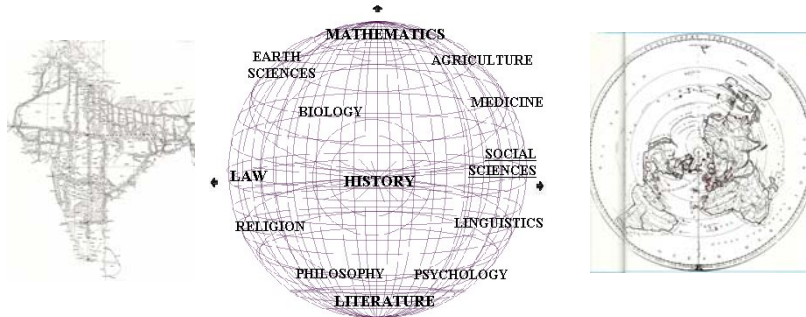


## Domain Maps: Purposes, History, Parallels with Cartography, and Applications



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 Information Science  
<http://ella.slis.indiana.edu/~pahook>  
 July 4, 2007, IV07-KDviz: 6th  
 Zurich, Switzerland

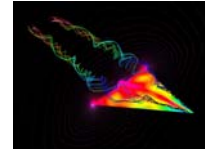
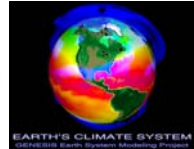


## Visualization – 2 Varieties

### • Scientific Visualization

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

- Term first used in 1987 – B. H. McCormick, T. A. DeFanti, and M. D. Brown, "Visualization in Scientific Computing," *Computer Graphics*, vol. 21, Nov. 1987.



### • Information Visualization

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

- Term first used in 1989 – G.G. Robertson, S.K. Card, and J.D. MacKinlay, "The Cognitive Coprocessor Architecture for Interactive User Interfaces," *Proceedings of UIST'89, ACM Symposium on User Interface Software and Technology*, pp. 10-18 1989.

# Purposes

- (1) Discovery
  - (2) Understanding
  - (3) Communication
  - (4) Education
- B. H. McCormick, T. A. DeFanti, and M. D. Brown, "Visualization in Scientific Computing," *Computer Graphics*, vol. 21, Nov. 1987.
  - T. A. DeFanti, M. D. Brown, and B. H. McCormick, "Visualization: Expanding Scientific and Engineering Research Opportunities," *Computer*, vol. 22, pp. 12-25, August 1989.
  - G. M. Nielson, B. Shriver, and L. J. Rosenblum, "Introduction and Overviews of Scientific Visualization," in *Visualization in Scientific Computing*, G. M. Nielson, B. Shriver, and L. J. Rosenblum, Eds. Los Alamitos, California: IEEE Computer Society Press, 1990, p. 273.

These may be collapsed into two general purposes:

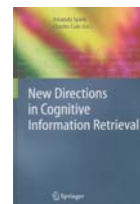
- (1) Discovery and (2) Explanation

# Knowledge Domain Visualizations

- **“Knowledge domain visualizations (KDV)s 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.

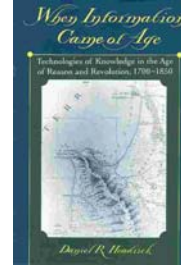
- Another definition intertwined with the object's purpose.
- Domain Maps
- Information Cartography
- Data Landscapes



