

A General Theory of Regulation

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The foundation of cybernetics

- Two basic elements – regulator and system being regulated
- Circular causal relations between the two
- Examples in biology – light on retina, hunger, thirst, hormones
- Examples in social systems – purposeful activities, driving a car, managing a firm; self-awareness, reflection, strategy

Facets of cybernetics 1

- Computer science, artificial intelligence -- Alan Turing, John von Neumann,
- Electrical engineering, control systems, automation -- Norbert Wiener,
- Neurophysiology, experimental epistemology -- Warren McCulloch,
- Biology of cognition and psychotherapy, consciousness studies – Bateson, Maturana, Watzlawick

Facets of cybernetics 2

- Management – Beer, Ackoff, Malik
- Media studies and literary analysis – Clark, Hayles, Krippendorff
- Social sciences – Deutsch, Buckley, Luhmann, Mueller
- Design, architecture, education – Pask, Glanville, Scott

Stages in the development of cybernetics in the US

- First order cybernetics – circular causality, engineering cybernetics, 1940s to 1974
- Second order cybernetics – the role of the observer, biological cybernetics, 1974 to early 1990s
- Social cybernetics – interaction between ideas and society, design of intellectual movements, early 1990s to 2000s
- Cybernetics and philosophy of science

Example: Amplifying
management capability

A basic principle in cybernetics: The law of requisite variety

- Formulated by Ross Ashby in 1952
- The variety in a regulator must be at least as great as the variety in the system being regulated
- Span of control in management
- Given limited human cognitive capacity, how do we manage social organizations?

W. Ross Ashby



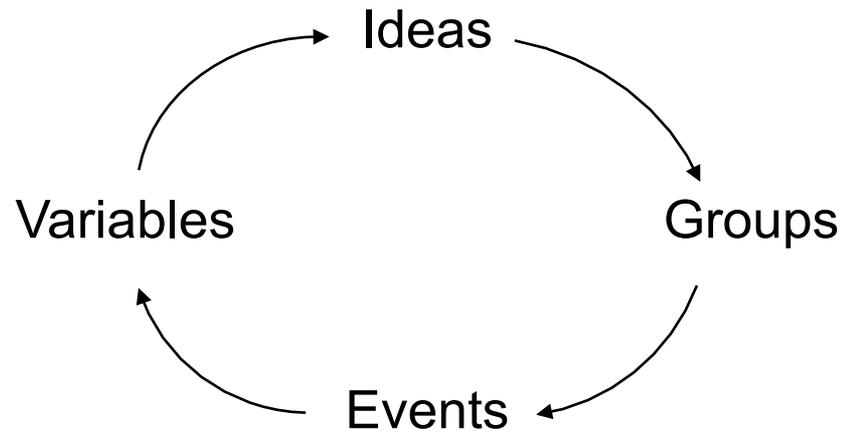
Four strategies of regulation

- One-to-one regulation of variety: football, war, assumes complete hostility
- One-to-one regulation of disturbances: crime control, build institutions
- Change the rules of the game: anti-trust regulation, preventing price fixing
- Change the game: the change from ideological competition to sustainable development

How complexity is controlled

- Each strategy allows an amplification of regulatory capability of about a factor of a thousand
- Regulation must occur throughout, but not necessarily by the regulator. For example, companies regulate each other through competition within rules set by the government

