Diversity in the Information Age

Nova Scotia Roundtable

October 11, 2001

Memorial University of Newfoundland
NSERC/PETRO-CANADA CHAIR
Women In Science and Engineering

Diversity: Changing Paradigms

- Discrimination and fairness
- Access and legitimacy
- Learning and effectiveness

Thomas, D. A. and R. Ely (1996). "Making differences matter: A new paradigm for managing diversity." Harvard Business Review (September-October): 79-90.

Objectives

- Provide framework for discussion of diversity in science & engineering
- Present analysis
- Identify trends
- Stimulate comment from Roundtable participants

AUDIENCE WARNING

Simplification of complex scenarios may lead to inaccurate conclusions.

This presentation contains simplifications.

Segmentation is simplification.

Alternatives to Segmentation

- Statistical distributions. Note: outliers influence perceptions.
- Fuzzy sets. (Sort of tall)
- Multiple dimensions.

Gender Differences

- Abilities - NO
  - test scores - maybe
- Motivations - YES
  - affective influence
  - value of contribution
  - work-life balance
- Thinking styles - YES

Thinking style affects ...

- Communication
- Information handling
- Problem solving
- Learning and teaching

Thinking Styles

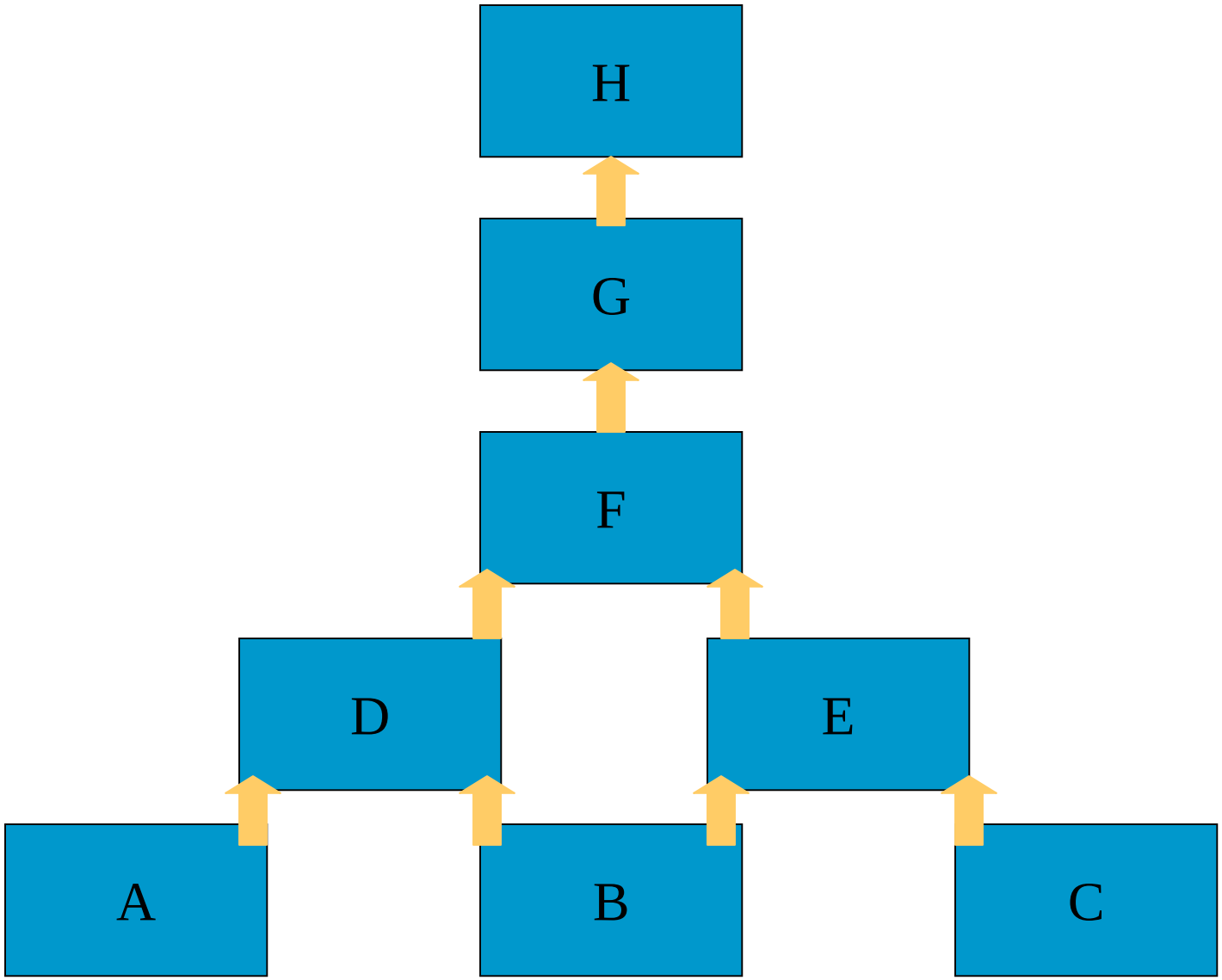
Hierarchical

- Progression
- Axiomatic
- Pure math
- Structured program
- Highly specialized

Relational

- Patterns
- Intuition
- Applied Math
- Bricolage *
- Interdisciplinary

*Levi-Strauss, *The Savage Mind*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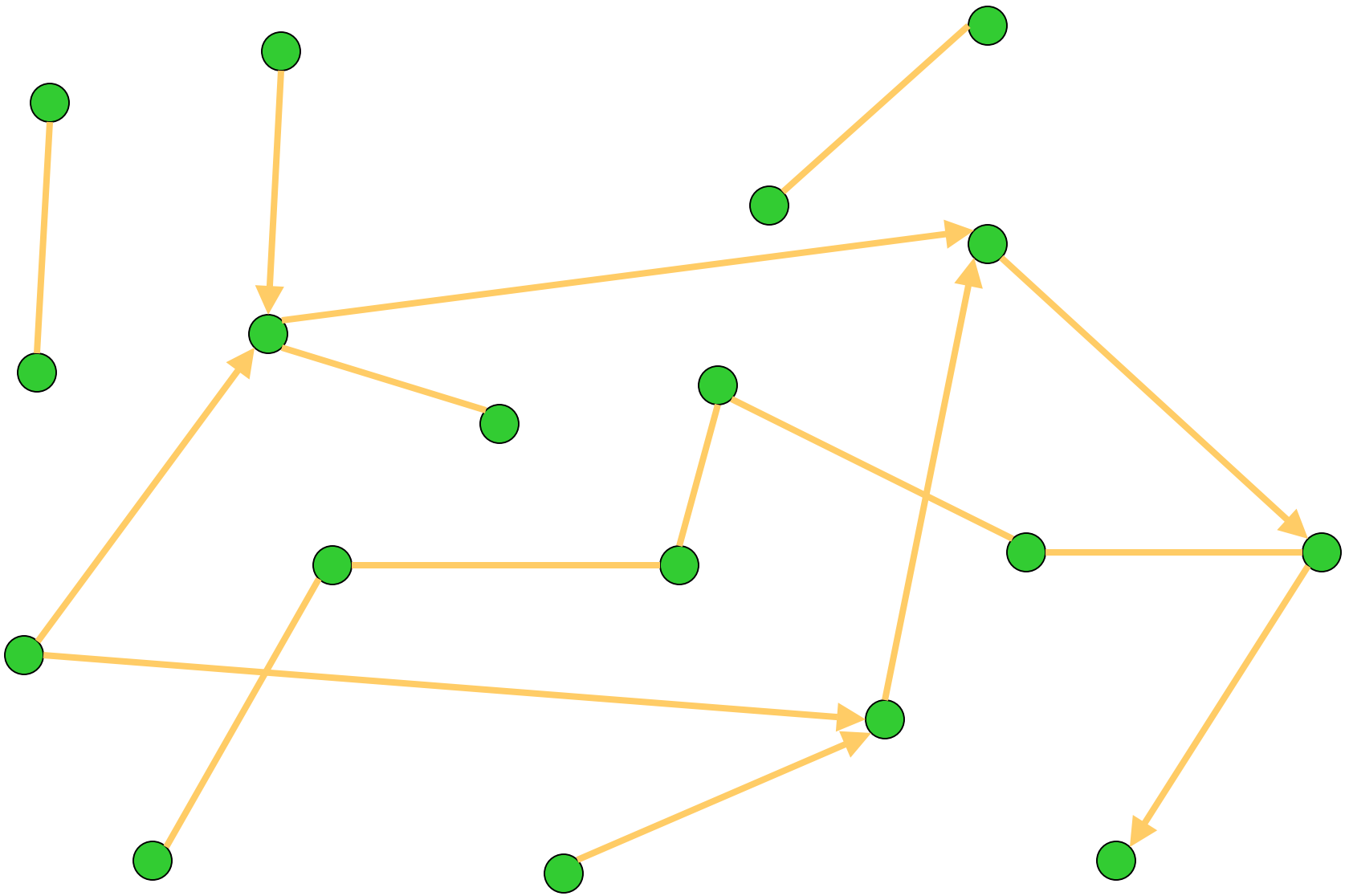