## Descriptive → Scientific Cartography

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

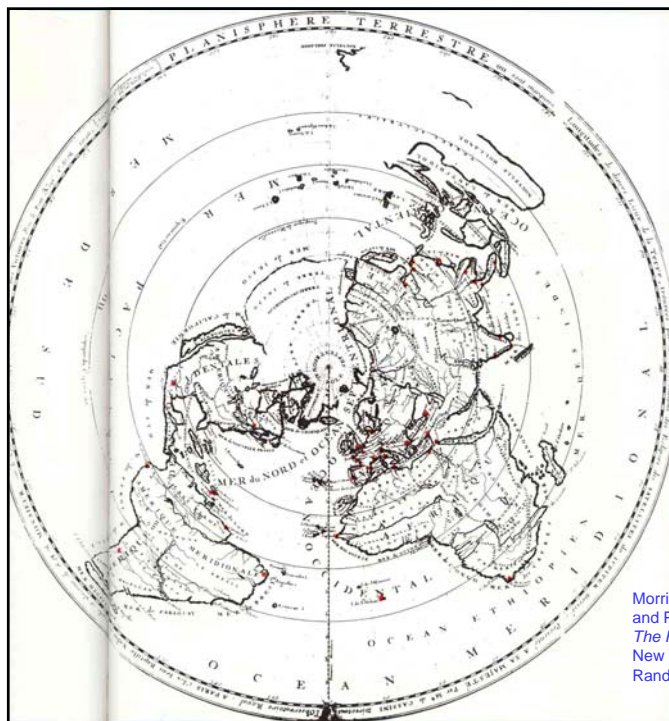
- Triangulation over large distances from a known base measure.
- Using the moons of Jupiter to establish longitude on land.
- Using accurate time pieces to establish longitude at sea.
- Accurately measuring depth and altitude, and representing them on maps.



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.
- We have more accurate views and there are evolving conventions.



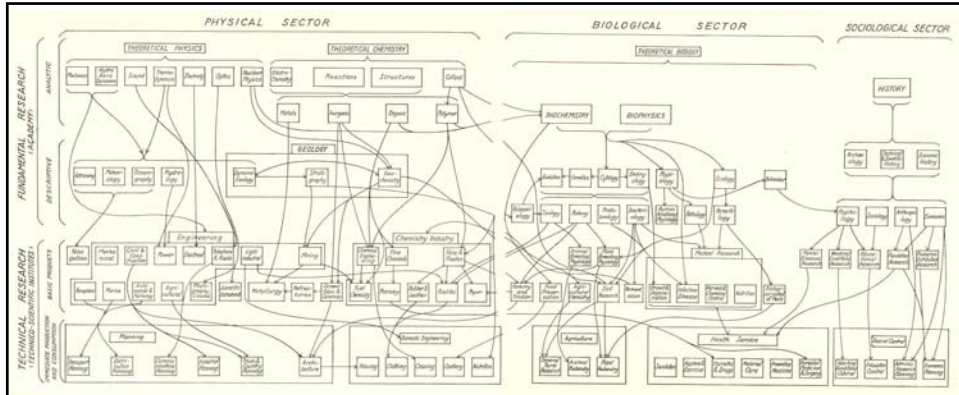
1696

- 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.

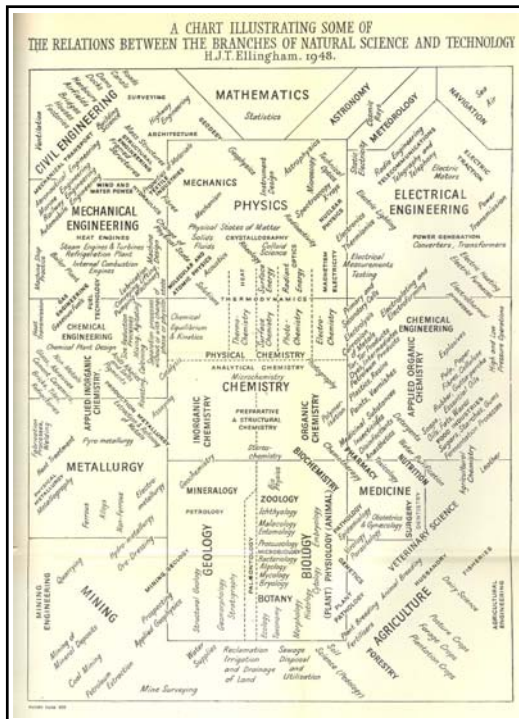
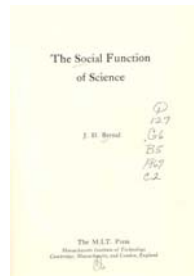




**1939**

- John D. Bernal (physicist, historian of science, and sociologist of science)
- Considered one of the first 'maps of science.'

