

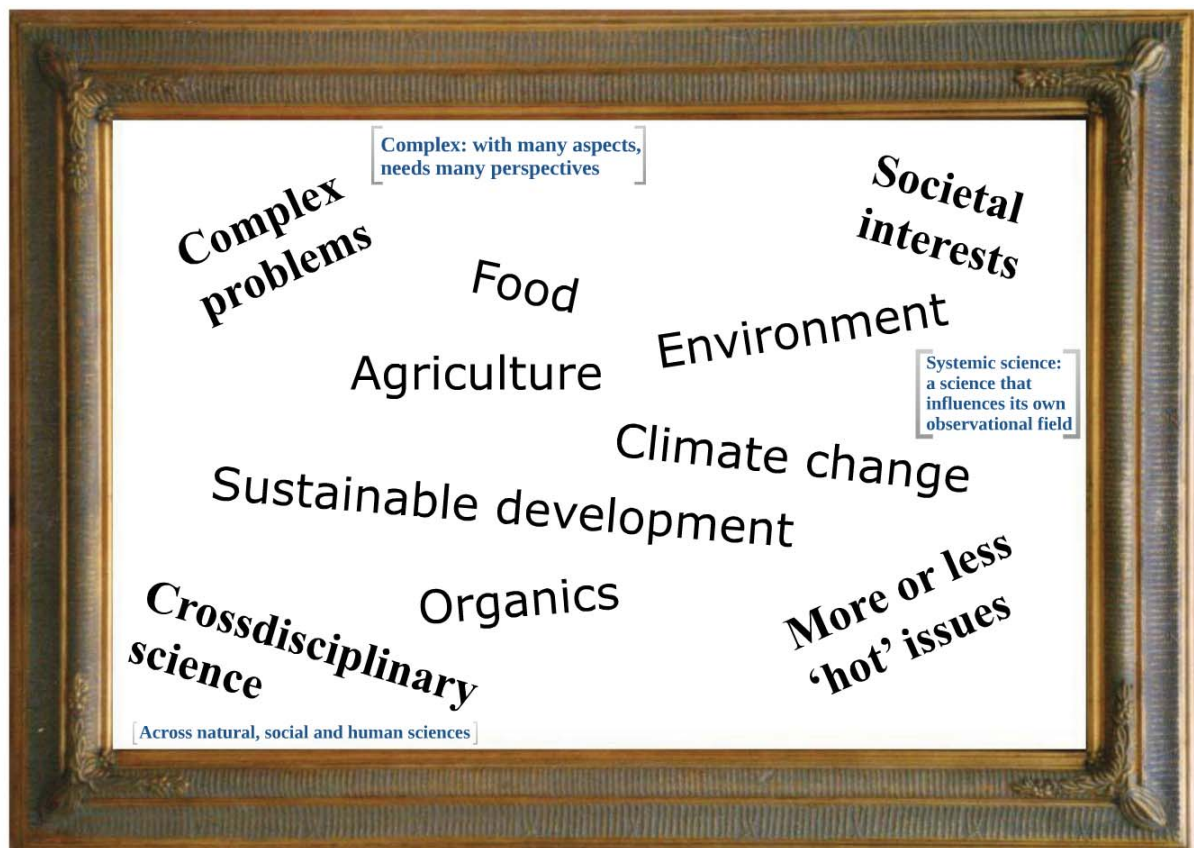
The non-trivial problem of cross-disciplinary research and the structure of scientific perspectives

Contents

- Examples of cross-disciplinary research and its problems
- What are the fundamental differences between disciplines?
- The perspectivist approach
- A semantic grounding
- Implications for research practice - some examples
- Future developments

Hugo F. Alrøe

Associate professor in philosophy of science and ethics
Research Group for Integrated Geographical and Social Studies
Department of Agroecology, Aarhus University



Contents

- **Examples of cross-disciplinary research and its problems**
- **What are the fundamental differences between disciplines?**
- **The perspectivist approach**
- **A semiotic grounding**
- **Implications for research practice - some examples**
- **Future developments**

Crossdisciplinary research on nature quality

Distinctive concepts of nature

“Nature as that which is not human”

Controlled, ordered culturally formed nature



The culturalists good nature

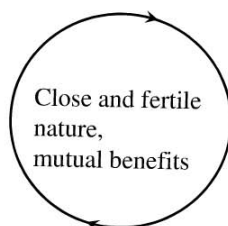
Untouched, original, naturally formed nature



The naturalists good nature

“Nature as an allied”
“Humans as part of nature”

Ecosystemic concepts of nature



The ecologists good nature

- **How to do research in nature**
- **What is good nature?**
- **Does organic agriculture have a special conception of nature**

- 1: Knowledge synthesis that clarifies perceptions of nature quality
- 2: Research project with four (very)
 - a natural history biological perspective
 - an ecological soil biology perspective
 - a geographical land use perspective
 - a sociological nature experience

Efforts to handle the (very) different perspectives
Cross-cuttings between different WP, study areas and shared data – but still
(<http://orgprints.org/3921>)

nature quality

- How to do research in nature quality?
 - What is good nature?
 - Does organic agriculture have a special conception of nature?
- 1: Knowledge synthesis that clarified different perceptions of nature quality
 - 2: Research project with four (very) different sciences
 - a natural history biological perspective (WP 3)

Distinctive concepts of nature

“Nature as that which is not human”

Controlled, ordered culturally formed nature



The culturalists good nature

Untouched, original, naturally formed nature



The naturalists good nature

“Nature as an allied”
“Humans as part of nature”

Ecosystemic concepts of nature

Close and fertile nature,
mutual benefits



The ecologists good nature

- **Does organic agriculture have a special conception of nature?**

- 1: Knowledge synthesis that clarified different perceptions of nature quality
- 2: Research project with four (very) different scientific perspectives:
 - a natural history biological perspective (WP 3)
 - an ecological soil biology perspective (WP 4)
 - a geographical land use perspective (WP 2)
 - a sociological nature experience perspective (WP 5)

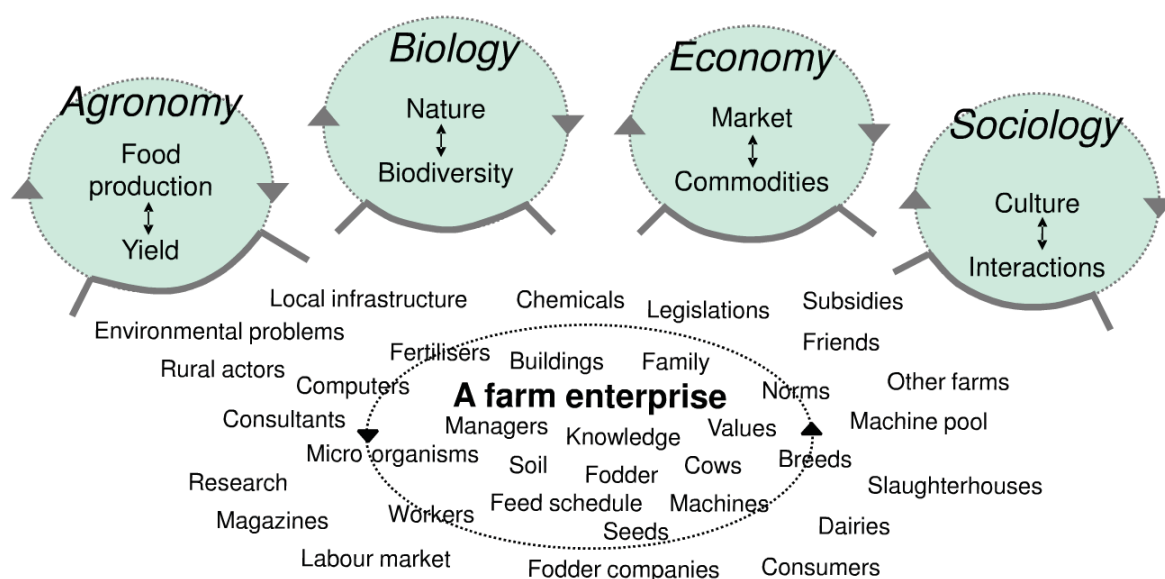


Efforts to handle the (very) different perspectives in the project:
 Cross-cuttings between different WP/perspectives based on shared study areas and shared data – but still problematic communication
 (<http://orgprints.org/3921>)

- Other examples from this field:**
- Animal welfare
 - Health
 - Soil quality
 - Sustainability

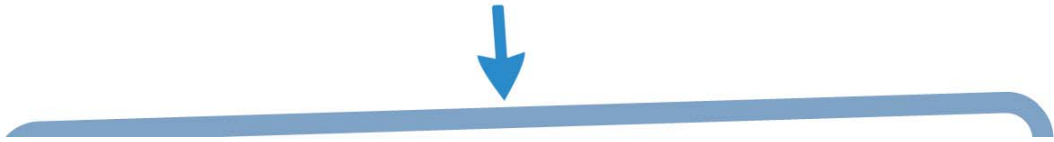
Functional differentiation as a prerequisite and a barrier for multifunctional agriculture. Economics as a hegemonic perspective.

MEA-Scope 2007



(Noe, Alrøe and Langvad 2008)

General problems in cross-disciplinary research

- There is a fundamental and increasing heterogeneity of scientific perspectives due to functional differentiation and specialisation in science
 - Fundamental concepts are often understood differently in different perspectives
 - Classifications are often different across perspectives
 - Logics, problems and agendas are often contested issues in cross-disciplinary work
 - Hegemony: often a dominating perspective claims to be more relevant or more scientific, and transforms research communication and results into its own image
- 

The paradox of scientific expertise

The growth of scientific knowledge leads to a fragmentation of scientific knowledge.

Differentiation increases the complexity that science can handle overall, by reducing the observational complexity that each perspective must handle.

This is the reason why a genuine reintegration that 'und-differentiates' science is, in general, neither possible nor desirable.

(Alrøe and Noe 2011)

General problems in cross-disciplinary research

- There is a fundamental and increasing heterogeneity of scientific perspectives due to functional differentiation and specialisation in science
- Fundamental concepts are often understood differently in different perspectives
- Classifications are often different across perspectives
- Logics, problems and agendas are often contested issues in cross-disciplinary work
- Hegemony: often a dominating perspective claims to be more relevant or more scientific, and transforms research communication and results into its own image



... transforms research communication and results into its own image



We lack tools to handle the heterogeneity of scientific perspectives and the problems connected with it!

This applies not only to cross-disciplinary research, but also to the cross-disciplinary use of scientific expertise in society.