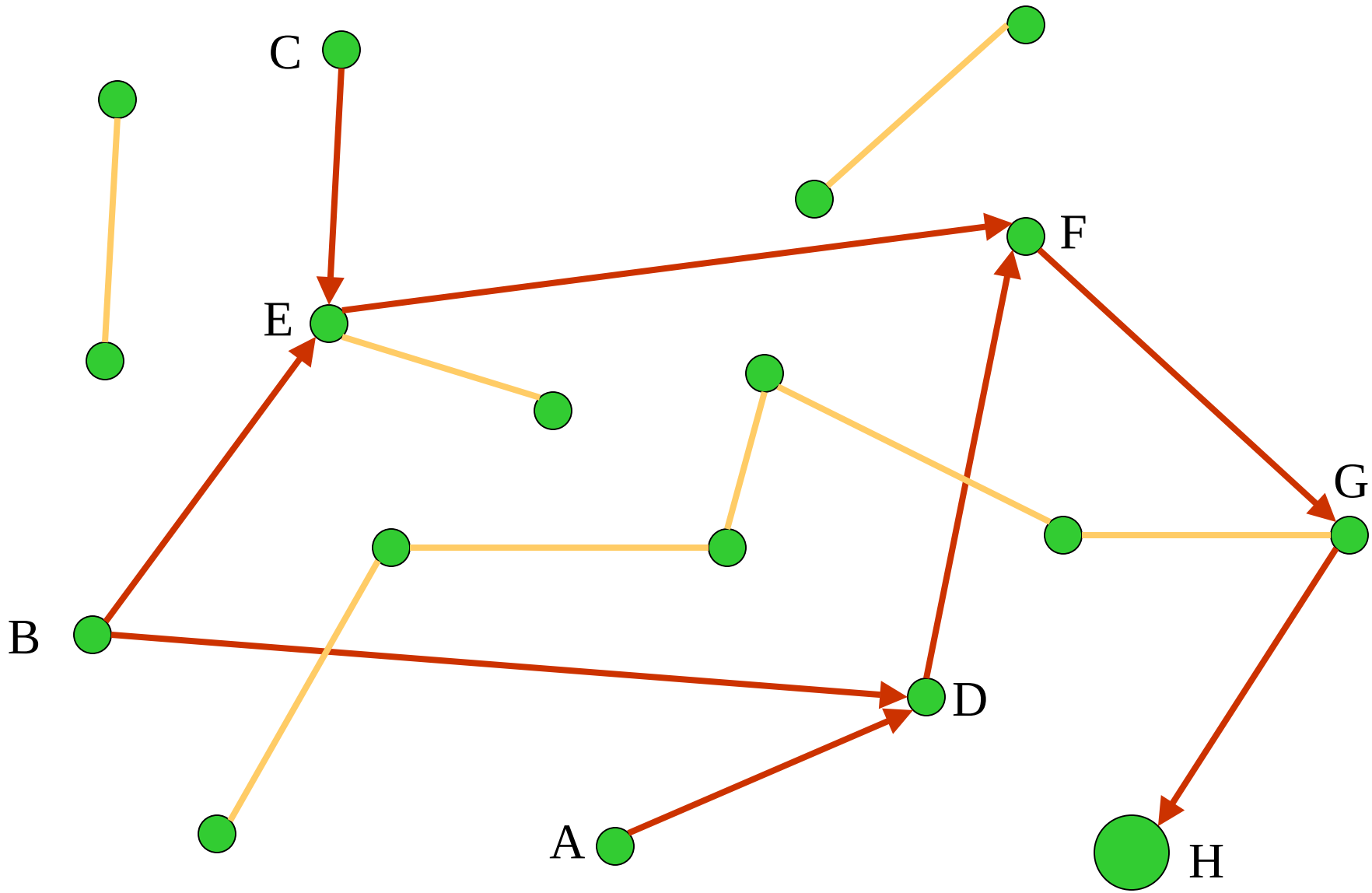
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Axiomatic Tradition

