Helga Nowotny
The messiness of real world problems - are we asking the wrong questions?

Crossing Borders

34th Conference of Rectors and Presidents of European Universities of Technology, Aalto University, Espoo, Finland

18-19 September 2015

Are we asking the right question? From traditional disciplinary silos towards a culture of sharing

I. **A reality check for interdisciplinary research**
II. **A glimpse into the black box**
III. **Which questions should we ask?**

A reality check for interdisciplinary research

1. Tacit and explicit assumptions
2. The elusive search for definitions and typologies
3. Multi-disciplinary research in industrial labs
4. What do failures tell us?

1. Tacit and explicit assumptions

- Real world problems need combined knowledge and know-how
- IR yields higher societal benefits
- Constrained by disciplinary boundaries
- Call for action to remove them

2. The elusive search for definitions and typologies

- Conceptual ambiguity
- Vast diversity of scientific practices and fields
- Low systematization
- Barriers often de-contextualized or too generalized

The elusive search for definitions and typologies

Table 2.1 Defining characteristics in typologies of interdisciplinarity

Multidisciplinarity	Interdisciplinarity	Transdisciplinarity
• juxtaposing	• integrating	• transcending
• sequencing	• interacting	• transgressing
• coordinating	• linking	• transforming
	• focusing	
	• blending	

• complementing

• hybridizing

• Encyclopedic ID

• Indiscriminate ID

• Pseudo ID

Systematic Integration

Transsector Interaction

Partial Integration ←----------→ Full Integration

Contextualizing ID		ConceptualID
Auxiliary ID	Supplementary ID	Structural ID/Unifying ID
Composite ID	Generalizing ID	Integrative ID