What are the relevant and interesting differences between disciplines?

Focus here →

Epistemic aspects:

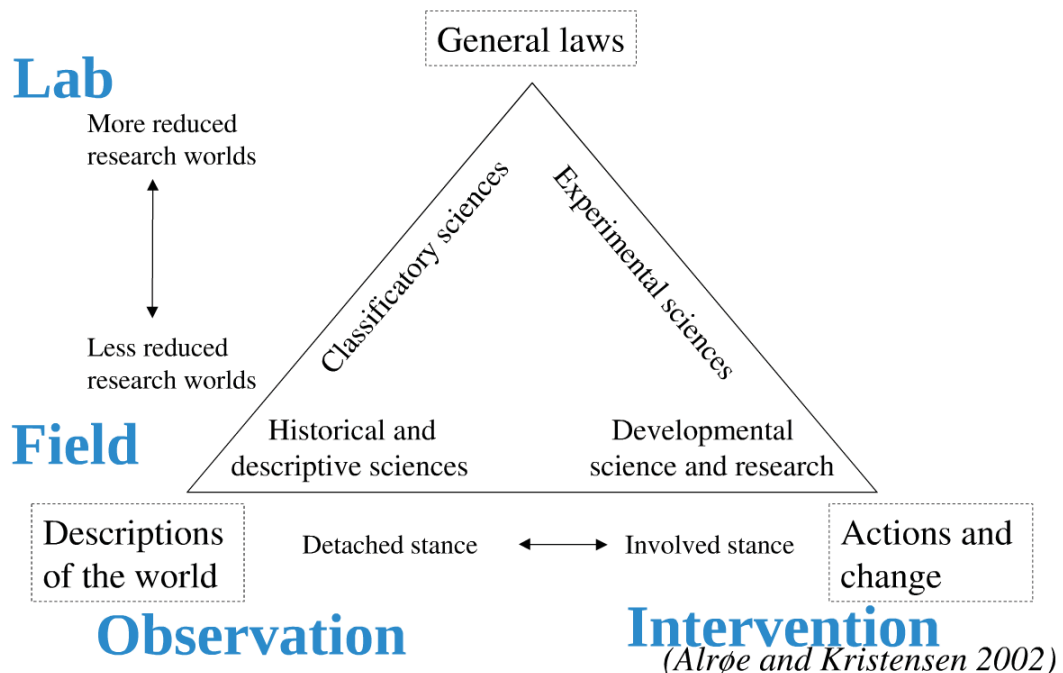
- Cognition
- Inquiry
- Learning
- ...

Social aspects:

- Power
- Funding
- Reputation, standing
- Personal relations
- ...

Epistemic differences between different types of science - two dimensions:

(Peirce, Joseph Rouse)



Ontic levels or kinds of entities

Ian Hacking:

- Indifferent
- Interactive

- Causal

- Adaptive

semiotics
autopoietic systems

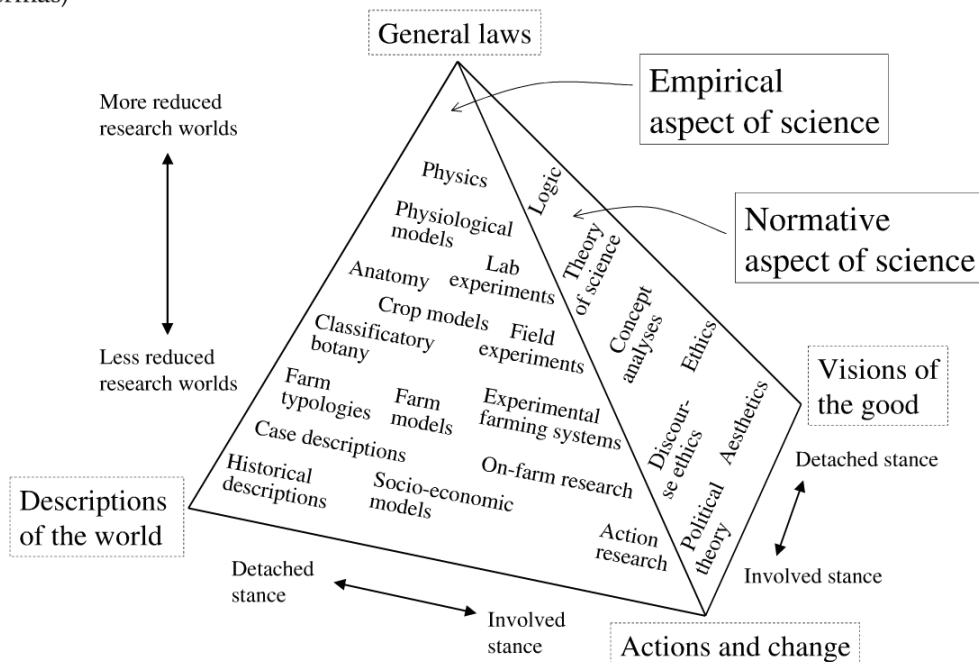
- Reflexive

self-awareness

What perspectives determine these levels and kinds of entities?

Two kinds of cognitive interest: empirical and normative

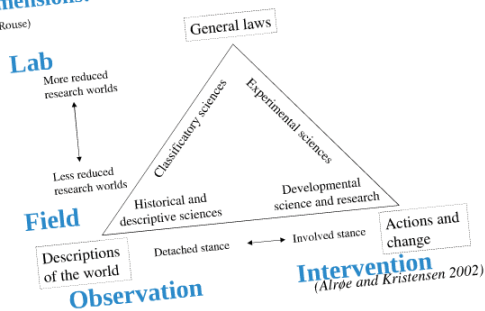
(Peirce, Habermas)



(Alrøe and Kristensen 2002)

The epistemic structure of scientific disciplines

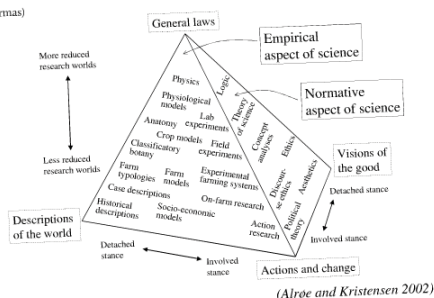
Epistemic differences between different types of science
- two dimensions:
(Peirce, Joseph Rouse)



Point:
The distinction between the natural, social and human sciences is not the key one.

There are more fundamental epistemic differences.

Two kinds of cognitive interest: empirical and normative
(Peirce, Habermas)



The perspectivist approach

Maturana & Varela:
Autopoietic view of observation

Ronald Giere:
Scientific perspectivism

Kuhn:
Disciplinary matrix

Luhmann:
Radical perspectivism
von Foerster:
Observing systems

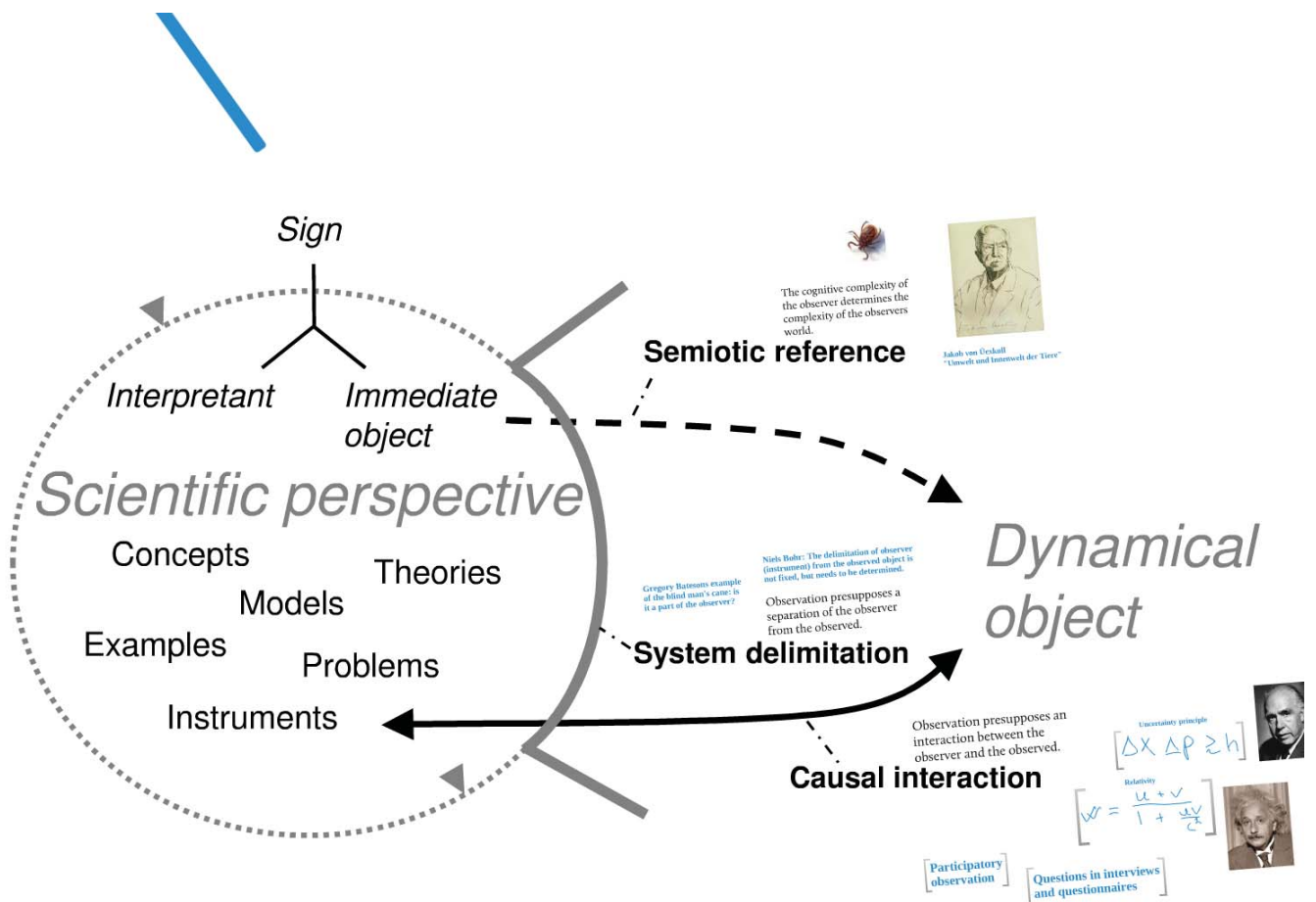
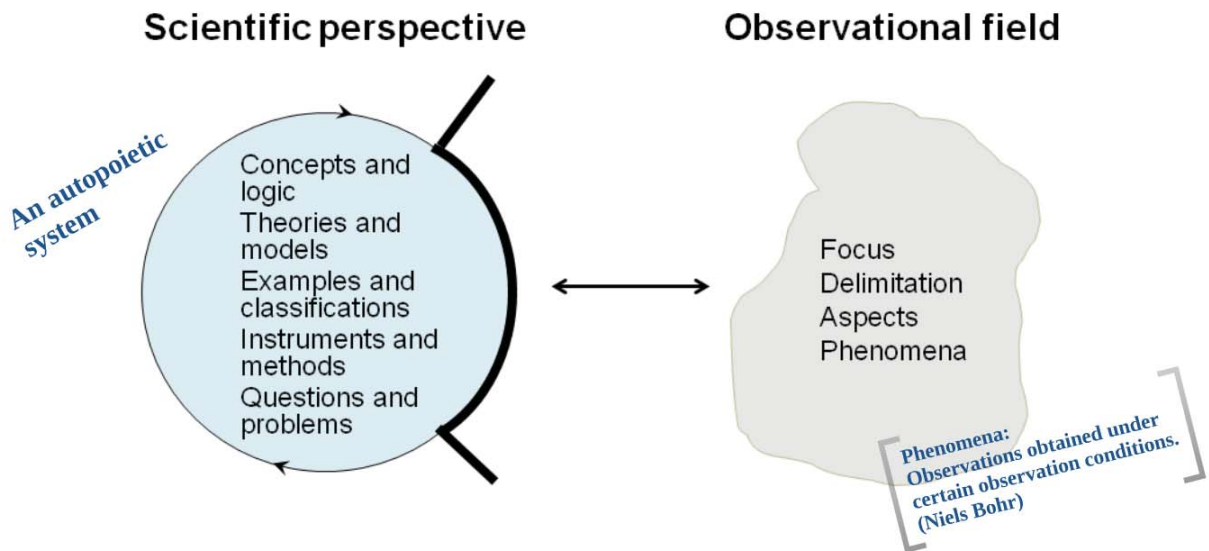
All scientific cognition and communication is based on and framed in perspectives

