



# Steinbeis

## New Cybernetics: An Emerging Post-Disiplinary Field

Karl H. Müller

Steinbeis Transfer Center

**New Cybernetics**

Orlando, July 17, 2014

# Overview

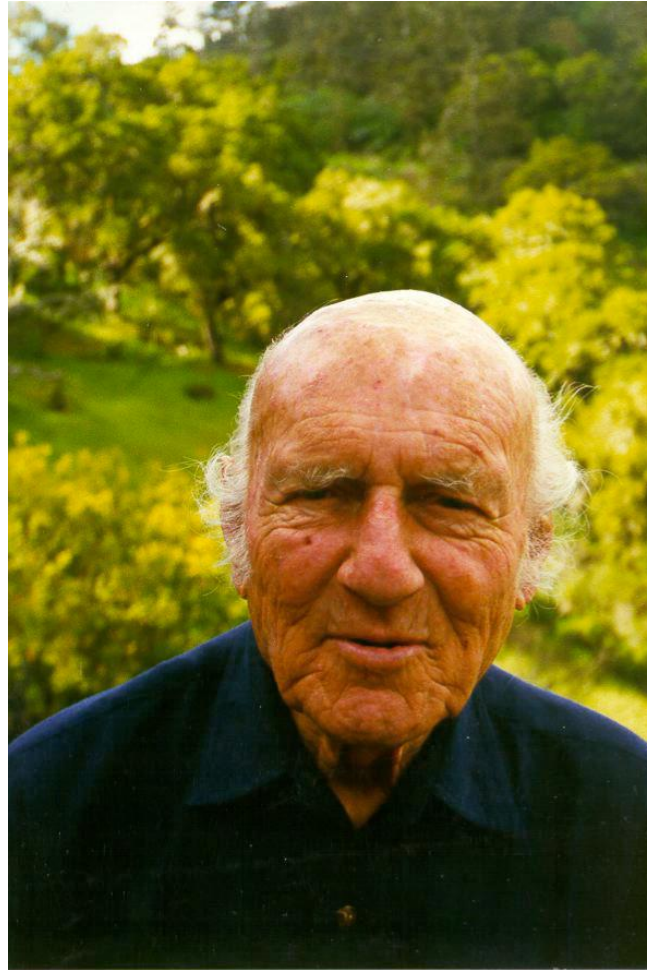
- The Mystery of Second-Order Cybernetics  
A Copernican Revolution without Traces
- Science Levels/Domains and the Post-Disciplinary Configuration
- New Cybernetics as a Copernican Revolution with Three Major Building Blocks
- Clusters of PhD-Programs in New Cybernetics

# The Mystery of Second-Order Cybernetics

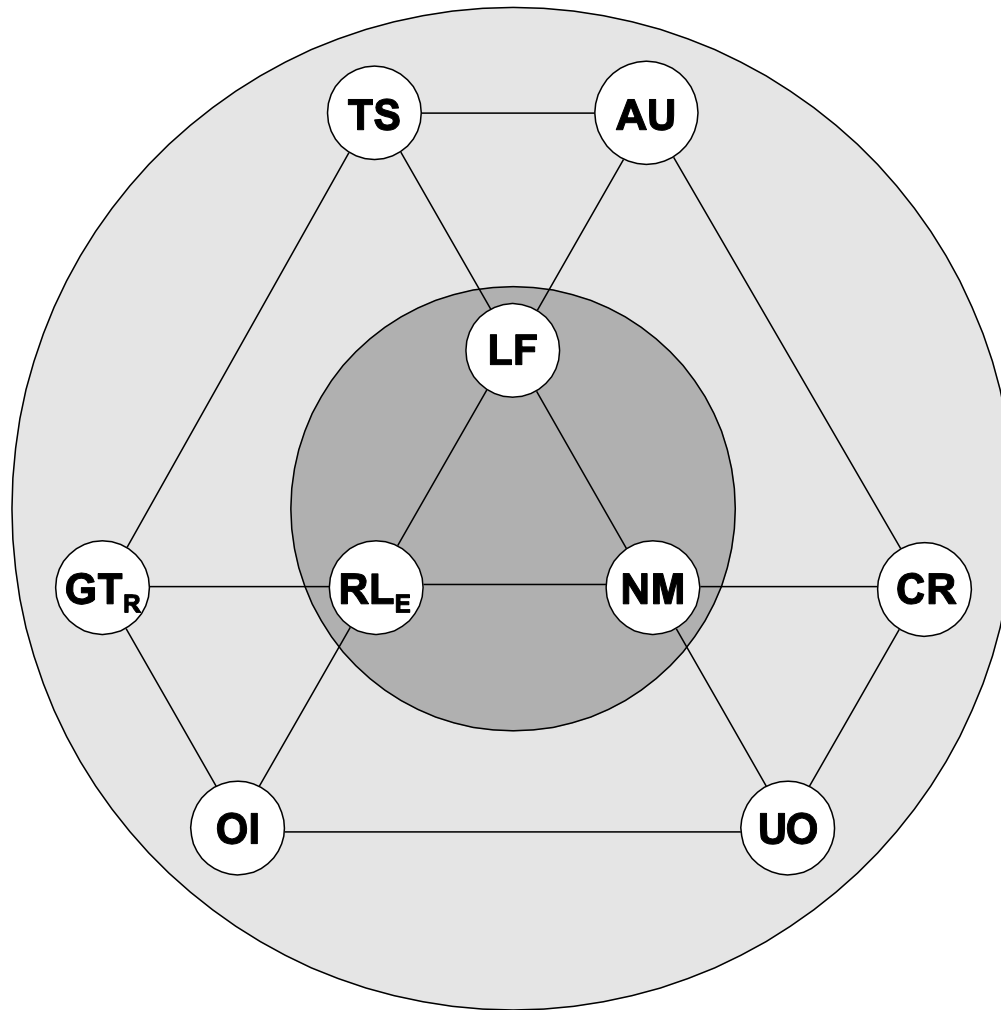
Heinz von Foerster  
(1911 – 2002):