- Legacy of the Greek schools
- Legitimacy through argument & proof
- Concept is primary; experience is secondary
- Progression is hierarchical

Relational Thinking

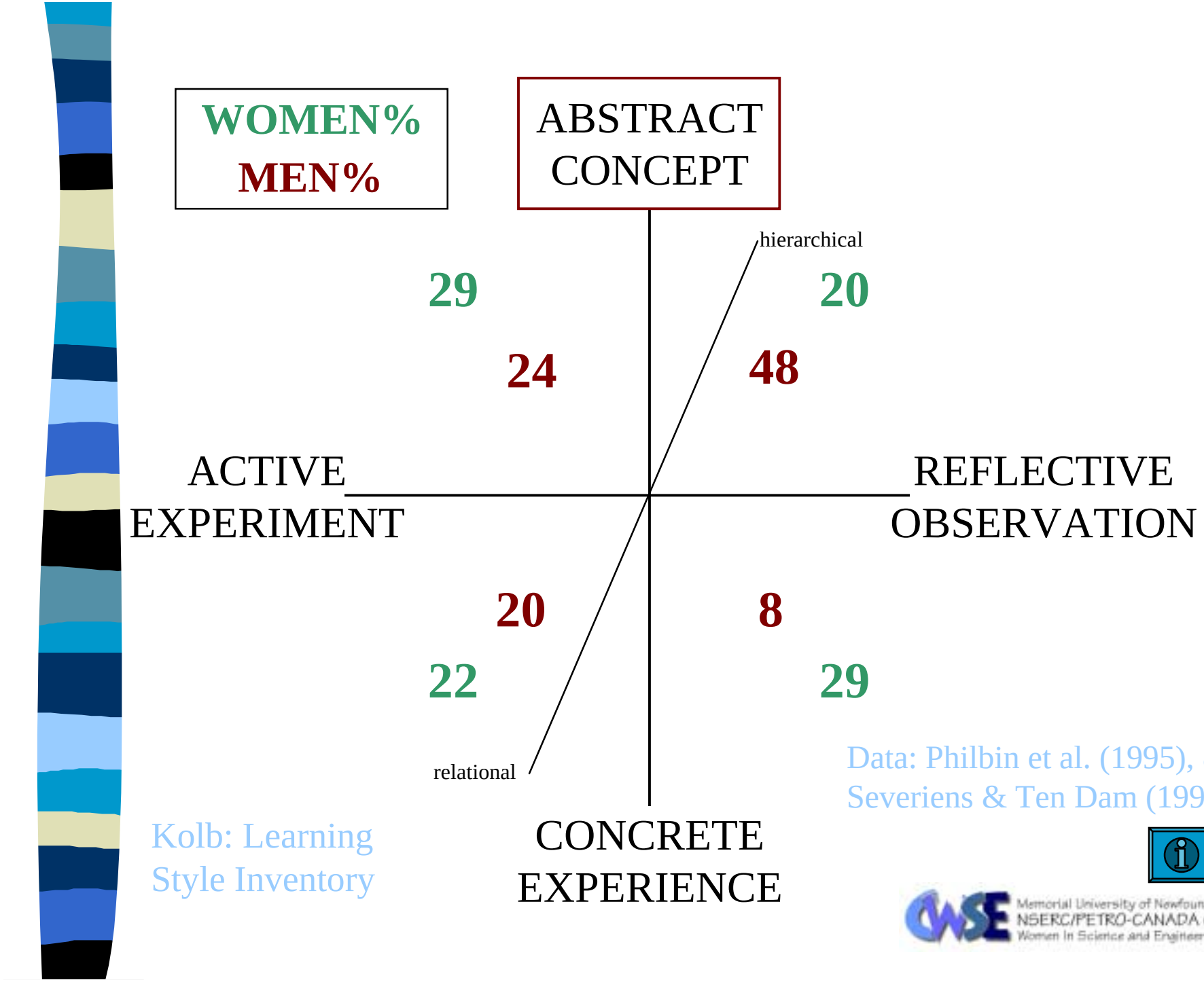
- Characteristic of the arts
- Legitimacy through observation & experience
- Relationships are primary; formalism is secondary
- Application & extension are continuous