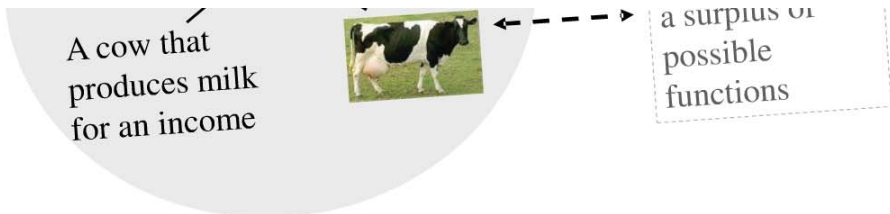
Data are observations from a certain perspective

“Perspective is one of the component parts of reality. Far from being a disturbance of its fabric, it is its organizing element. ... Every life is a point of view directed upon the universe. Strictly speaking, what one sees, no other can. ... Reality happens to be, like a landscape, possessed of an infinite number of perspectives, all equally veracious and authentic. The sole false perspective is that which claims to be the only one there is.”

(José Ortega y Gasset, 1961 [1923] The theme of our time)

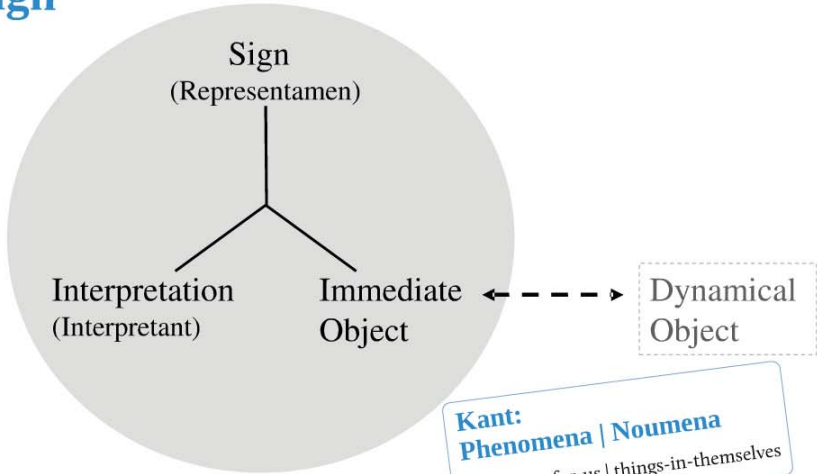
A scientific perspective is a differentiated and refined system of observation and learning - such as a discipline, a subdiscipline, a school of thought, or a more specific approach



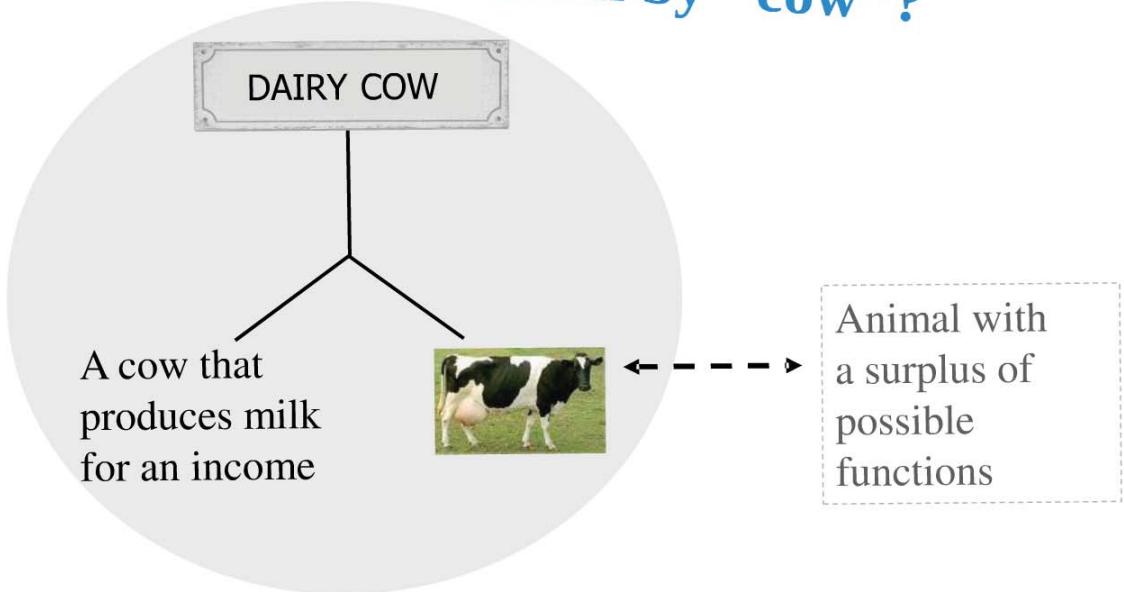


Charles S. Peirce's semiotics: the triadic sign

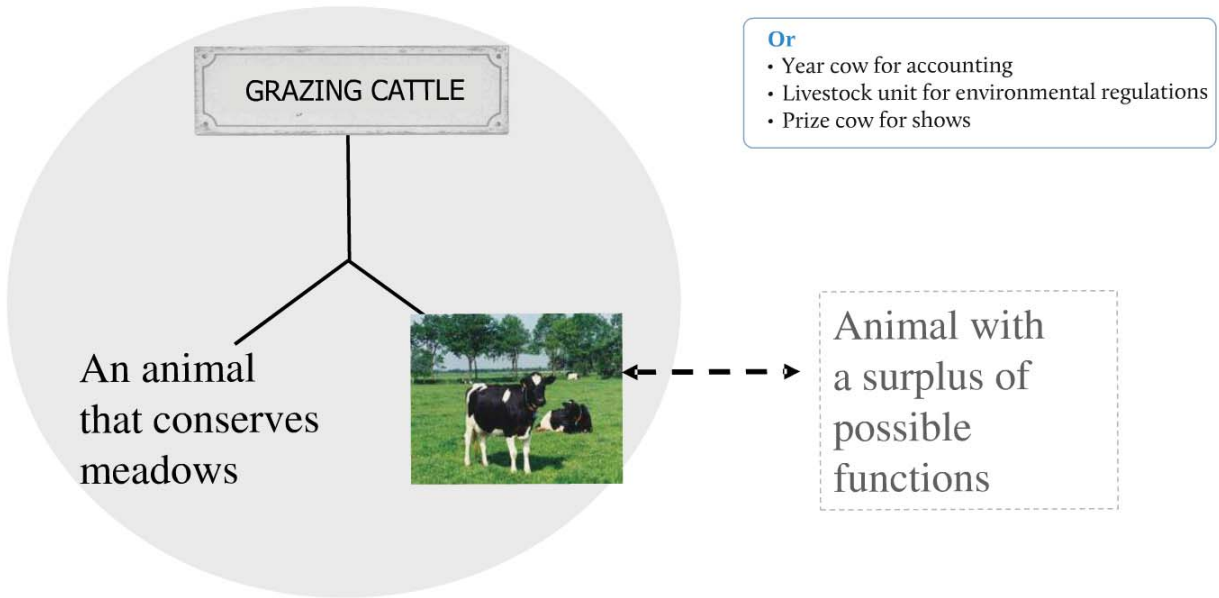
A sign is something that stands to somebody for something in some respect.