Example: A multi-disciplinary
theory of social change

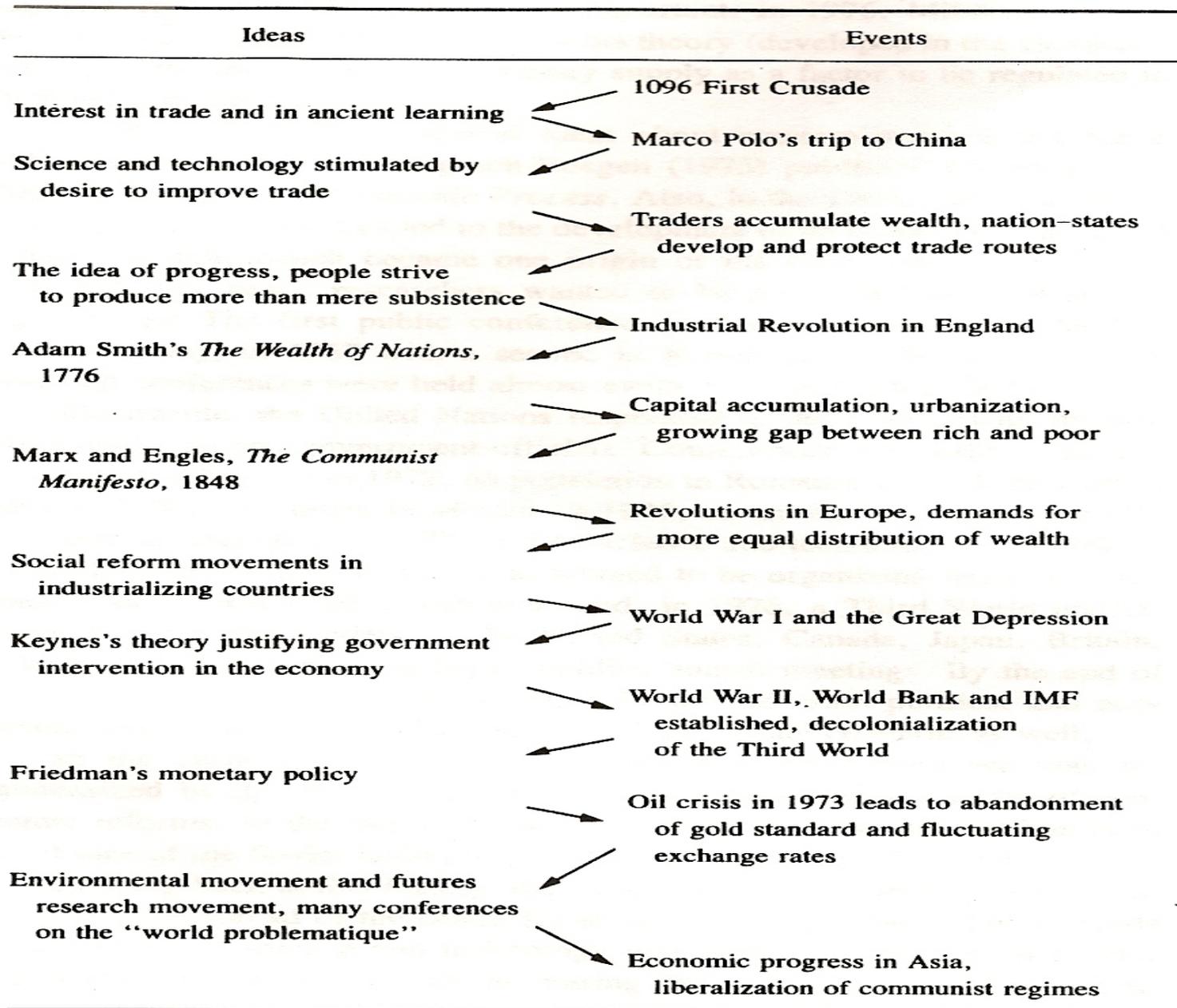


A model of social change using four methods for describing systems

Ways that disciplines describe social systems

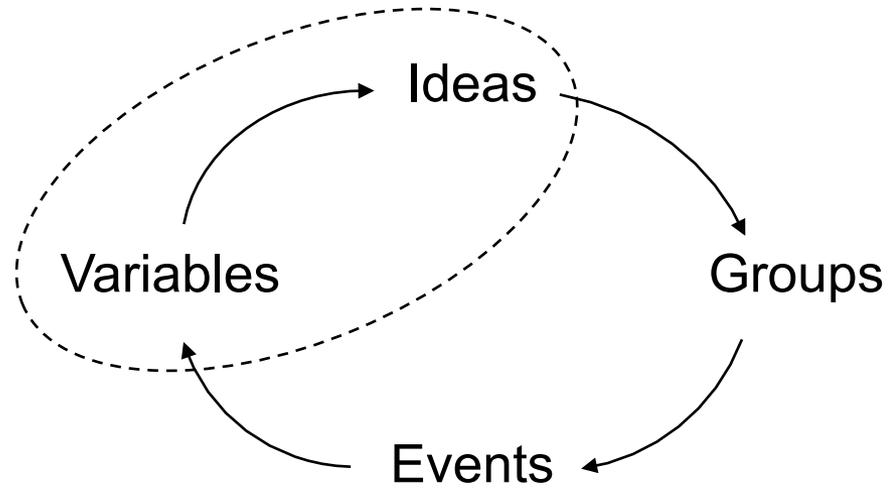
- Variables – physics, economics
- Events – computer science, history
- Groups – sociology, political science
- Ideas – psychology, philosophy, cultural anthropology
- Interaction between ideas and events, a “shoelace model”