Relational Learners in Axiomatic Environment

- Question legitimacy
- Question motivation & relevance
- Anxiety due to missing legitimacy
- Miss steps in progression

  or are slower initially

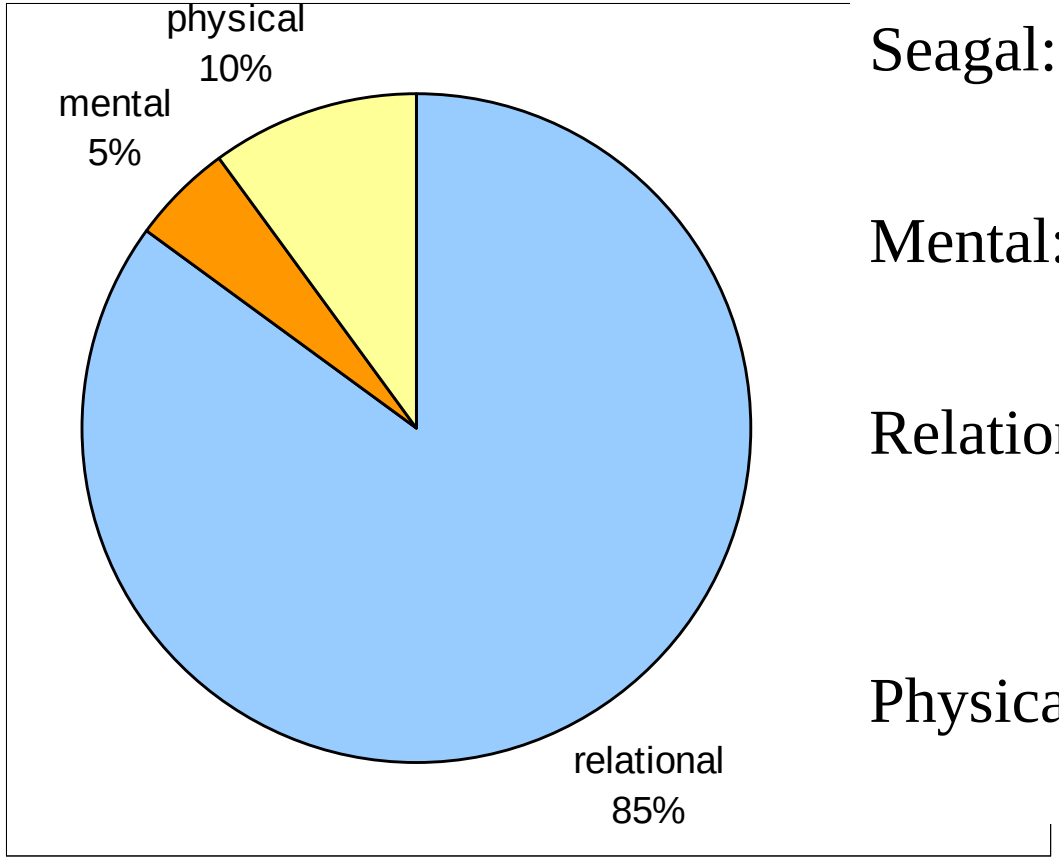
(Booth and Brooks 1985)



Kolb: Learning Style Inventory

Data: Philbin et al. (1995), & Severiens & Ten Dam (1994)

Related Formulation



Seagal: *Human Dynamics Model* (1985)

Mental: ideas & content; focused

Relational: experience & communication; multi-tracking.

Physical: task-oriented, thorough.

