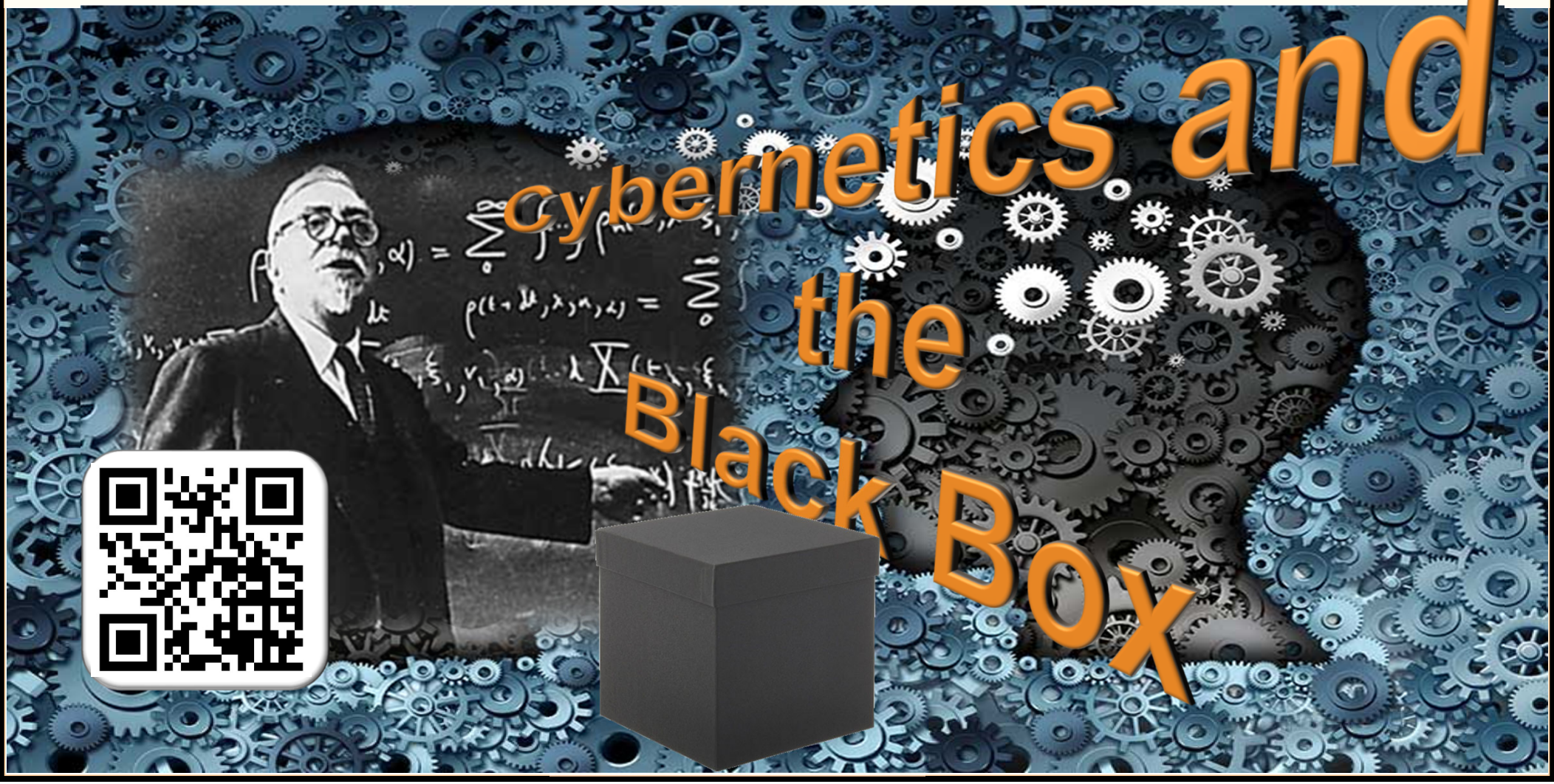
lecture 4 – Part 2



evaluation

- Participation: 20%.
  - class discussion, everybody reads and discusses every paper
  - engagement in class
- Paper Presentation and Discussion: 20%
  - SSIE501 assigned to groups to present papers as group lead presenters or lead discussants
    - all students are supposed to read and participate in discussion of every paper.
  - Presenter prepares short summary of assigned paper (15 minutes)
    - no formal presentations or PowerPoint unless figures are indispensable.
  - Summary should:
    - 1) Identify the key goals of the paper (not go in detail over every section)
    - 2) What discussant liked and did not like
    - 3) What authors achieved and did not
    - 4) Any other relevant connections to other class readings and beyond.
  - Class discussion is opened to all
    - lead discussant ensures we important paper contributions and failures are addressed
- Black Box: 60%
  - Group Project (2 parts)
    - Assignment I (25%) and Assignment II (35%)

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key events coming up

- Paper Presentation: 20%
  - Present and lead the discussion of an article related to the class materials
    - Enginet students post/send video or join by Zoom synchronously
- Module 1: Cybernetics and the Information Turn
- Today: September 11
  - Discussion Set 2 (**group 2**)
    - Brenner, Sydney. [2012]. "History of Science. The Revolution in the Life Sciences". *Science* **338** (6113): 1427-8.
    - Brenner, Sydney. [2012]. "Turing centenary: Life's code script. *Nature* **482** (7386) (February 22): 461-461.
    - Cobb, Matthew. [2013]. "1953: When Genes Became 'Information'." *Cell* **153** (3): 503-506.