Degrees of Collaboration

Shared ID ←----------→ Cooperative ID

• Narrow versus Broad or Wide ID

• Methodological versus Theoretical ID

• Bridge Building versus Restructuring

• Instrumental versus Critical ID

• Endogenous versus Exogenous ID

3. Multiy-disciplinary research in industrial labs

A ‘convergent’ photographic research lab, Eastman Kodak

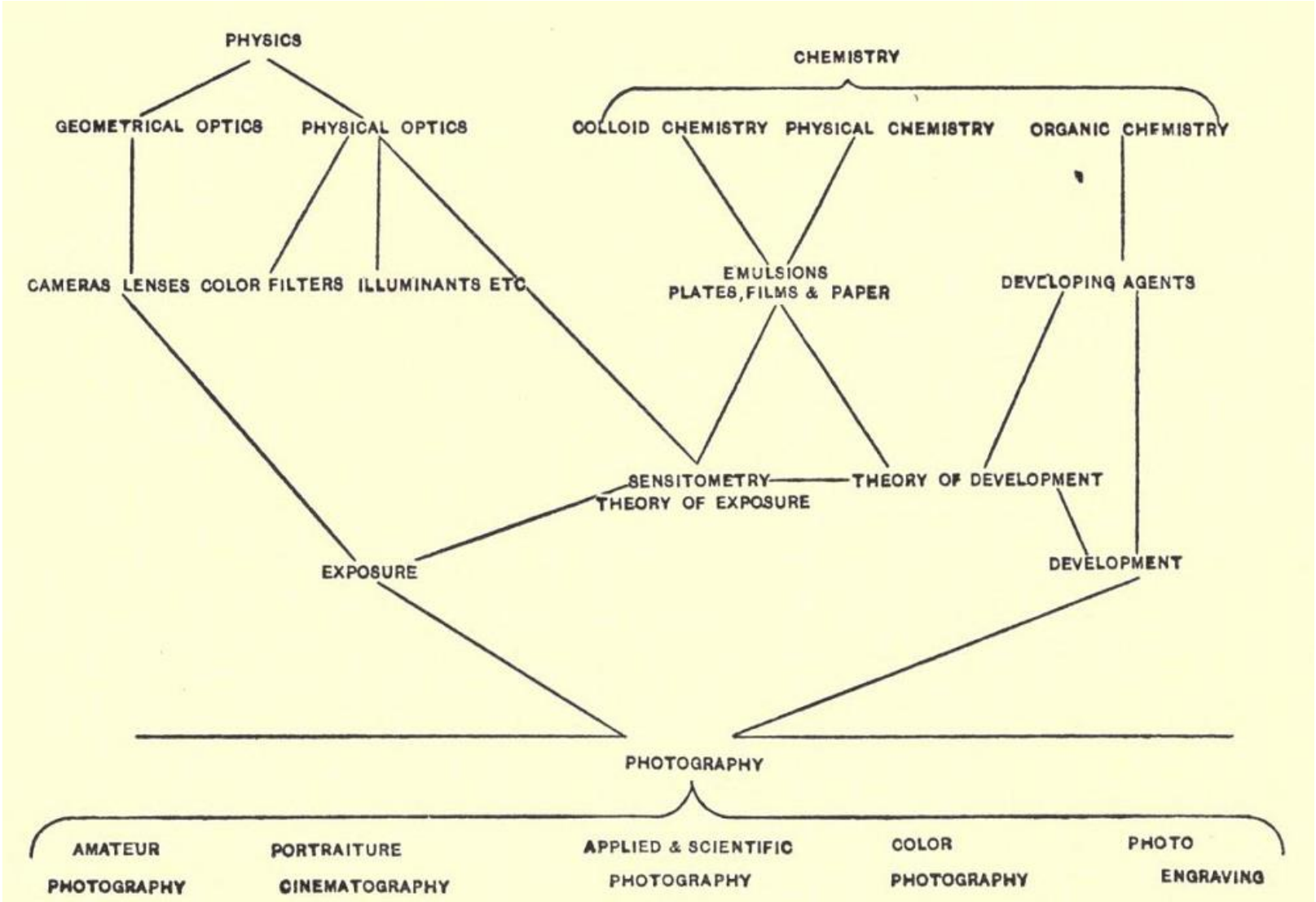
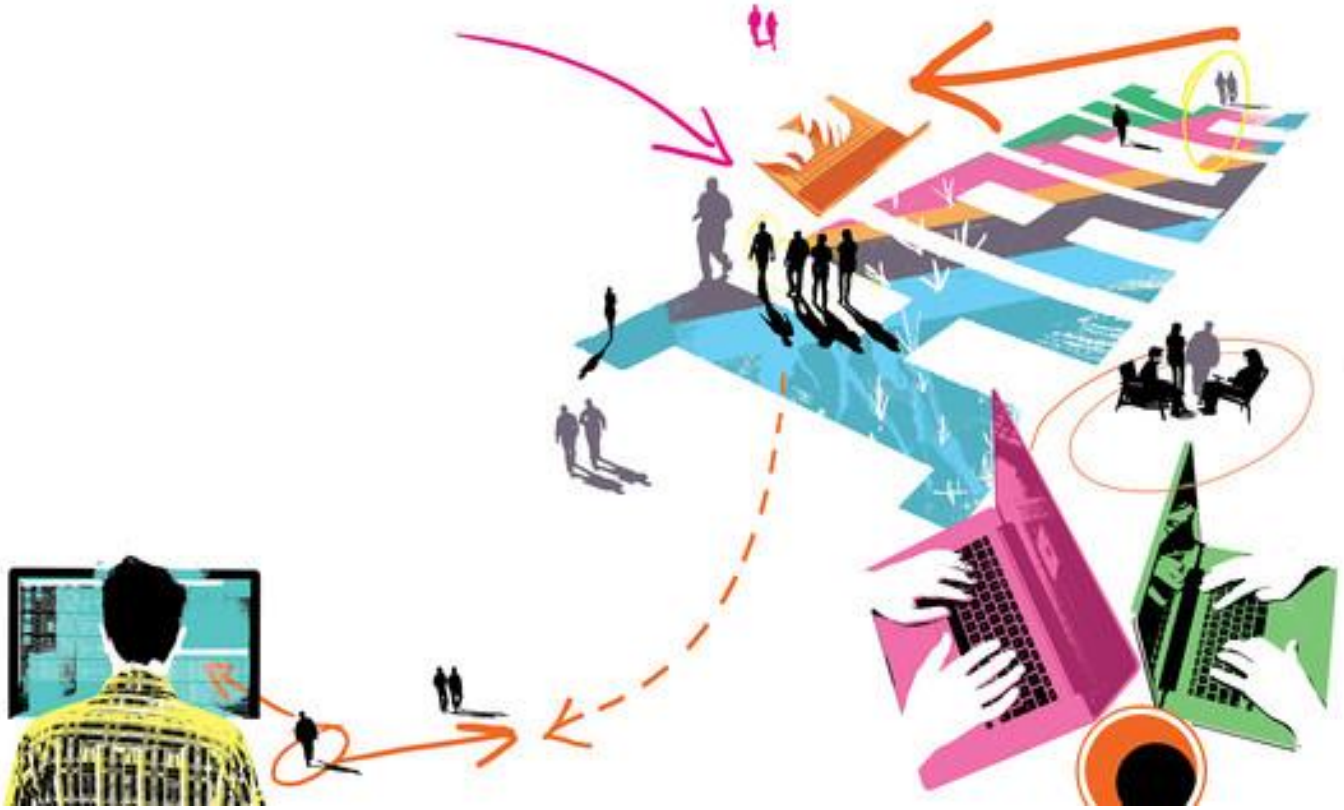