Scientific Process

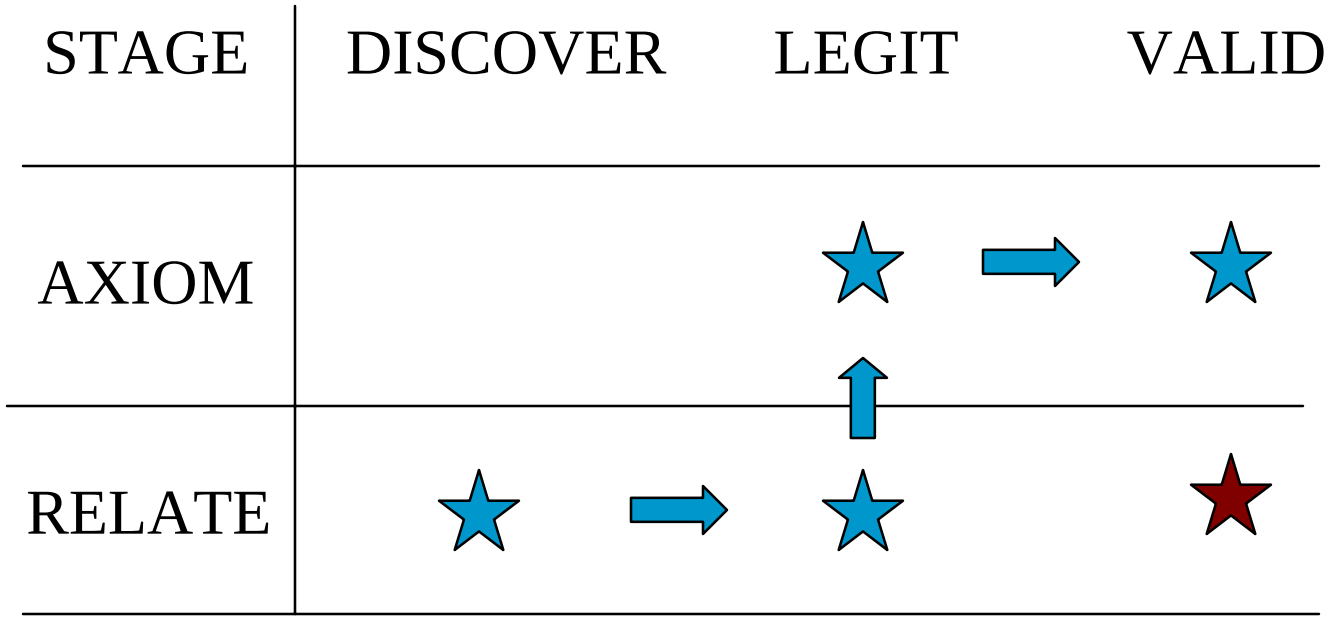
STAGE	DISCOVER	LEGIT	VALID
AXIOM	★ →	★ →	★
RELATE		⊘	

Some Relational Thinkers

" … it was necessary to continue the development of the picture as the method, before the mathematics could really be done." - Richard Feynman

"The way the two triple sets of axioms are contrasted in (the book) is not at all the way things happened in the process of actual thinking. This was merely a later formulation of the subject matter." - Albert Einstein

Creative Process



Scientific Validity (Truth)

Axiomatic validity is necessary, but not sufficient.

Result must also be consistent with all related observations and results.