      - Optional: Searls, David B. [2010]. "The Roots of Bioinformatics". *PLoS Computational Biology* **6**(6): e1000809.
    - ~~Weaver, W. [1948]. "Science and Complexity". *American Scientist*, **36**(4): 536-44. Also available in Klir, G.J. [2001]. *Facets of systems Science*. Springer, pp: 533-540.~~
  - **Discussion by all**

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more upcoming readings (check brightspace)

- Paper Presentation: 20%
  - Present and lead the discussion of an article related to the class materials
    - Enginet students post/send video or join by Zoom synchronously
- Module 2: Systems Science
  - September 18
    - Discussion Set 3:
      - Klir, G.J. [2001]. *Facets of systems Science*. Springer. Chapters 1 and 2.
        - Optional:
        - Rosen, R. [1986]. "Some comments on systems and system theory". *Int. J. of General Systems*, **13**: 1-3. Available in: Klir, G.J. [2001]. *Facets of systems Science*. Springer. pp: 241-243.
        - Wigner, E.P. [1960], "The unreasonable effectiveness of mathematics in the natural sciences". Richard courant lecture in mathematical sciences delivered at New York University, May 11, 1959. *Comm. Pure Appl. Math*, **13**: 1-14.
      - Weaver, W. [1948]. "Science and Complexity". *American Scientist*, **36**(4): 536-44. Also available in Klir, G.J. [2001]. Facets of systems Science. Springer, pp: 533-540.
  - September 25 (no class on 23)
    - Discussion Set 4:
      - Klir, G.J. [2001]. *Facets of systems Science*. Springer. Chapter 3.
      - Klir, G.J. [2001]. *Facets of systems Science*. Springer. Chapter 8.
        - Optional: Klir, G.J. [2001]. *Facets of systems Science*. Springer. Chapter 11
- Future Modules
  - See brightspace