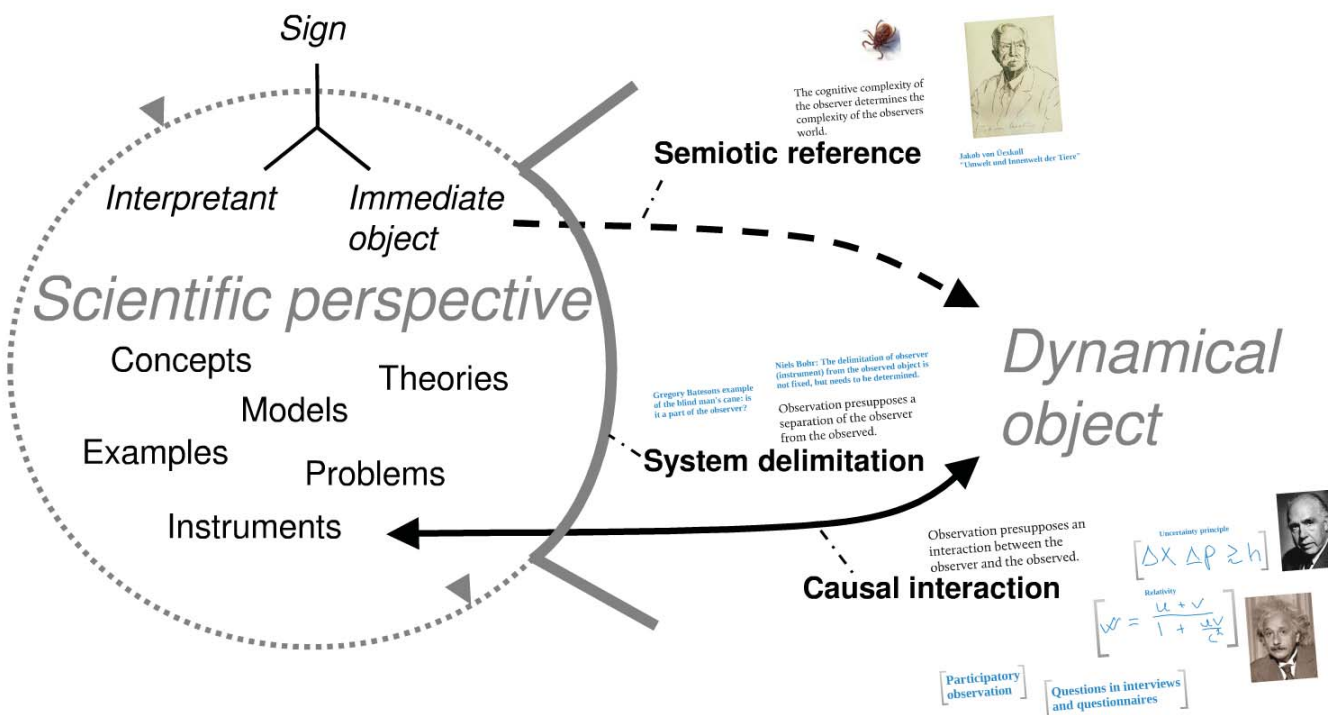
What do we mean by "cow"?



Charles S. Peirce's semiotics: the triadic sign



What do we mean by "cow"?



Gregory Batesons example of the blind man's cane: is it a part of the observer?

Niels Bohr: The delimitation of observer (instrument) from the observed object is not fixed, but needs to be determined.

Observation presupposes a separation of the observer from the observed.

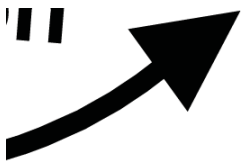
System delimitation

delimitation

Observation presupposes an interaction between the observer and the observed.

Causal interaction

Participatory observation

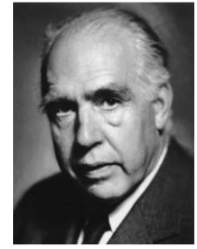


Observation presupposes an interaction between the observer and the observed.

Interaction

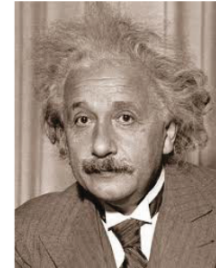
Uncertainty principle

$$[\Delta X \Delta p \geq h]$$



Relativity

$$[w = \frac{u + v}{1 + \frac{uv}{c^2}}]$$



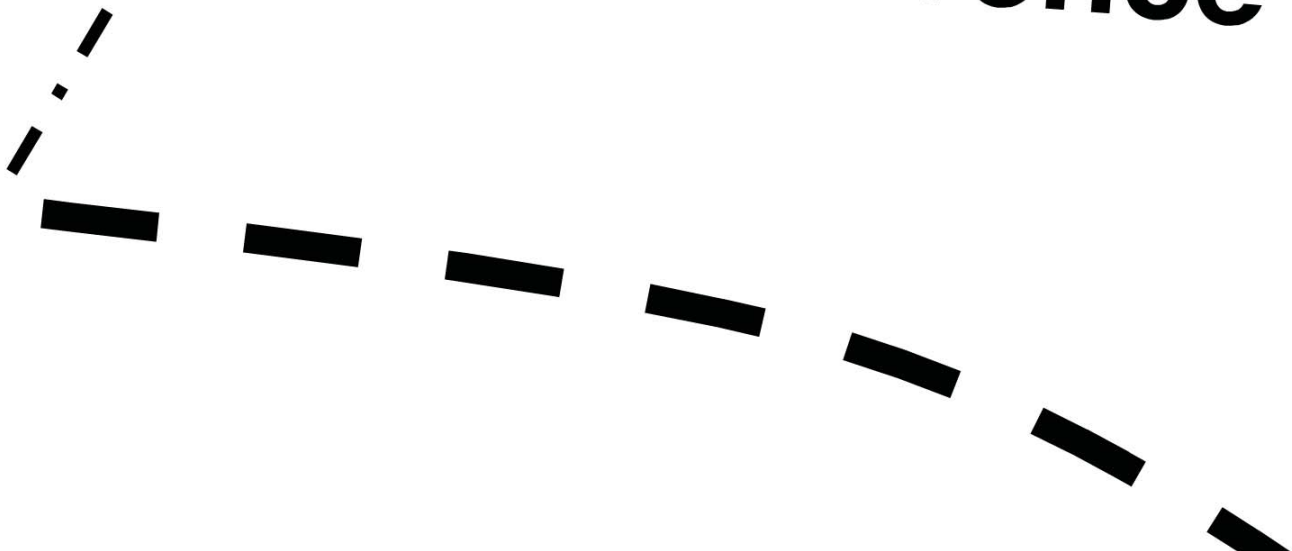
[Participatory observation]

[Questions in interviews and questionnaires]



The cognitive complexity of the observer determines the complexity of the observers world.

Semiotic reference





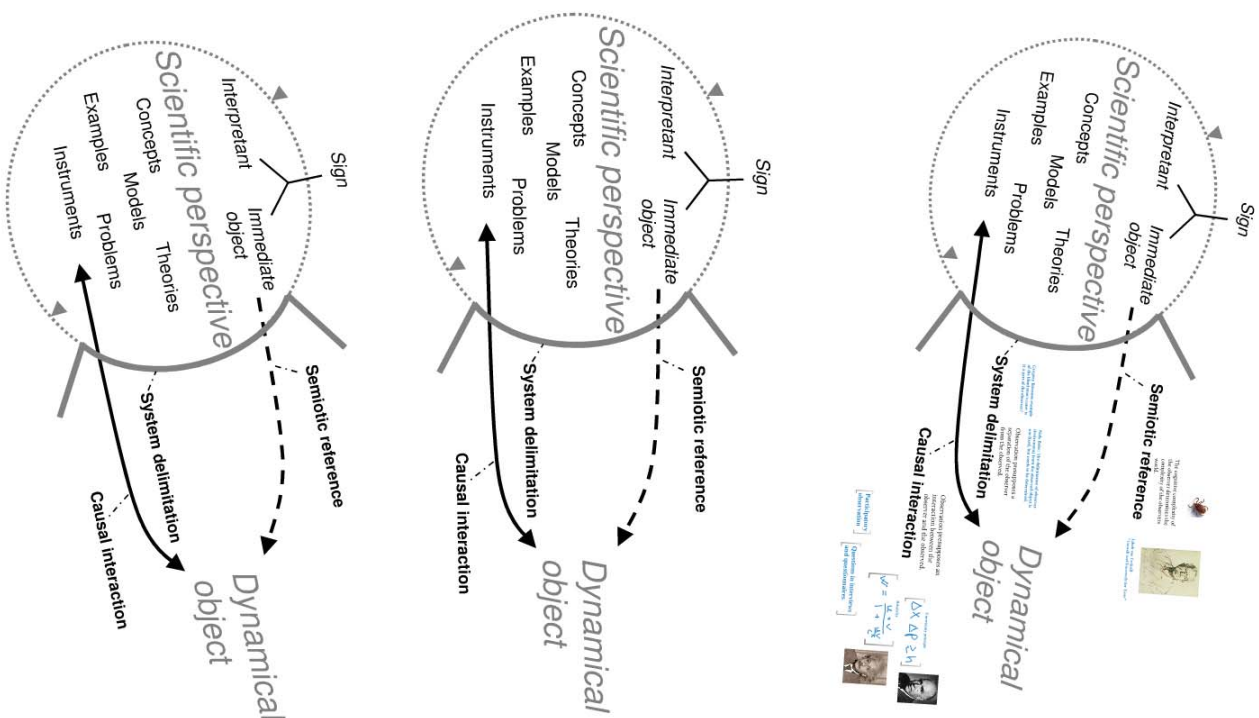
The cognitive complexity of the observer determines the complexity of the observers world.



Jakob von Üexküll
"Umwelt und Innenwelt der Tiere"

reference

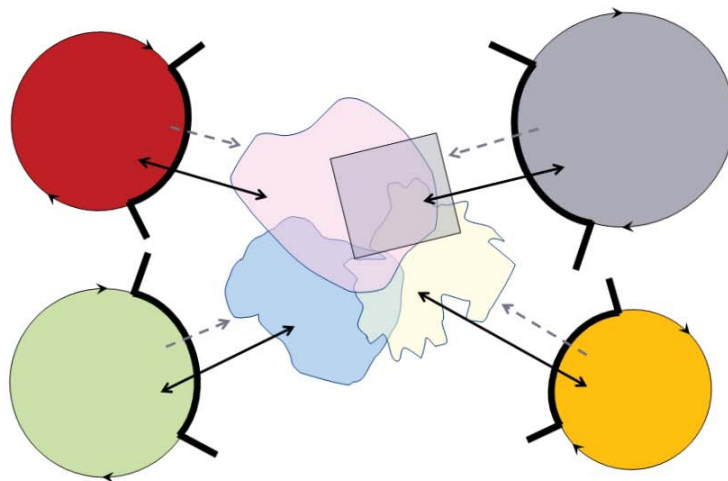
The crossdisciplinary challenge



...chemical object?

Shared dynamical object?

The differentiation and specialisation of science creates strong monocular knowledge - and new communication problems



What we see depends on how (with what means) we see it.