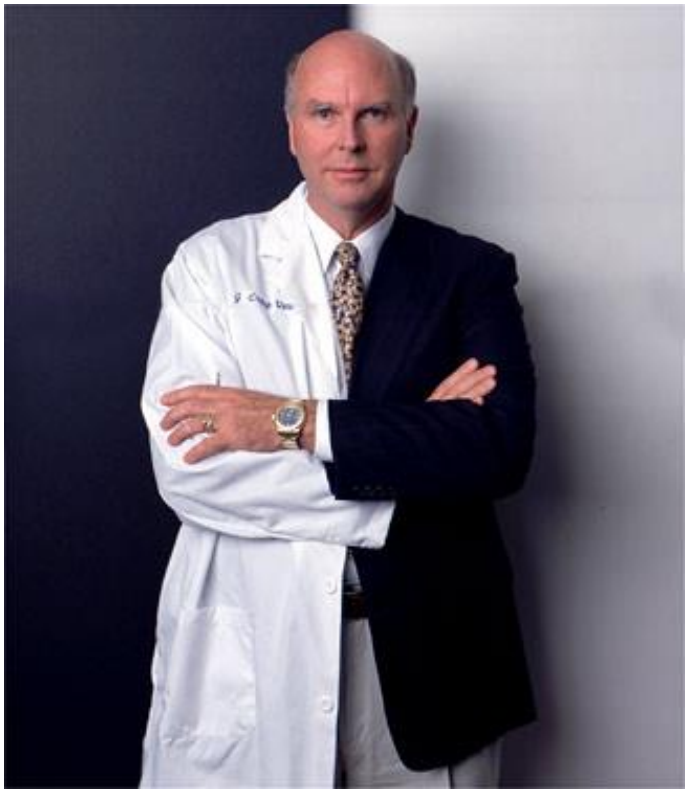
FIG. 4.