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



**1948**



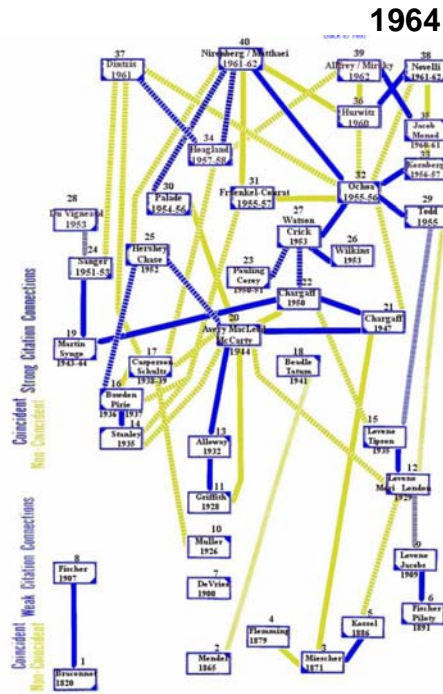
Ellingham, H. J. T. (1948), Divisions of Natural Science and Technology, in Reports and Papers of the Royal Society Scientific Information Conference, 21 June – 2 July, 1948. London: The Royal Society, Burlington House.

**Historiograph of DNA Development**  
 (Garfield, Sher, & Torpie, 1964)  
 "The Use of Citation Data in Writing the History of Science."  
 Published by The Institute for Scientific Information, December 1964. Report of research for Air Force Office of Scientific Research under contract F49(638)-1256.

**Eugene Garfield**, recent photo. Creator of the ISI Web of Science citation database.



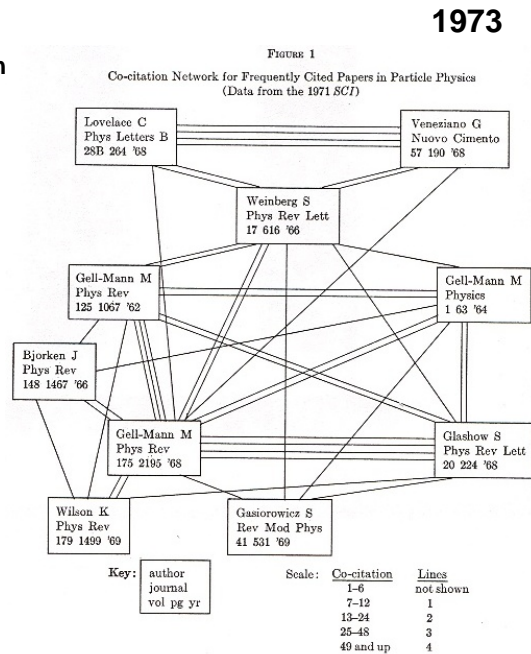
<http://www.garfield.library.upenn.edu/>



**Co – Discoveries / Implementation**

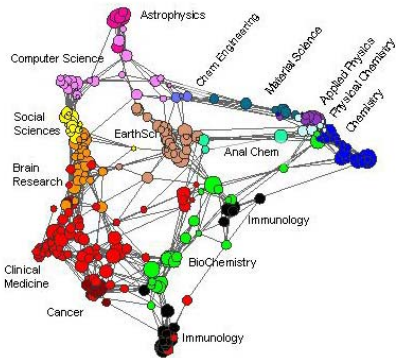
Using Co-Citation to create domain maps.

- 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.

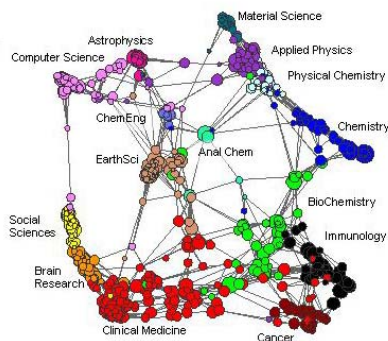




## 2004 Paradigm Maps



ISI Map (283 Nodes)



Scopus Map (554 Nodes)

SciTech Strategies, Inc.