The Interaction Between Ideas and Society



Advantages of using all four methods

- A richer description of the social system is produced
- Important considerations are less likely to be overlooked
- The theories and methods of more than one discipline are used

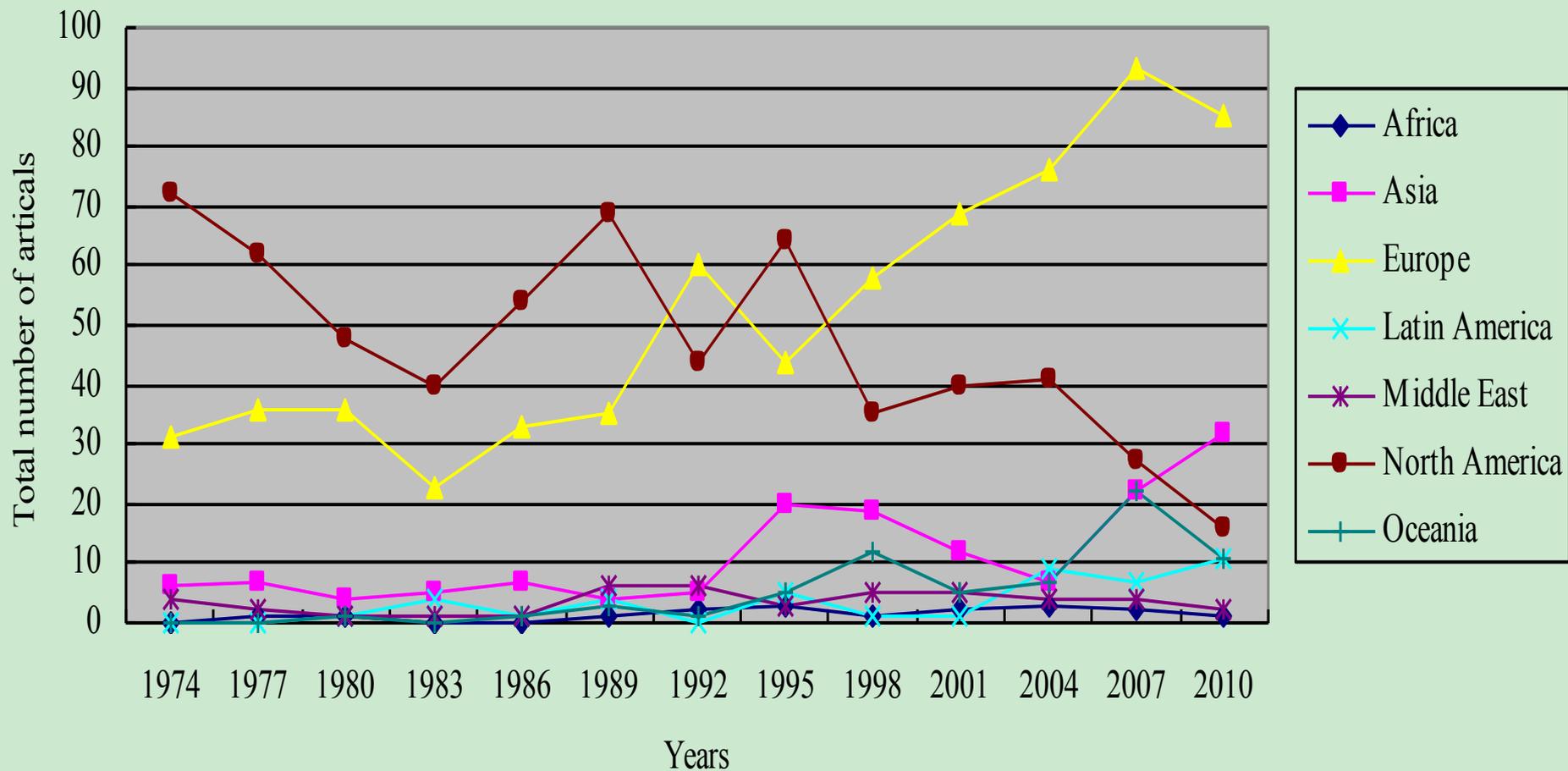


A reflexive theory operates at two levels

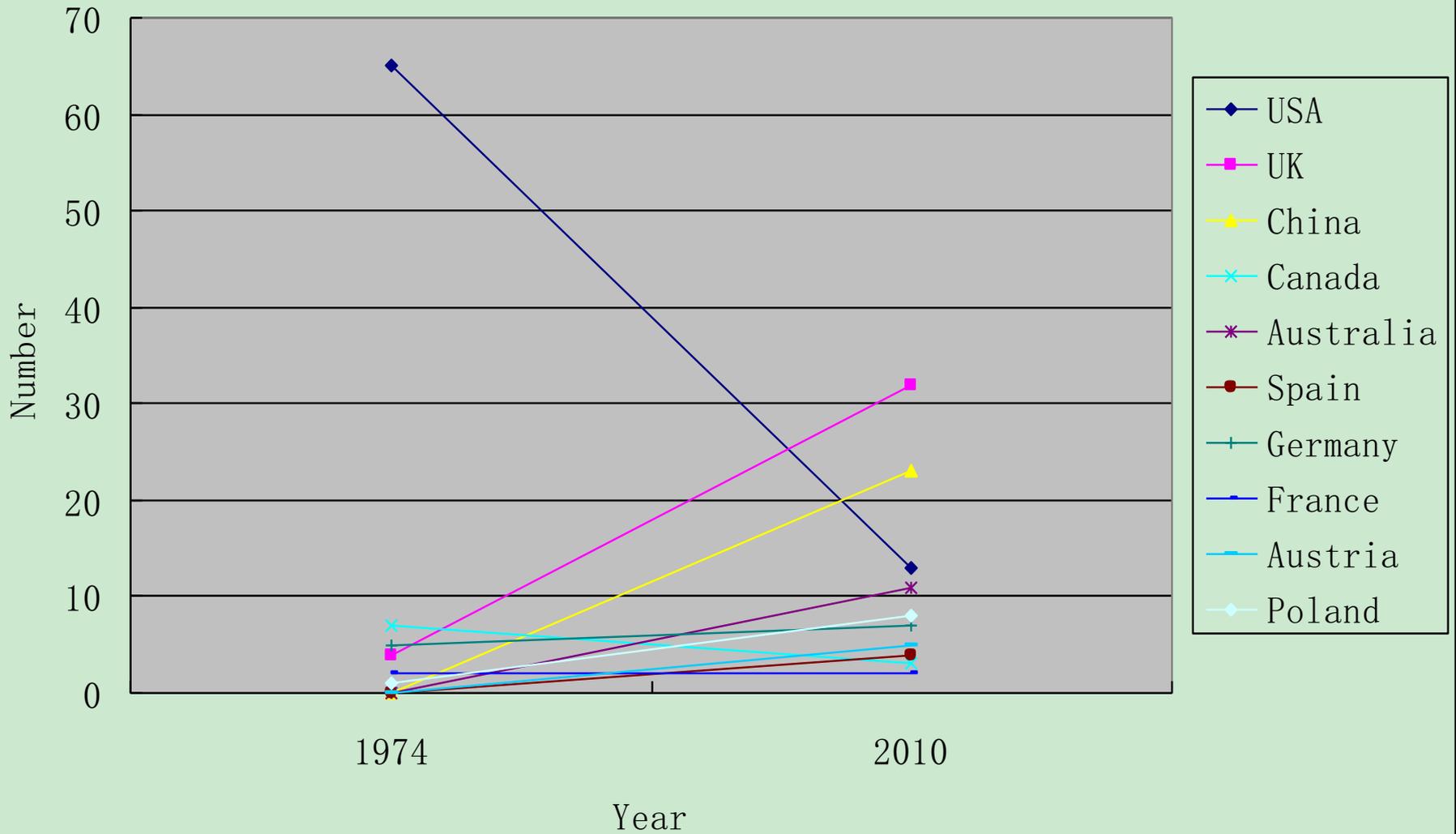
A study of three journals

- Record the country of the lead author of each article in 3 English language journals
- Sum the number of articles for each region (or country)
- Articles by N. American (or U.S.) authors have declined
- Articles by European and Asian authors have increased

Total articles per year by region over time in three journals



Trend for Top 10 Countries



The current state of cybernetics

- The larger field (see “facets of cybernetics” above) is not known in the U.S.
- No educational programs in the U.S.
- To most people “cyber” means computers, nothing more
- Growing interest in Europe and Asia
- Lack of interest in the U.S. is due to a lack of interest in general theories

Policy challenges

- Supporting research in cybernetics
- Supporting education in cybernetics
- Does the U.S., which was the leading creator of cybernetics, want to abandon the field to other countries?
- Cybernetics provides a theory of an information society

Conferences in summer 2014

- American Society for Cybernetics, GW, Washington, DC, August 3-9, 2014, 50th Anniversary meeting, www.iss.org
- International Society for the Systems Sciences, GW, Washington, DC, July 27 – August 1, 2014, www.asc-cybernetics.org

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