Team work better adapted to solution of problems



Rise of the scientific entrepreneurship today

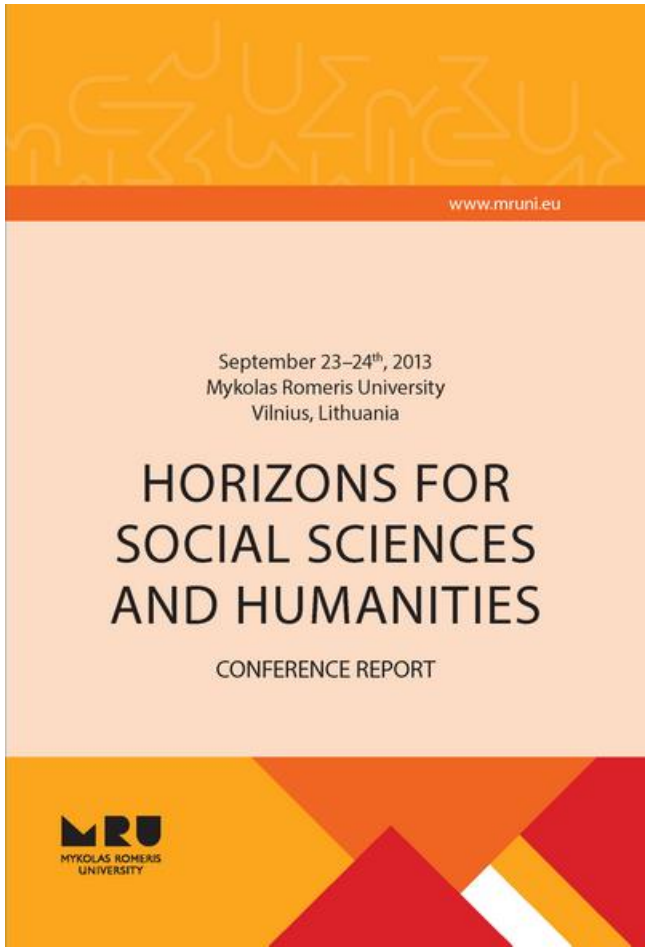
Having fun, making money



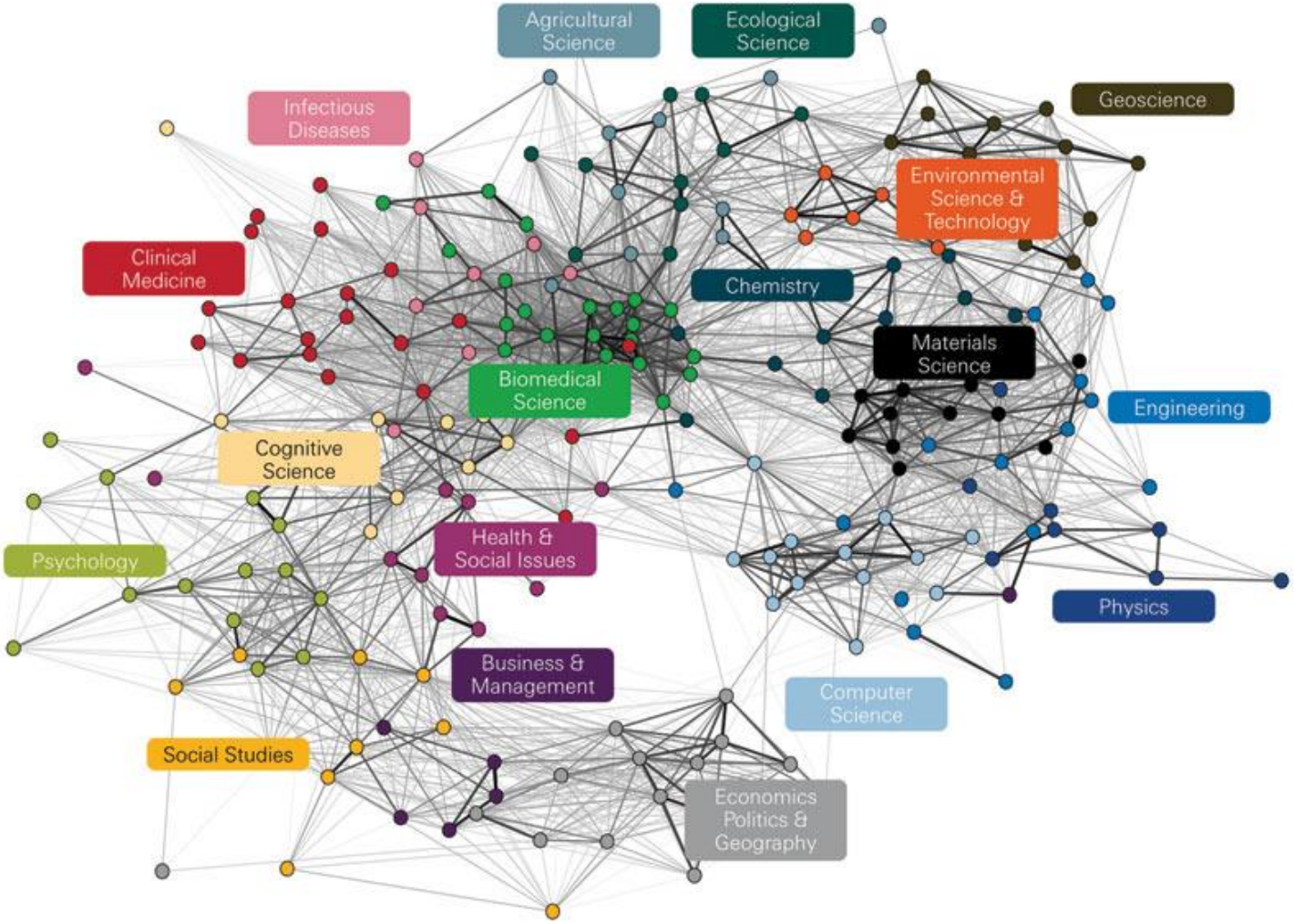
4. What do failures tell us?