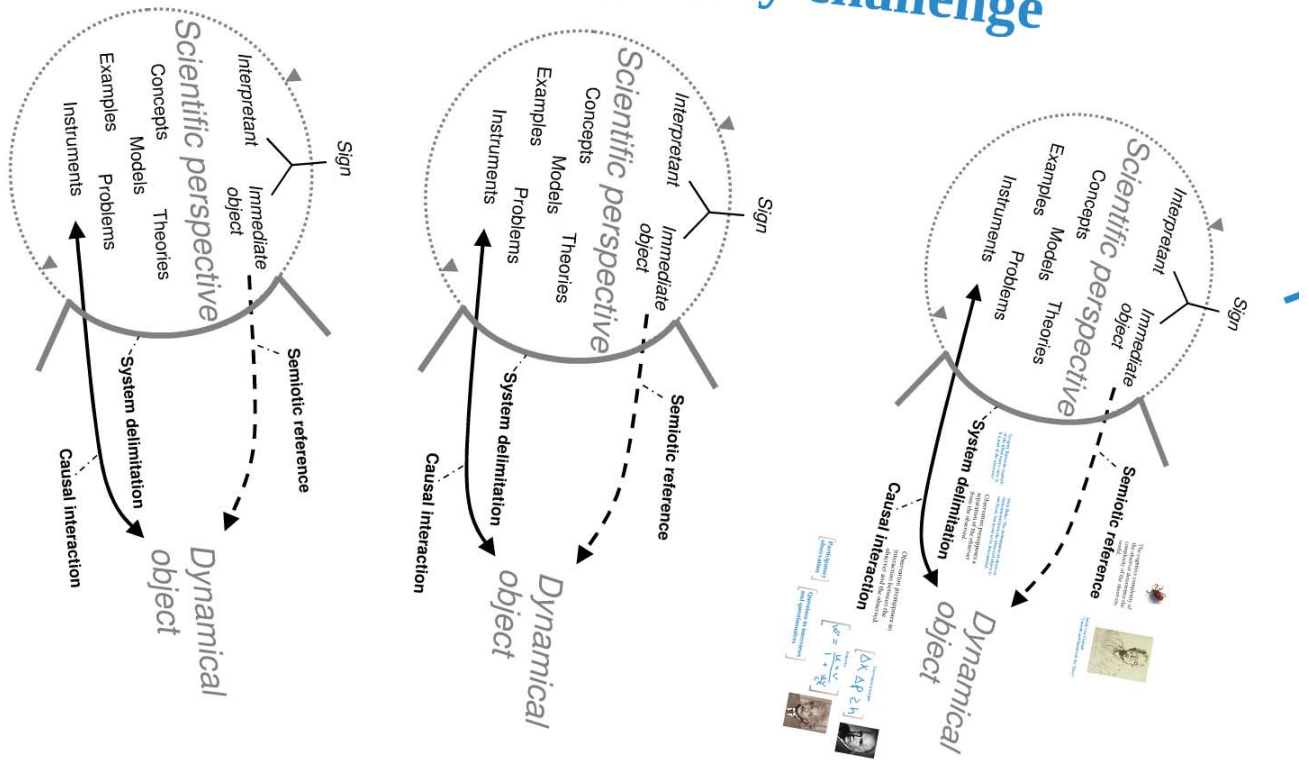
- Any dynamical object has a surplus of possibilities for observation - there is no complete cognition.
- Any cognition is necessarily a reduction, since it is based on a specific cognitive context.

We cannot be sure that we see the same thing - even though we say we do

- A concept creates different interpretations of different immediate objects for different people or perspectives.
- Immediate objects do refer to dynamical 'objects in themselves', and dynamical objects 'strike back' in our interaction with them.
- But none of the immediate objects are the same as the dynamical object in itself.

(Alrøe and Noe 2008)

Shared dynamical object?



Primary challenge



What we see depends on how (with what means) we see it.

- Any dynamical object has a surplus of possibilities for observation - there is no complete cognition.
- Any cognition is necessarily a reduction, since it is based on a specific cognitive context.

We cannot be sure that we see the same thing - even though we say we do

- A concept creates different interpretations of different immediate objects for different people or perspectives.
- Immediate objects do refer to dynamical 'objects in themselves', and dynamical objects 'strike back' in our interaction with them.
- But none of the immediate objects are the same as the dynamical object in itself.

(Alrøe and Noe 2008)

The communicative paradox of cross-disciplinary science

The communicative paradox of cross-disciplinary science

The common language is not sufficiently precise for specialised perspectives, but more precise and specialised communication moves us away from the common language with which we can communicate across perspectives.

(Alrøe and Noe 2011)

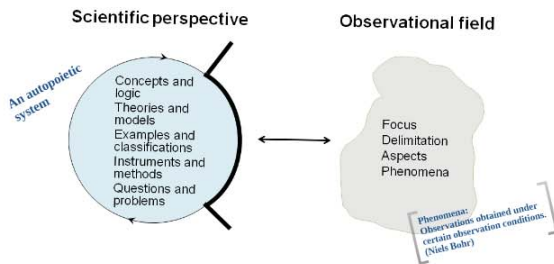
"Communication is possible only as a self-referential process"
(Luhmann 1995)



What does this perspectivist view mean for our understanding of the problems of crossdisciplinary science?

A scientific perspective is a differentiated and refined system of observation and learning - such as a discipline, a subdiscipline, a school of thought, or a more specific approach

Implications for practise and methodology



Distinguishing 'bad science' from 'different science' criteria for good science
 Analysing the role of values in science As an observer

Understanding of the interdisciplinary science?

Implications for research practise and methodology

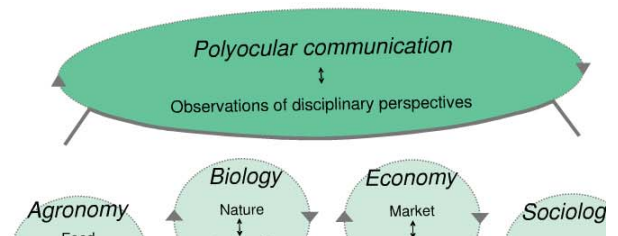
A perspectivist view of scientific knowledge and expertise, disagreement, and learning

	Type of knowledge and expertise		Type of disagreement	Type of system learning process
1. Within a perspective	Embodied and tacit knowledge. Paradigm. Contributory expertise.	Orthodox knowledge.	Converging disagreement.	Socializing. Reproducing and refining. Normal science.
2. Transgressing a perspective		Heterodox knowledge.	Diverging disagreement.	Differentiation of science. Scientific revolution.
3. Between perspectives (of first order)	Acontextual knowledge. Interactional expertise.		Unconnected 'blind' disagreement. Communication failure.	'Learning the language.' Hegemony. Boundary-work.
4. In a second order perspective	Contextualised knowledge. Reflexive expertise.		Perspectival disagreement.	Second order polyocular communication.

(Alree and Noe 2010)

Example: The MultiTrust project

A separate, second order perspective



Criteria assessment and communication of effects of food systems. An Organic RDD project 2011-2013.

1.2 mil. NZ\$ by the Green Growth programme

Ministry for Food

It will provide analyses, methods and of multidisciplinary assessment to help



concepts
nature

“Nature as that
which is not human”



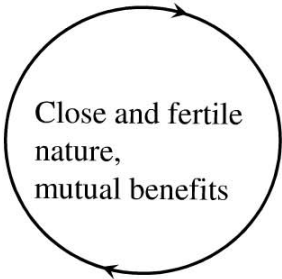
The culturalists good nature



The naturalists good nature

“Nature as an allied”
“Humans as part of
nature”

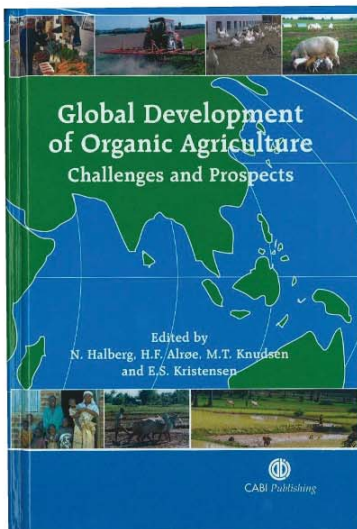
Ecosystemic
concepts of nature



The ecologists good nature

Scientific article with a multiperspectival analysis of considerations and interests from three different perspectives on nature: Culturalist, Naturalist and Ecologist – interesting but difficult to carry out. (Tybirk, Alrøe and Frederiksen 2004)

Different perspectives on globalisation and sustainable development



(CABI Publishing, 2006)

1. Growth without borders	2. Growth within limits	3. Growth and ecological injustice
Globalisation is not a problem, on the contrary: globalization provides new opportunities for the market.	The economic system is dependent on a fragile ecological system with limits to growth.	Development and efficiency are not solutions, but causes of social and ecological problems due to commercialisation of hitherto commons.

(Byrne, Glover and Alrøe 2006, p. 54)

	1. Growth without borders	2. Growth within limits	3. Growth and ecological injustice
Focus	Market solutions	Ecological system limits	Individuals and local communities
Relevant discipline	Neo-classical and environmental economics	Ecological economics	Political ecology
Characteristic concepts	Free trade, internalizing external costs	Sustainable scale, finite ecosphere, functional integrity	Ecological justice, fairness with regard to the common environment
How may certified organic agriculture meet the challenges of globalization?	Develop globally recognized principles and regionally adapted standards; create a space for organic agriculture in free trade institutions, e.g. the 'green box' in WTO	Enforce principles of ecology and sustainability in the organic certification standards to resist ill effects of market pressures	Include ecological justice in the organic certification standards to resist ill effects of e.g. distant trade, corporate involvement and large-scale cash-cropping
How can certified organic agriculture offer a solution?	Provide alternative products in the market and increase consumer choices	Provide means to promote sustainability in non-localized food systems with global trade	Provide means to promote ecological justice in non-localized food systems; create alliance with fair trade
How can non-certified organic agriculture offer a solution?	Through institutional protection of vital local primary production systems and markets	Provide a more sustainable strategy to development of local agriculture in low-income countries	Provide local food systems that promote ecological justice; institutional support for their further development

(Halberg, Alrøe and Kristensen 2006, p. 346)

'standing of the disciplinary science?

Implications for research practise and methodology

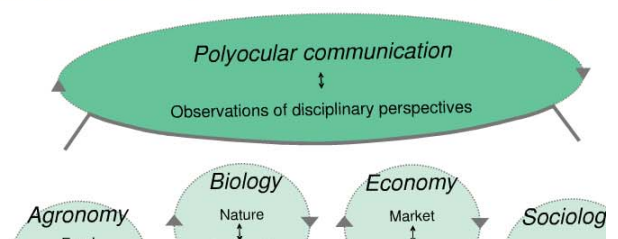
A perspectivist view of scientific knowledge and expertise, disagreement, and learning

	Type of knowledge and expertise		Type of disagreement	Type of system learning process
1. Within a perspective	Embodied and tacit knowledge. Paradigm. Contributory expertise.	Orthodox knowledge.	Converging disagreement.	Socializing. Reproducing and refining. Normal science.
2. Transgressing a perspective		Heterodox knowledge.	Diverging disagreement.	Differentiation of science. Scientific revolution.
3. Between perspectives (of first order)	Acontextual knowledge. Interactional expertise.		Unconnected 'blind' disagreement. Communication failure.	'Learning the language.' Hegemony. Boundary-work.
4. In a second order perspective	Contextualised knowledge. Reflexive expertise.		Perspectival disagreement.	Second order polyocular communication.