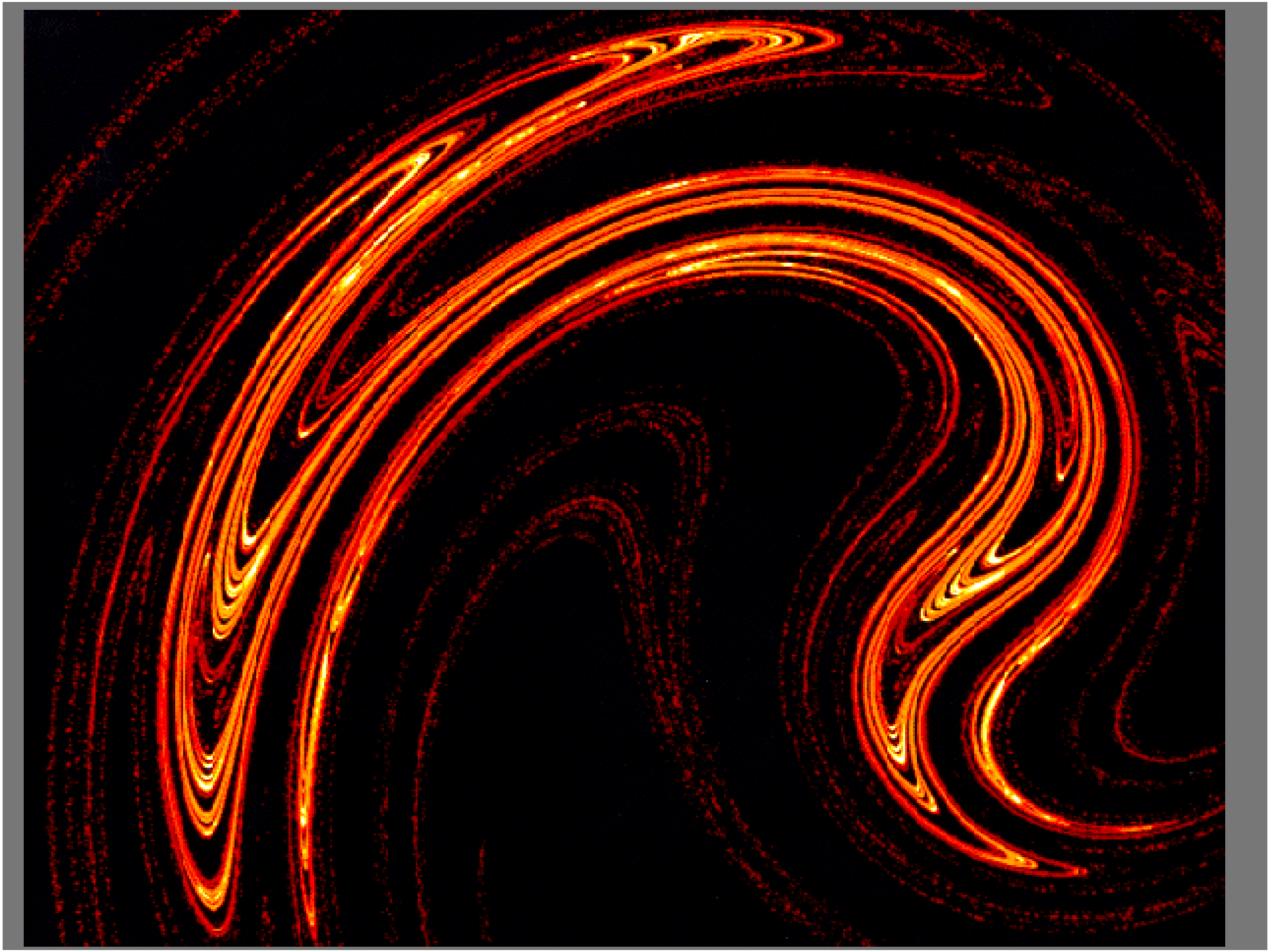
Scientific Validity (Truth)

Consistency with all related observations and results is necessary, but not sufficient.

Axiomatic argument must lead to equivalent result.

Interim Result

- Range of thinking styles is an example of diversity.
- Hierarchical & Relational attributes provide a framework for discussion of diversity in science & engineering.
- Analysis: Diversity is “ok”.



Nonlinear Dynamics

- Chaos theory, complexity, fractals
- Simple laws give rise to apparently chaotic systems
- Simple patterns repeat at different scales
- Applications in biology, economics, astronomy, information theory.

Information Age Trends

- Increasing amounts of information
  - collected or produced
  - analysed and compared
  - stored
- Information processing
  - modelling
  - simulation
  - pattern recognition

Infographics

The statistics, patterns, and trends in information;

the characteristics of the information landscape.

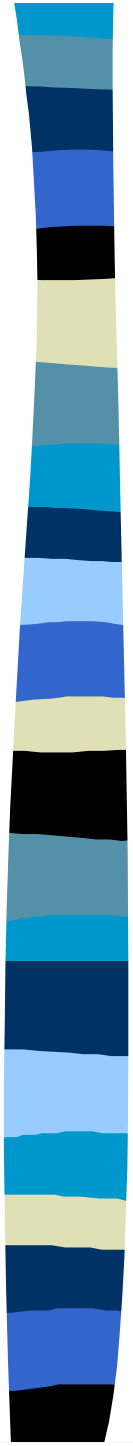
Trends from Infographics

Quantities increase ⟹ patterns emerge

Patterns complex ⟹ fields emerge

Fields complex ⟹ fields merge

⟹ Emergence of relational technologies



Relational Technologies

- Fuzzy logic - automation and control
- Neural networks - system modelling
- DNA - and genetic engineering
- World wide web
- Climate modeling - global warming

Summary

- Hierarchical & Relational thinking styles illustrate diversity.
- Science tradition is hierarchical.
- Infographics trend is relational.
- Diversity challenges traditions.