Richard Klavans

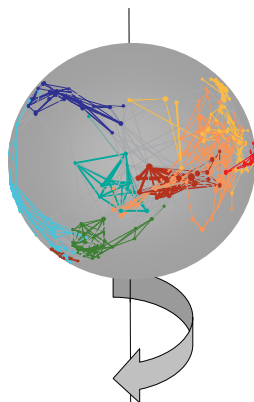


Kevin Boyack

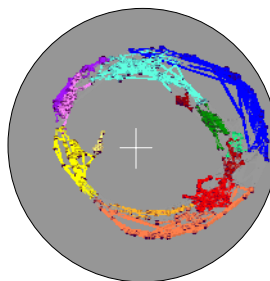
Klavans, R., Boyack, K.W., *Is There a Convergent Structure to Science?*, Presentation for the 11th International Conference of the International Society for Scientometrics and Informetrics Madrid, Spain, 26 June. 2007.

## UCSD Disciplinary Map

Global Projection



Rescaled Stereographic Projection



Images of Disciplinary Map © The Regents of the University of California

SciTech Strategies, Inc.



Richard Klavans

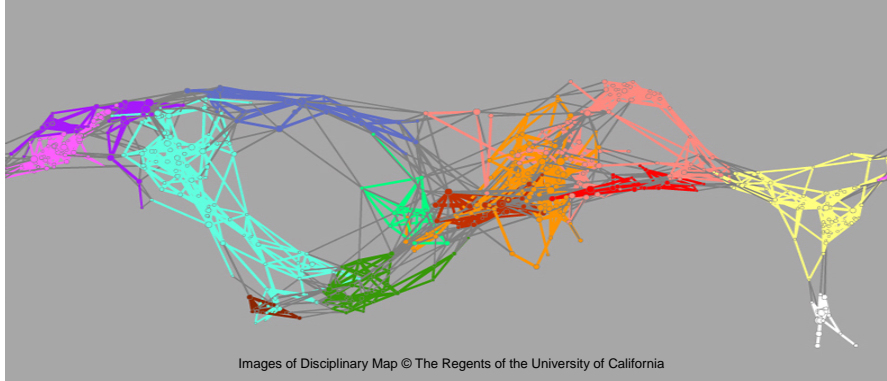


Kevin Boyack

Klavans, R., Boyack, K.W., *Is There a Convergent Structure to Science?*, Presentation for the 11th International Conference of the International Society for Scientometrics and Informetrics Madrid, Spain, 26 June. 2007.

## UCSD Disciplinary Map

Mercator Projection



SciTech Strategies, Inc.



Richard Klavans



Kevin Boyack

Klavans, R., Boyack, K.W., *Is There a Convergent Structure to Science?*, Presentation for the 11th International Conference of the International Society for Scientometrics and Informetrics Madrid, Spain, 26 June. 2007.

## 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.



**ARIST**  
 Online Learning Environment  
Advanced Research in Information Science

Information Failures in Health Care. MacIntosh-Murray, A. and Choo CW, Vol. 40:9, ARIST 2006, 357-371.  
 Intelligence, Terrorism, and National Security. Cronin, B., Vol. 39:10, ARIST 2004, 395-432.

Browse by:

