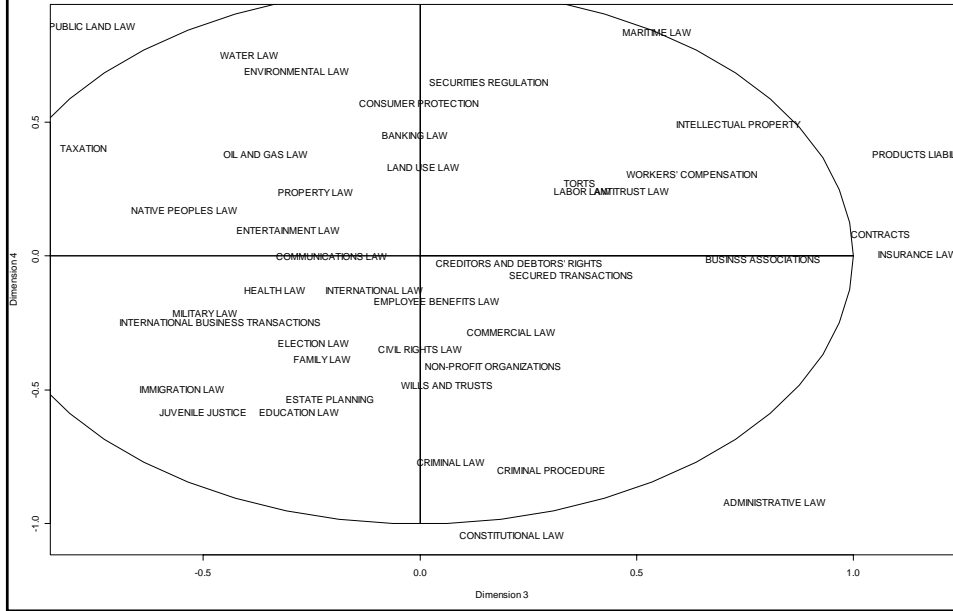
Neural Theory of Knowledge

- Associations between different sensory experiences result from consistent co-activation of different clusters of neurons.
- Eventually, these associations become fixed via the “recruitment of neural circuitry linking them.” In a similar process, abstract concepts also become linked.
- This gives rise to metaphors in which “highly structured neural ensembles in different regions of the brain” are associated together through repeated co-activation.
- All knowledge is built upon a series of ever more complex neural associations.

Lakoff, G., & Johnson, M. (2003 (1980)). *Metaphors We Live By*. Chicago: University of Chicago Press.



PCA, Doctrinal Subjects Aggregated to Law School Course Offerings



THE END