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      - Weaver, W. [1948]. "Science and Complexity". Facets of systems Science. Springer, pp: 533-
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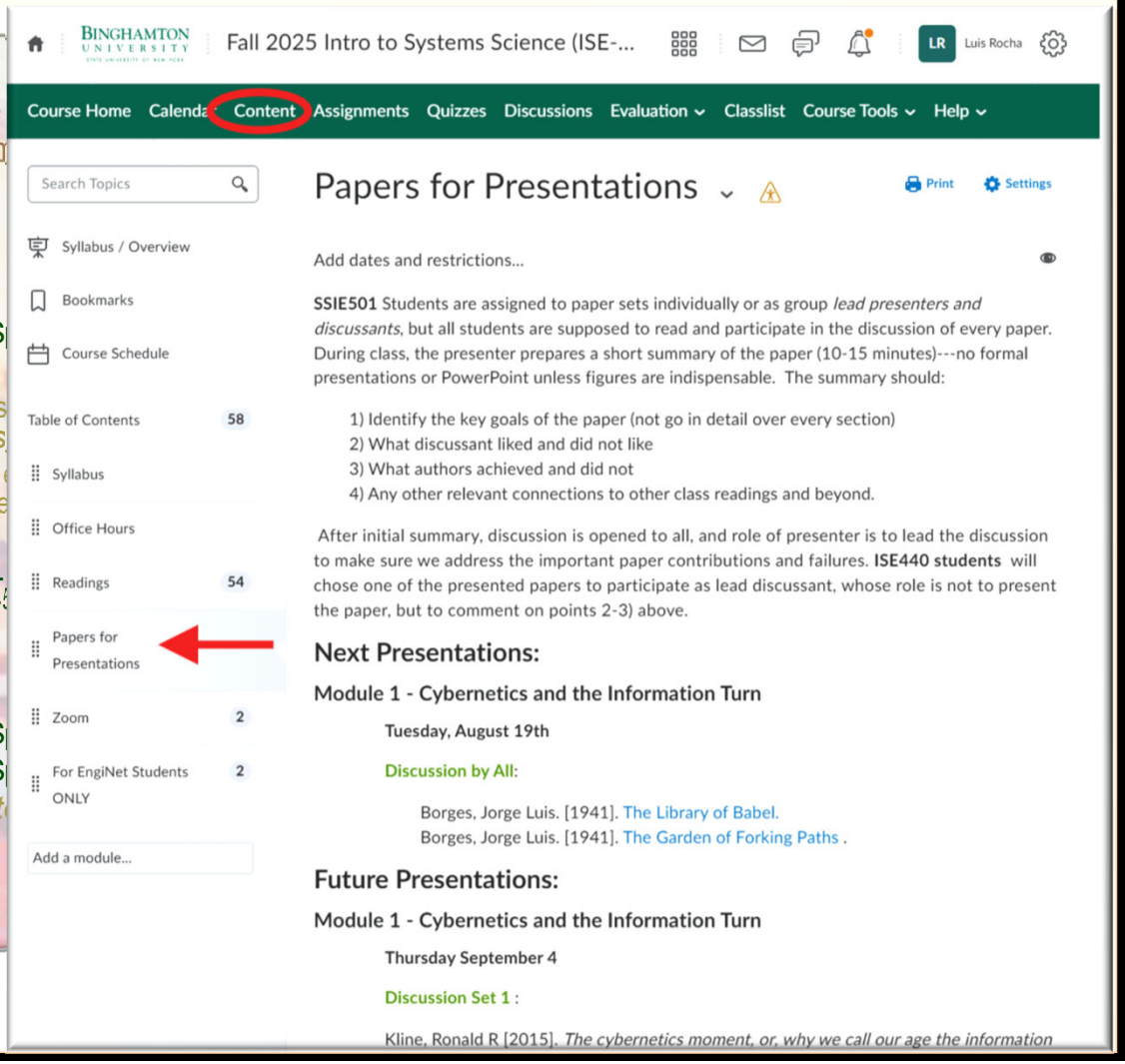
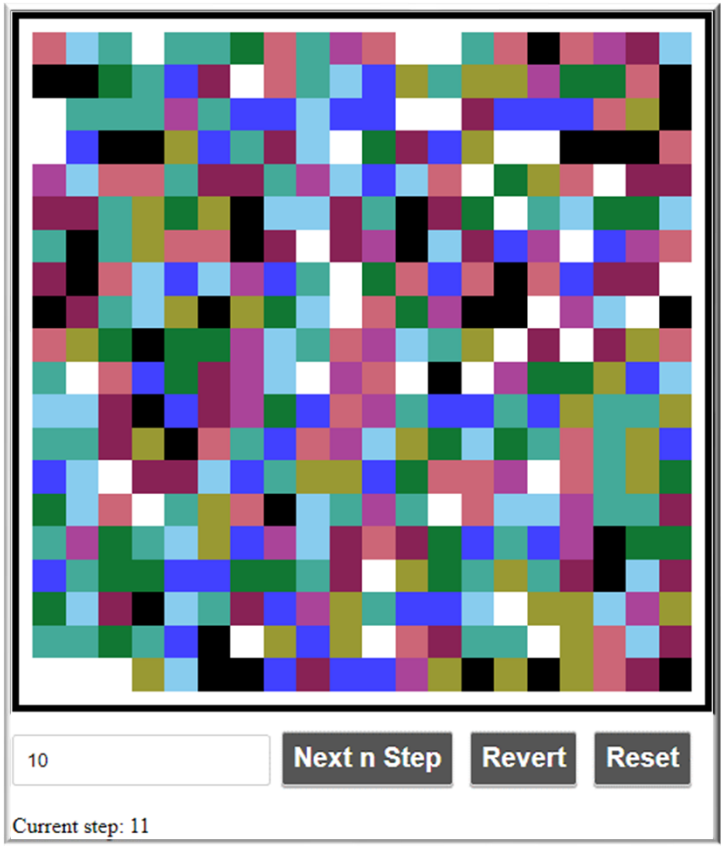