Title  
  Author  
  Volume  
  Topic

Browser panel entries sorted by Title

- Bioinformatics. Benoit, G., Vol. 39:5, ARIST 2004, 179-218.
- Children, Teenagers, and the Web. Large, A., Vol. 39:9, ARIST 2004, 319-330.
- Collaborative Information Seeking and Retrieval. Foster, J., Vol. 39:10, ARIST 2004, 395-432.
- Domestic Security Surveillance and Civil Liberties. Strickland, J., Vol. 39:10, ARIST 2004, 395-432.
- Electronic Records Management. Gilliland-Swetland, A., Vol. 39:10, ARIST 2004, 395-432.
- Formal Concept Analysis in Information Science. Priss, U., Vol. 39:10, ARIST 2004, 395-432.
- Geographies of the Internet. Zook, M., Vol. 40:2, ARIST 2006, 29-38.
- Information Behavior. Case, DO., Vol. 40:7, ARIST 2006, 29-38.
- Information Failures in Health Care. MacIntosh-Murray, A., Vol. 40:9, ARIST 2006, 357-371.
- Information History. Black, A., Vol. 40:11, ARIST 2006, 441-450.
- Information Retrieval on the Web. Yang, K., Vol. 39:2, ARIST 2004, 51-60.
- Information Visualization. Zhu, B. and Chen, H., Vol. 39:4, ARIST 2004, 111-120.
- Intelligence and Security Informatics. Chen, H. and Xu, J., Vol. 39:10, ARIST 2004, 395-432.
- Intelligence, Terrorism, and National Security. Cronin, B., Vol. 39:10, ARIST 2004, 395-432.
- Interface Design and Culture. Callahan E., Vol. 39:7, ARIST 2004, 211-220.
- Introduction. Cronin, B., Vol. 40:Intro, ARIST 2006, VII-IX.
- Introduction. Cronin, B., Vol. 39:Intro, ARIST 2004, VII-XI.
- Labor in Information Systems. Warner J., Vol. 39:13, ARIST 2004, 411-420.

Information Failures in Health Care references the following resources:

- \*I MED, 2003, PAT SAF ACH NEW STAN
- \*NAT STEER COMM PA, 2002, BUILD SAF SYST NAT I
- ALVESSON M, 1993, CULTURAL PERSPECTIVE
- ALVESSON M, 2002, UNDERSTANDING ORG CU

**WARREN COURT**

**BURGER COURT**

**REHNQUIST COURT**

### Ideological Alliances on the Supreme Court: Visualizing Co-Voting Data

Peter A. Hook  
 Doctoral Student  
 Indiana University-Bloomington  
 School of Library and Information Science  
 300-300-3000 (hook@slis.indiana.edu)

Justices of the United States Supreme Court (1956 – 2005 Terms)

Justice 1	Justice 2	Agreement %
Black	Stevens	90.00
Black	Souter	85.00
Black	Ginsburg	85.00
Black	Breyer	85.00
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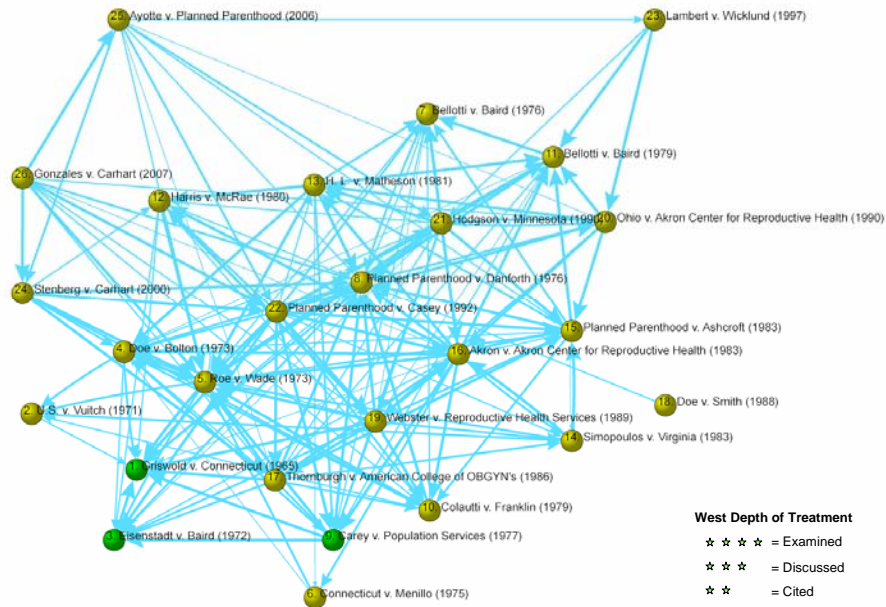
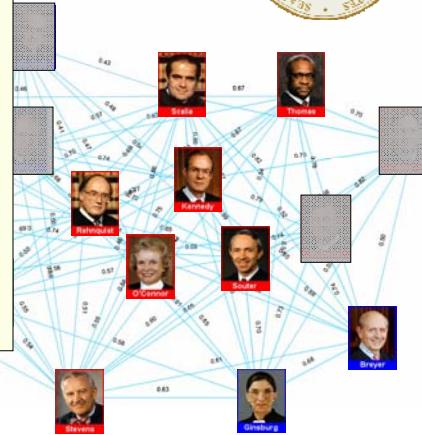
## Justices of the United States Supreme Court (1956 – 2005 Terms)