- Industry experience cannot be transferred 1:1 to universities
- Great variety of scientific practices
- Very different institutional and organizational contexts
- Emergent new disciplines

A special challenge – integration of the social sciences



Science is interconnected



Is IR a proxy object?

- No direct link for solving ‘real world’ problems
- Translation process is lengthy and uncertain
- Societal challenges on the rise
- Different expectations between ‘science’ and ‘society’

I. A reality check for interdisciplinary research

II. A glimpse into the black box

III. Which questions should we ask?

Trading Zones

(P. Galison, 1997)

- The many cultures of physics: establish contact language
- Trading partners can agree on rules of exchange
- Locality of exchange: physical, institutional, administrative

Nanoscale research – a new disciplinarity?

(A. Marcovitch and T. Shinn, 2014)

- Disciplinary referent remains
- Centrality of combinatorials, i.e. instruments, materials, concepts, people…
- Computer simulation/instrumentation leads to fresh associations, integration

What does opening the black box tell us?

- Instrumentation, simulation, computation create transversal openings
- Social, institutional, administrative environment
- Follow the dynamics of research fields

I. A reality check for interdisciplinary research

II. A glimpse into the black box

III. Which questions should we ask?

Creativity defies one size fits all

- Scientific creativity knows many pathways
- From focusing on the one goal to making tools
- Learning is often faster with the right collaborators
- Courting serendipity wherever it may be found

Innovative institutions

- Bell Labs, Janela Farm and universities
- Selection of problem is paramount; meeting other interesting people
- Universities: provide experimental space – and more time

Tackling societal challenges: some larger trends

- Multi-disciplinary, multi-national, multi-funded; multi-authored science
- Big Data and digitalization
- Towards a culture of sharing
- Complexity sciences: the unintended consequences of human action

The messiness of real world problems - is science ready?

- Call for interdisciplinary research:
  two inter-related but distinct phenomena
- One: matching the dynamics of science with new forms of organizing scientific activity
- Two: strengthening the responsiveness of science towards societal needs and challenges