(Alrøe and Nøe 2010)

Example: The MultiTrust project

A separate, second order perspective



Criteria assessment and communication of effects of organic food systems. An Organic RDD project 2011-2013.

12 mio. NZ\$ by the Green Growth programme
New Zealand Ministry for Food

It will provide analyses, methods and
of multidisciplinary assessment to help



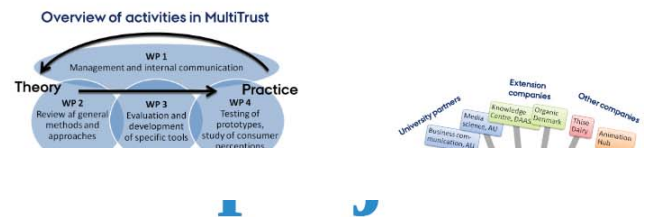


Example: The MultiTrust project

Multicriteria assessment and communication of effects of organic food systems. An Organic RDD project 2011-2013.

Funded with 2 mio. NZ\$ by the Green Growth programme under the Danish Ministry for Food

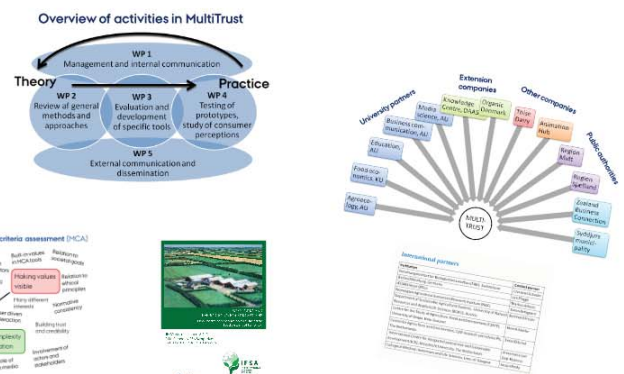
This project will provide analyses, methods and prototypes of multicriteria assessment, to help organic actors and stakeholders develop, document



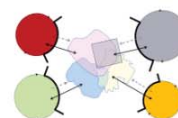
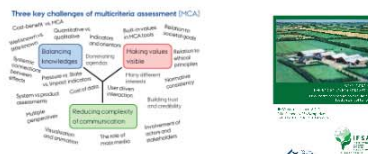
Multicriteria assessment and communication of effects of organic food systems. An Organic RDD project 2011-2013.

Funded with 2 mio. NZ\$ by the Green Growth programme under the Danish Ministry for Food

This project will provide analyses, methods and prototypes of multicriteria assessment, to help organic actors and stakeholders develop, document and communicate balanced overall assessments of the effects of organic food systems on society and nature.



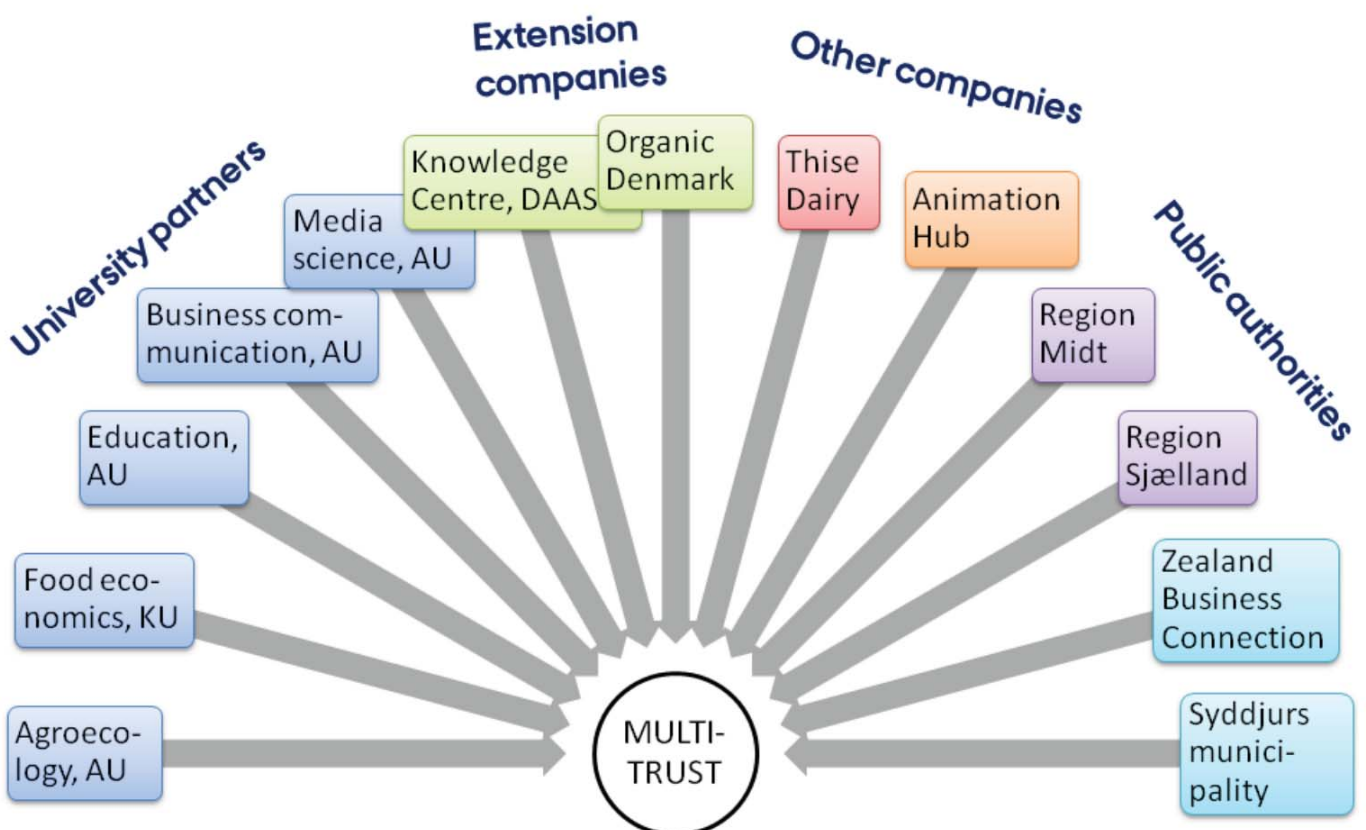
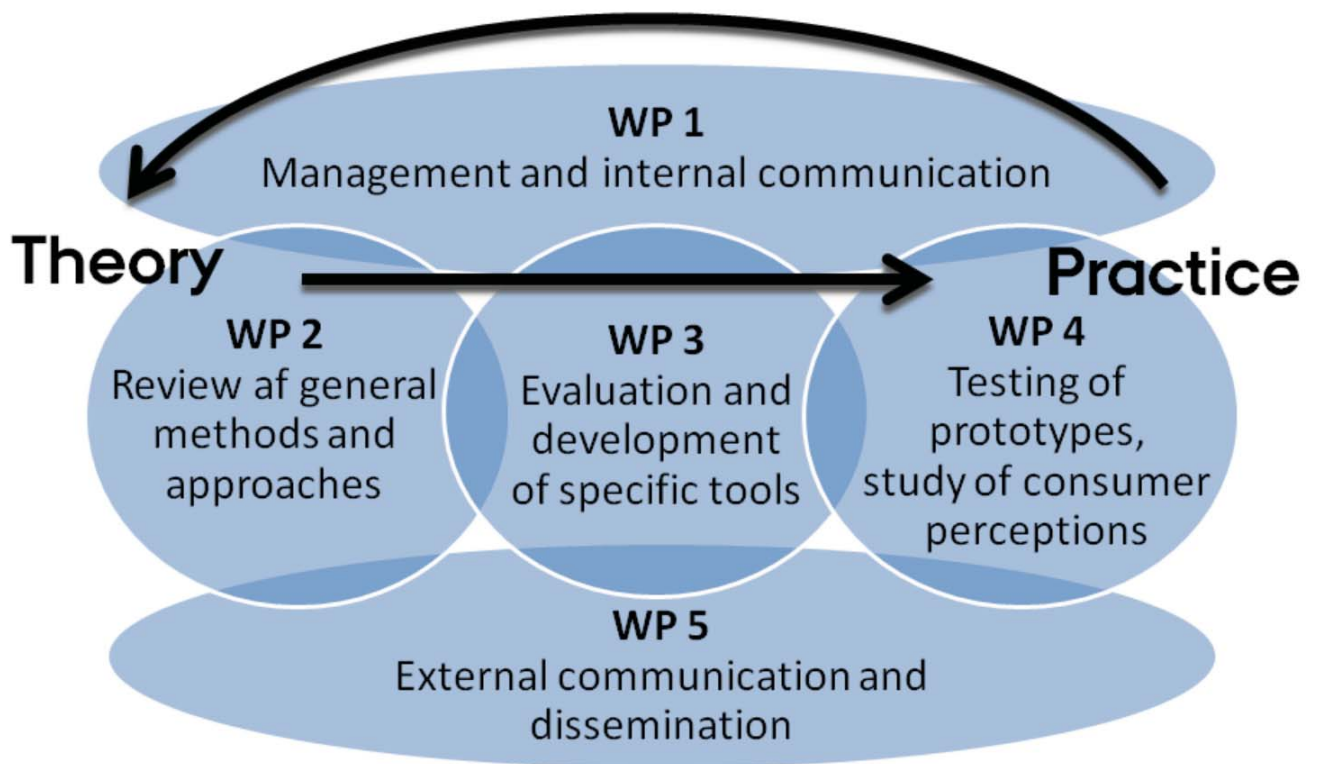
- Assessment and communication
- Values and knowledge
- Practice and science



Step one:
Descriptions of own perspective

A multiperspective approach (which works explicitly with the different aspects of organic agriculture exposed by different scientific disciplines) is required to facilitate the interdisciplinary work and to enable the participation of a diverse range of organic actors and stakeholders in the project.