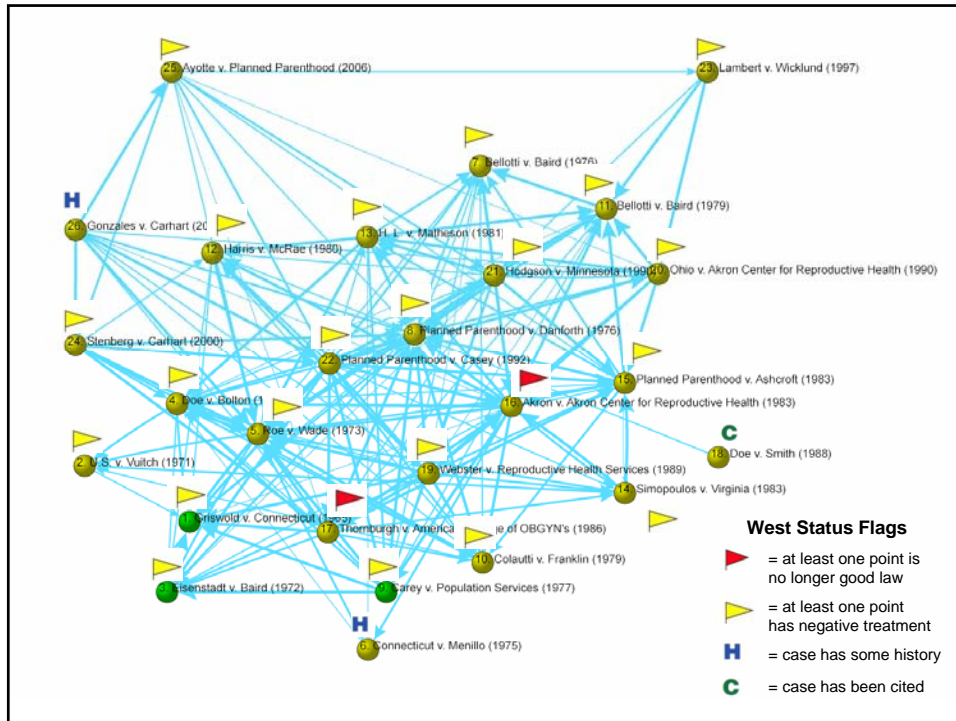
### Significant Cases Rehnquist Court 6:

- **U.S. Term Limits v. Thornton** – no state term limits for Congresspersons
- **Clinton v. Jones** – President can be sued while in office
- **Boy Scouts of America v. Dale** – private organization can prohibit homosexuals
- **Bush v. Gore** – Florida recount must stop
- **Lawrence v. Texas** – sodomy laws unconstitutional
- **Atkins v. Virginia** – cannot execute mentally retarded criminals
- **Grutter v. Bollinger** – narrowly tailored affirmative action is permissible
- **Hamdi v. Rumsfeld** – enemy combatants have right to neutral decisionmaker
- **Kelo v. City of New London** – state can take private property for commercial development

### Rehnquist Court 6

(Aug. 3, 1994 to Sept. 28, 2005)  
 (6<sup>th</sup> different composition of nine Justices during the tenure of Chief Justice William H. Rehnquist.)





**THE END**