The Black Box: Due: October 10th, 2025

Herbert Simon: Law discovery means only finding **pattern** in the data; whether the pattern will continue to hold for new data that are observed subsequently will be decided in the course of **testing the law**, not discovering it. The **discovery process** runs from particular facts to general laws that are somehow induced from them; the **process of testing** discoveries runs from the laws to predictions of particular facts from them [...] To explain why the patterns we extract from observations frequently lead to correct predictions (when they do) requires us to face again the problem of **induction**, and perhaps to make some hypothesis about the uniformity of nature. But that hypothesis is neither required for, nor relevant to, the theory of discovery processes. […] By separating the question of pattern detection from the question of prediction, we can construct a **true normative theory of discovery**-a logic of discovery.



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Turing as cybernetician

- The Ratio Club (starting in1949)
  - British cybernetics meetings
    - William Ross Ashby, W. Grey Walter, Alan Turing. etc
  - "computation or the faculty of mind which calculates, plans and reasons"
  - Also following Wiener's use of "*Machina ratiocinatrix*" in Cybernetics (1948), following Leibniz' "*calculus ratiocinator*"

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Notes: Back row (from the left): Harold Shipton, John Bates, William Hick, John Pringle, Donald Sholl, John Westcott, and Donald Mackay; middle row: Giles Brindley (guest), Turner McLardy, Ross Ashby, Thomas Gold, and Albert Uttley; front row: Alan Turing, Gurney Sutton (guest), William Rushton, George Dawson, and Horace Barlow
Source: Image courtesy of the Wellcome Library for the History and Understanding of Medicine, London

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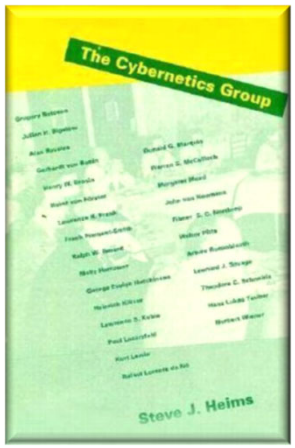
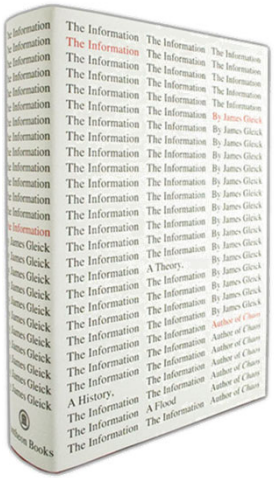
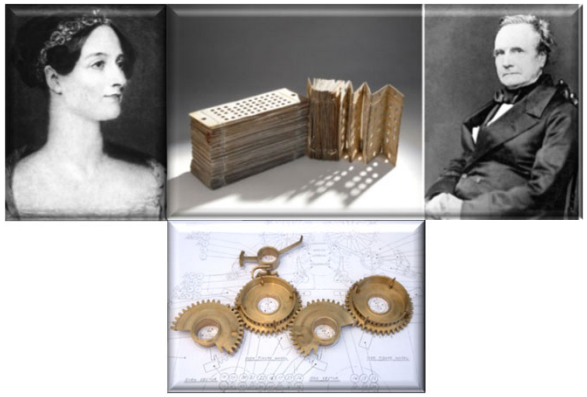
information as its own thing, functional equivalence of mechanisms, and modelling