Overview of activities in MultiTrust



International partners

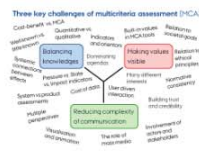
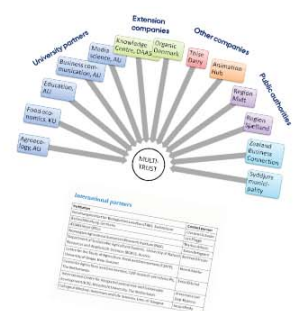
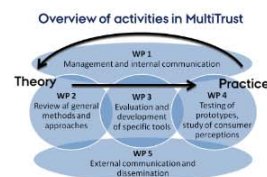
Institution	Contact person
Forschungsinstitut für Biologischen Landbau (FiBL), Switzerland	Christian Schader
Bioland Beratung, Germany	Jan Plagge
IFOAM Head Office	Markus Arbenz
Norwegian Agricultural Economics Research Institute (NILF)	Karen Refsgaard
Department of Sustainable Agricultural Systems, University of Natural Resources and Applied Life Sciences (BOKU), Austria	Bernhard Freyer
Centre for the Study of Agriculture, Food and Environment (CSAFE), University of Otago, New Zealand	Henrik Moller
Centre for Agriculture and Environment, CLM research and advice Plc, The Netherlands	Emiel Elferink
International Centre for Integrated assessment and Sustainable development (ICIS), Maastricht University, The Netherlands	Annemarie van Zeijl-Rozema
College of Medical, Veterinary and Life Sciences, Univ. of Glasgow	Jacqui Reilly

Multicriteria assessment and communication of effects of organic food systems. An Organic RDD project 2011-2013.

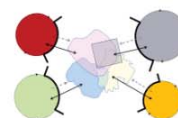
Funded with 2 mio. NZ\$ by the Green Growth programme under the Danish Ministry for Food

This project will provide analyses, methods and prototypes of multicriteria assessment, to help organic actors and stakeholders develop, document and communicate balanced overall assessments of the effects of organic food systems on society and nature.

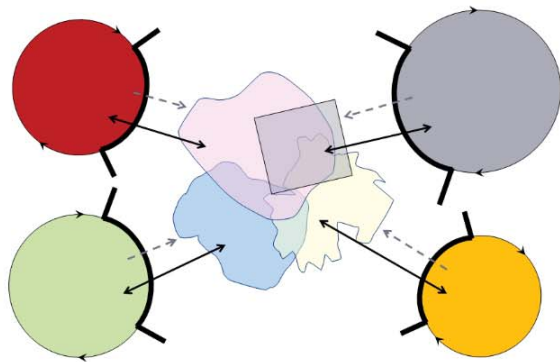
- Assessment and communication
- Values and knowledge
- Practice and science



A multiperspective approach (which works explicitly with the different aspects of organic agriculture exposed by different scientific disciplines) is required to facilitate the interdisciplinary work and to enable the participation of a diverse range of organic actors and stakeholders in the project.

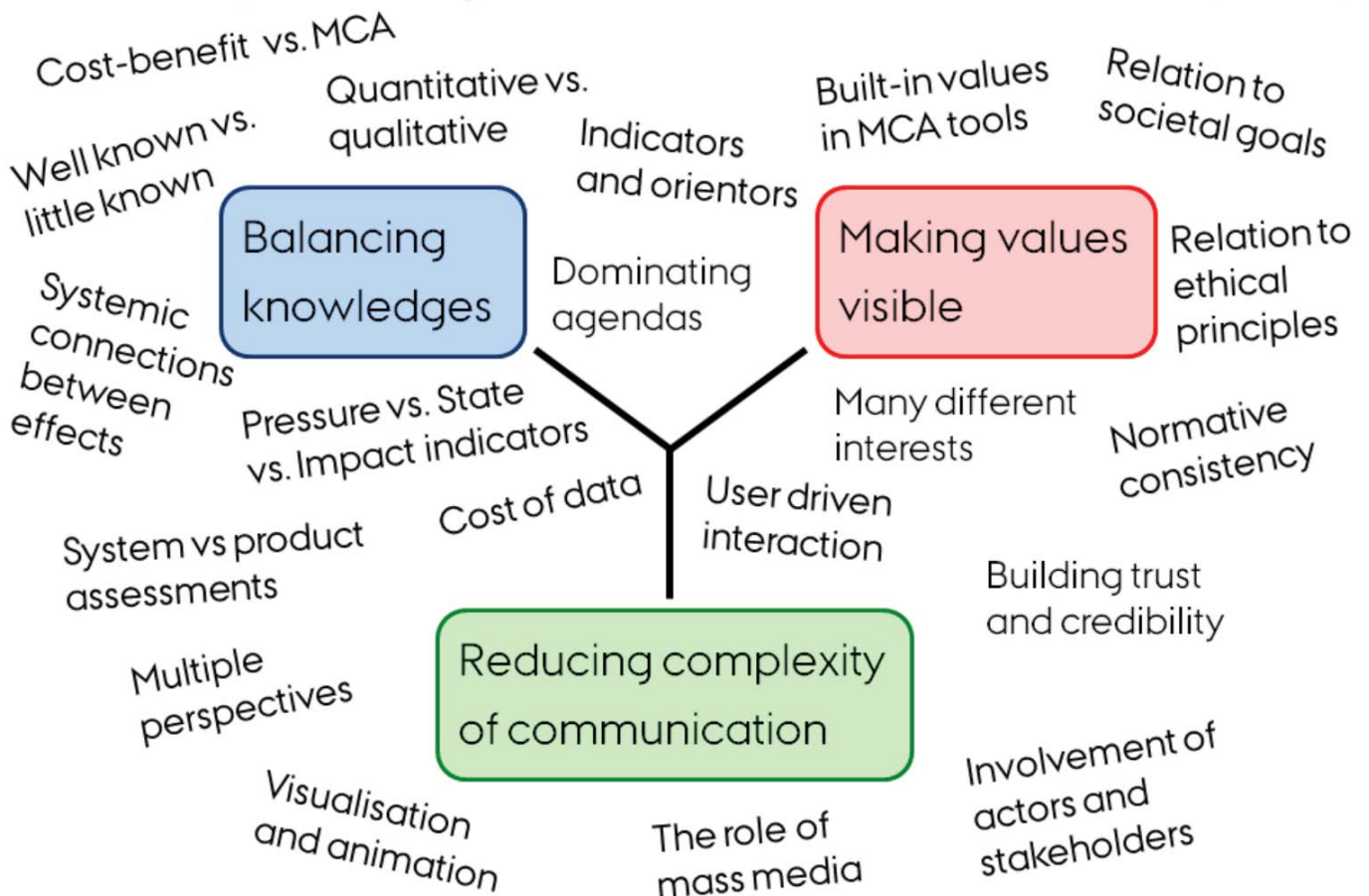


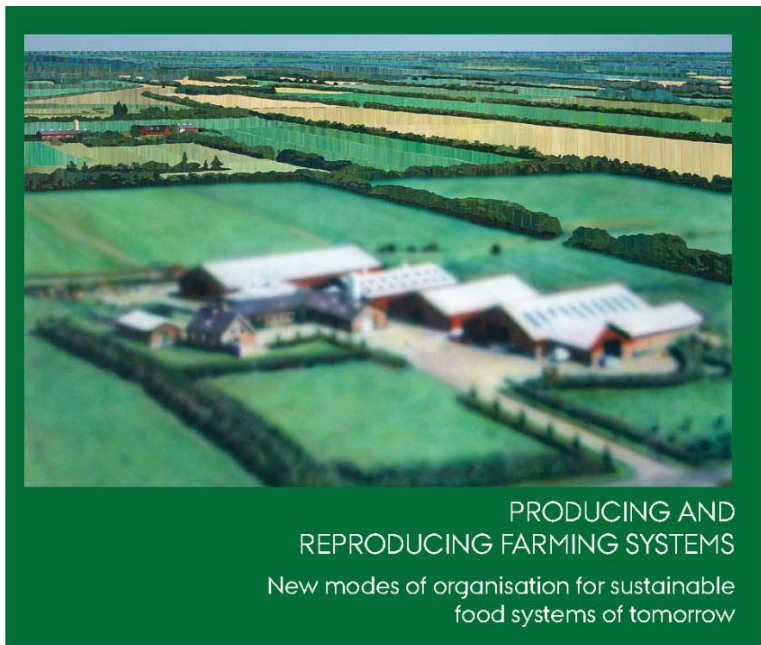
Step one: Descriptions of own perspective



Step one: Descriptions of own perspective

Three key challenges of multicriteria assessment (MCA)





IFSA Symposium 2012
10th European IFSA Symposium
1-4 July 2012 in Aarhus, Denmark



standing of the disciplinary science?

Implications for research practise and methodology

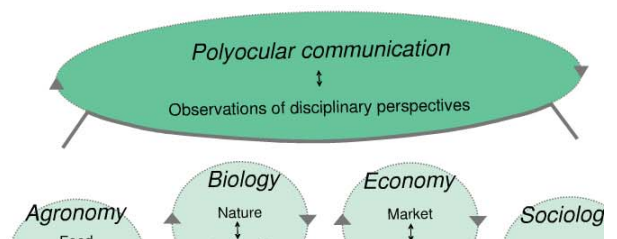
A perspectivist view of scientific knowledge and expertise, disagreement, and learning

	Type of knowledge and expertise		Type of disagreement	Type of system learning process
1. Within a perspective	Embodied and tacit knowledge. Paradigm. Contributory expertise.	Orthodox knowledge.	Converging disagreement.	Socializing. Reproducing and refining. Normal science.
2. Transgressing a perspective		Heterodox knowledge.	Diverging disagreement.	Differentiation of science. Scientific revolution.
3. Between perspectives (of first order)	Acontextual knowledge. Interactional expertise.		Unconnected 'blind' disagreement. Communication failure.	'Learning the language.' Hegemony. Boundary-work.
4. In a second order perspective	Contextualised knowledge. Reflexive expertise.		Perspectival disagreement.	Second order polyocular communication.

(Alvares and Noe 2010)

Example:
The MultiTrust project

A separate, second order perspective



criteria assessment and communication of effects of organic food systems. An Organic RDD project 2011-2013.