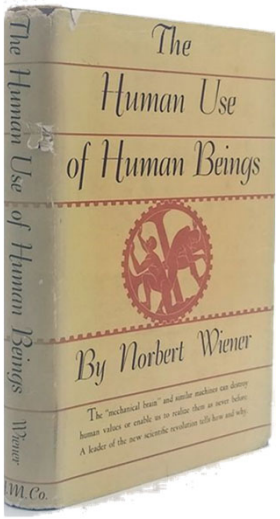


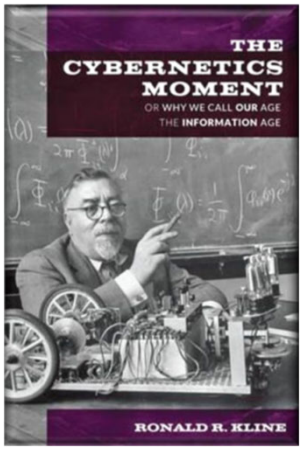
Heims, S.G. [1991]. *The Cybernetics Group*. MIT Press.



Gleick, J. [2011]. *The Information: A History, a Theory, a Flood*. Random House.







"Information is information, not matter or energy. No materialism which does not admit this can survive at the present day." That is, the amount of information was related to a choice among messages (a pattern), not to the material basis or the energy involved in its communication. In discussing the societal implications of cybernetics,

Kline, Ronald R. *The cybernetics moment: Or why we call our age the information age*. JHU Press, 2015.

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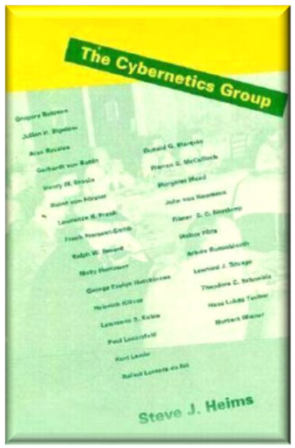

He

Theseus illustrates the blurring of boundaries between animals and machines that has fascinated commentators on cybernetics since the 1950s.[59] But the editors of the conference proceedings—von Foerster, Mead, and Teuber—noted a major problem with Shannon's model. Goal-seeking devices such as guided missiles had "intrigued the theorists [of cybernetics] and prompted the construction of such likeable robots as Shannon's electronic rat." Yet the "fascination of watching Shannon's innocent rat negotiate its maze does not derive from any obvious similarity between the machine and a real rat; they are, in fact, rather dissimilar. The mechanism, however, is strikingly similar to the *notions* held by certain learning theorists about rats and about organisms in general." Theseus thus modeled a theory of learning, rather than how real mice learned to run mazes. The editors concluded that the "computing robot provides us with analogues that are helpful as far as they seem to hold, and no less helpful whenever they break down." Empirical studies on nervous systems and social groups were necessary to test the relationships suggested by the models. "Still, the reader will admit that, in some respects, these models are rather convincing facsimiles of organismic or social processes—not of the organism or social group as a whole, but of significant parts [of it]."[60]

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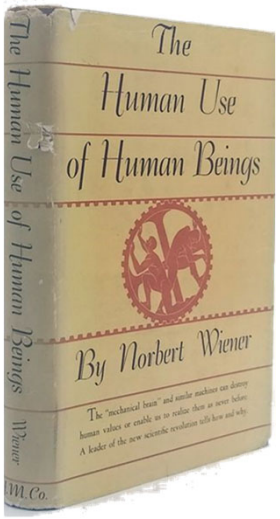

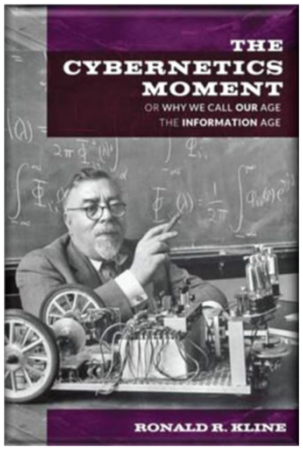

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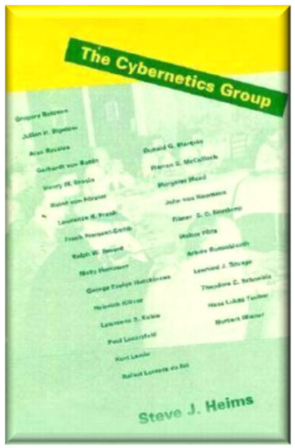

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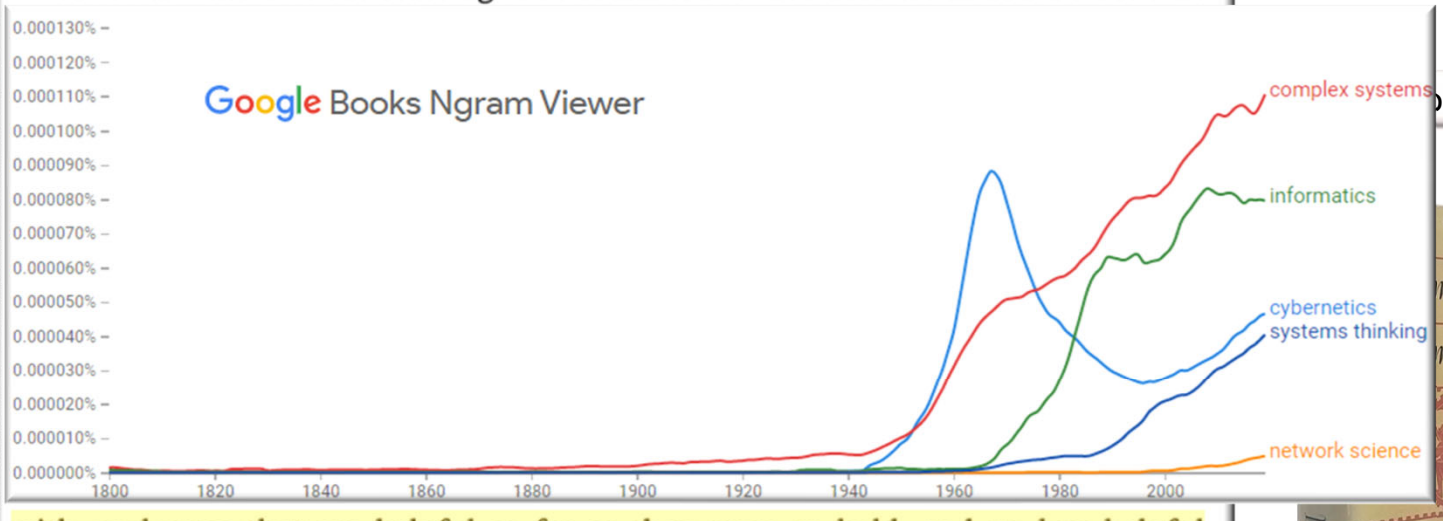

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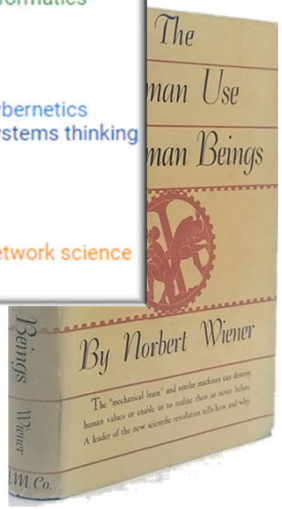

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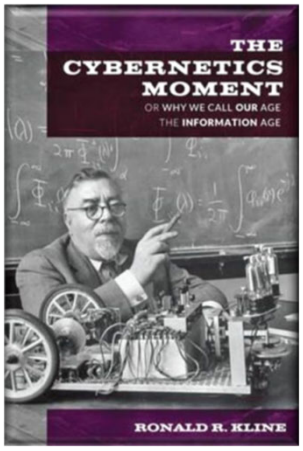

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readings

- Class Book
  - Klir, G.J. [2001]. *Facets of systems science*. Springer.
- Papers and other materials
  - Discussion Set 3 (Group 3): September 18th
    - Klir, G.J. [2001]. *Facets of systems Science*. Springer. Chapters 1 and 2.
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