12 miles, NZS by the Green Growth programme Danish Ministry for Food

It will provide analyses, methods and of multidisciplinary assessment to help

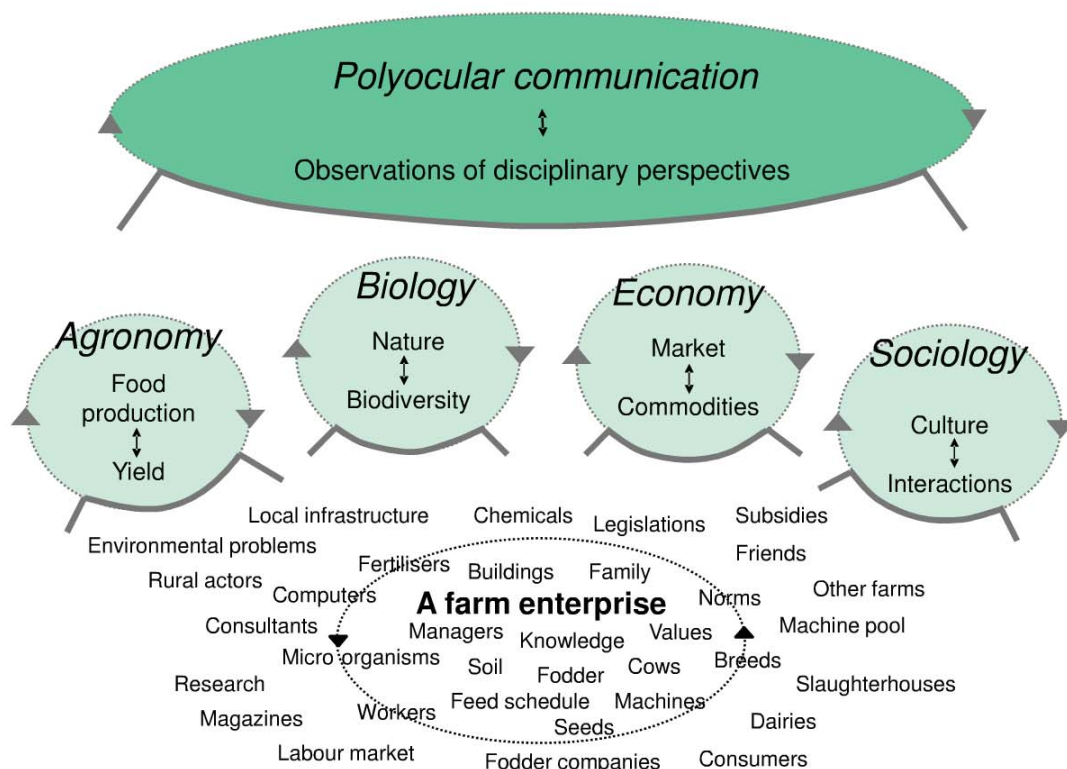


A perspectivist view of scientific knowledge and expertise, disagreement, and learning

	Type of knowledge and expertise		Type of disagreement	Type of system learning process
1. Within a perspective	Embodied and tacit knowledge. Paradigm. Contributory expertise.	Orthodox knowledge.	Converging disagreement.	Socializing. Reproducing and refining. Normal science.
2. Transgressing a perspective		Heterodox knowledge.	Diverging disagreement.	Differentiation of science. Scientific revolution.
3. Between perspectives (of first order)	Acontextual knowledge. Interactional expertise.		Unconnected 'blind' disagreement. Communication failure.	'Learning the language.' Hegemony. Boundary-work.
4. In a second order perspective	Contextualised knowledge. Reflexive expertise.		Perspectival disagreement.	Second order polyocular communication.

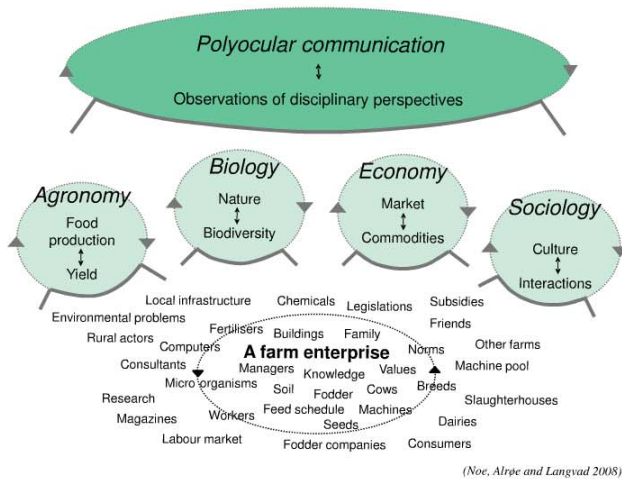
(Alrøe and Noe 2010)

A separate, second order perspective



(Noe, Alrøe and Langvad 2008)

A separate, second order perspective



Second order observation and polyocular communication seems to be a promising way to handle communicational problems across perspectives

Disciplinary specialised perspectives offer a consistent, effective and precise knowledge in context of a sharply delimited research world.

Polyocular communication can unfold a multidimensional space of understanding based on second order observations of specialised perspectives and the cognitive context of their observations.

Polyocular communication can only happen with reference to a shared dynamic object that can be observed in different ways.

Perspectivist ethics?

- The empirical and normative aspects of science depend on each other
- The perspectival structure of science therefore has implications for ethics
- There is for instance a need to rethink the precautionary principle accordingly
- Development of a systems ethics proper

Stakeholder perspectives and societal interests

- It gets even more complex: heterogeneous science x heterogeneous interests
- In what ways do stakeholder perspectives differ from scientific perspectives?
- The two kinds of perspectives are not independent - certain scientific perspectives are often shared by certain stakeholders and support certain interests
- The problem of problem forming
- The role of cultural differences

Further developments

The structure of complementarity?

Why can some perspectives be integrated and others not?

Niels Bohr: The principle of complementarity is a general principle, and not restricted to quantum physics.

Analyse whether and how different perspectives on the same dynamic object are mutually incompatible – in other words, where they are complementary.

This can be used to identify fundamental barriers for integration of scientific perspectives and sources of communication

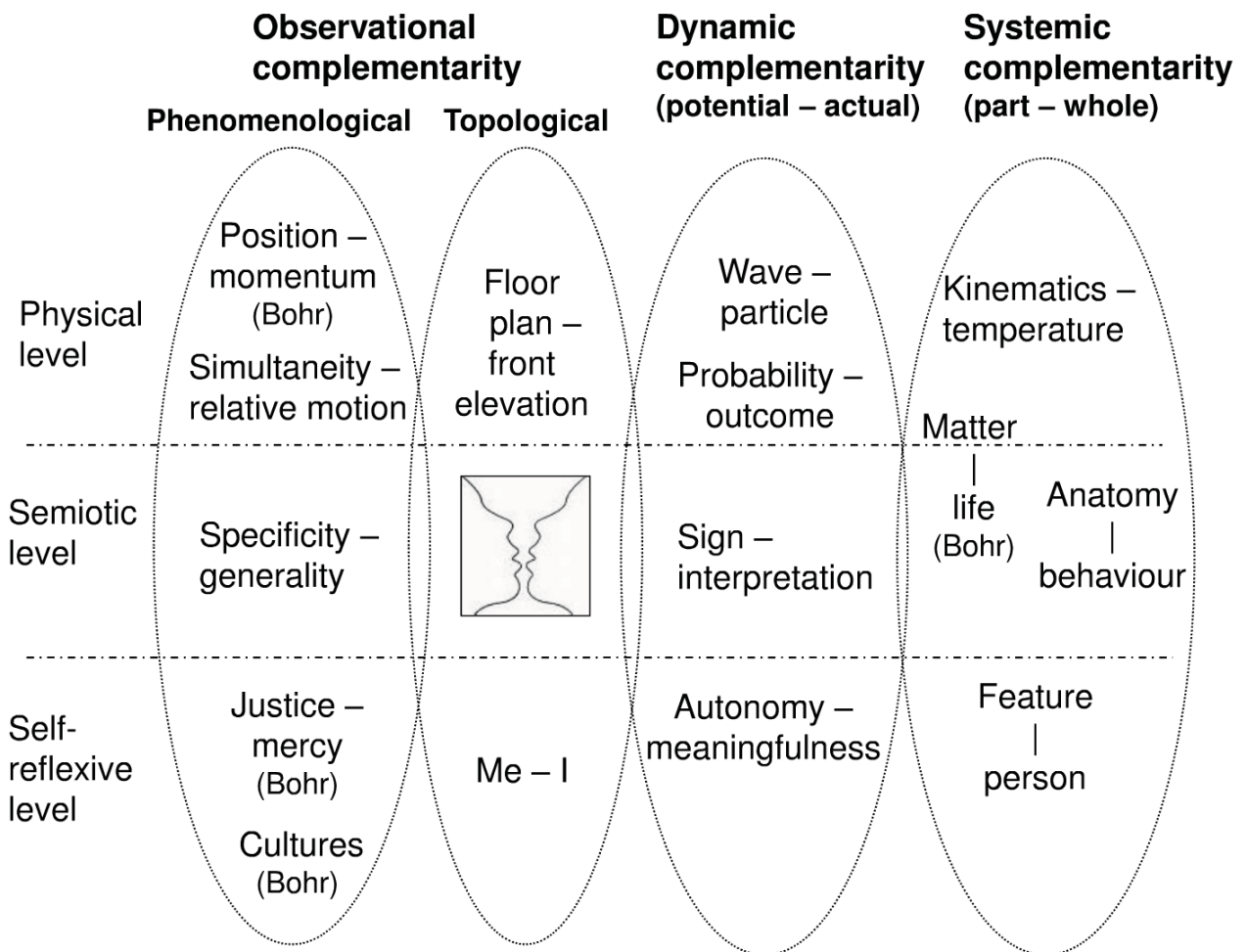
The structure of complementarity?

Why can some perspectives be integrated and others not?

Niels Bohr: The principle of complementarity is a general principle, and not restricted to quantum physics.

Analyse whether and how different perspectives on the same dynamic object are mutually incompatible – in other words, where they are complementary.

This can be used to identify fundamental barriers for integration of scientific perspectives and sources of communication problems.



(sketch)

Perspectivist ethics?

- The empirical and normative aspects of science depend on each other
- The perspectival structure of science therefore has implications for ethics
- There is for instance a need to rethink the precautionary principle accordingly
- Development of a systems ethics proper



Stakeholder perspectives and societal interests

- It gets even more complex: heterogeneous science x heterogeneous interests
- In what ways do stakeholder perspectives differ from scientific perspectives?
- The two kinds of perspectives are not independent - certain scientific perspectives are often shared by certain stakeholders and support certain interests
- The problem of problem forming
- The role of cultural differences



Thank you for your attention!

Contact: hugo.alroe@djf.au.dk

Homepage: <http://hugo.alroe.dk>
(with publications for download)