Cybernetics of Cybernetics  
(1974): Two Pages

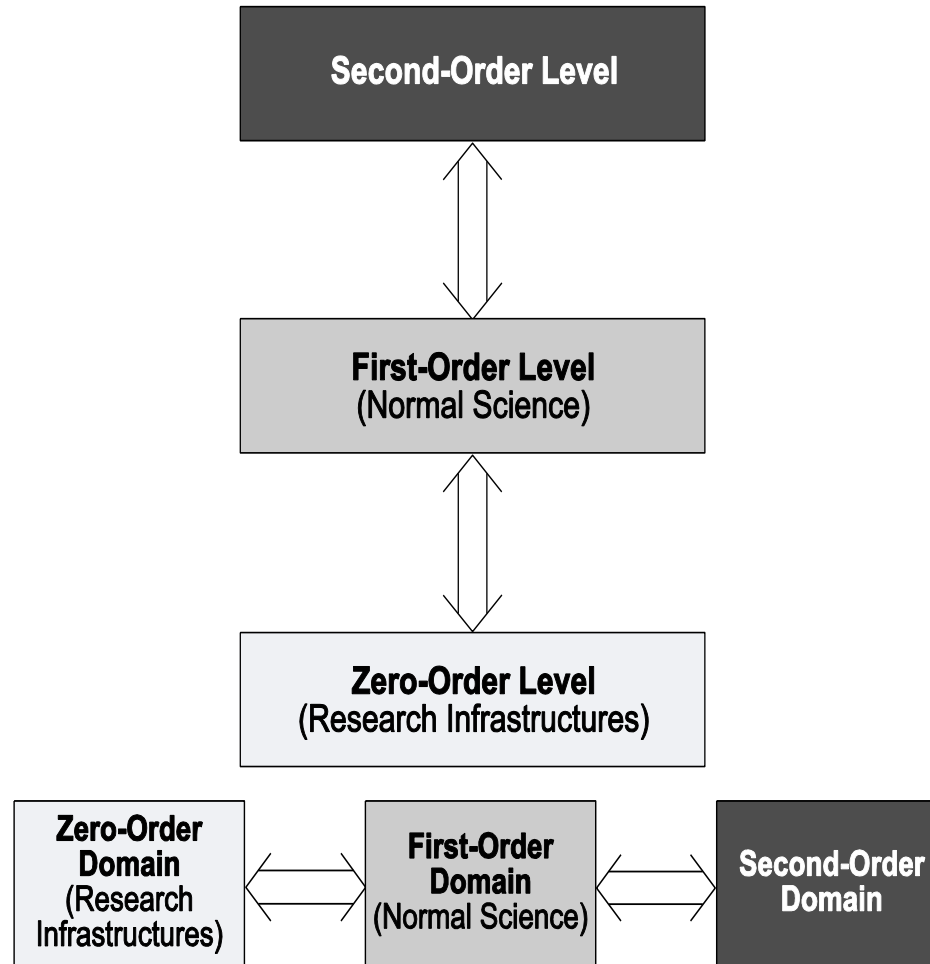
Cybernetics of Cybernetics  
(2003): Four Pages



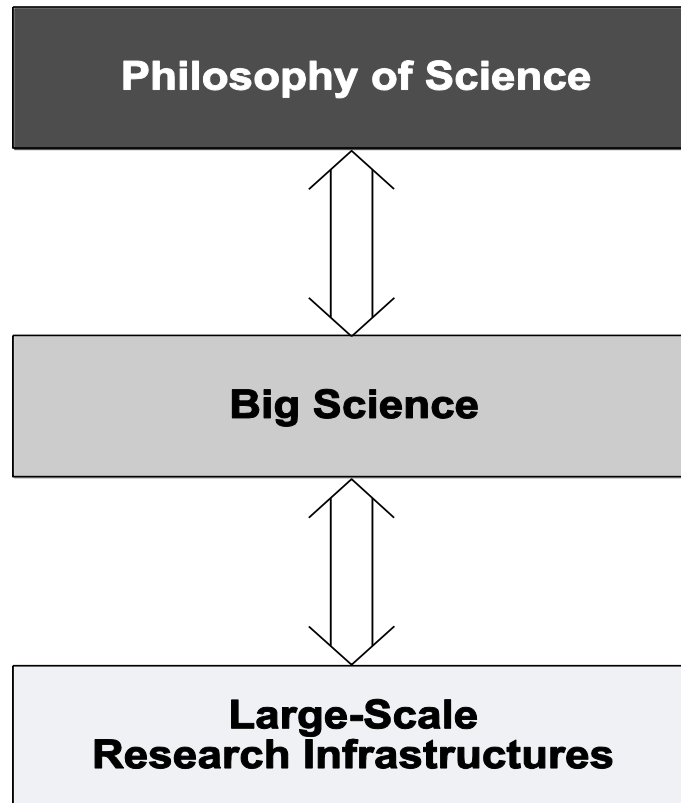
# The Building Blocks of Foerster's Second-Order Cybernetics



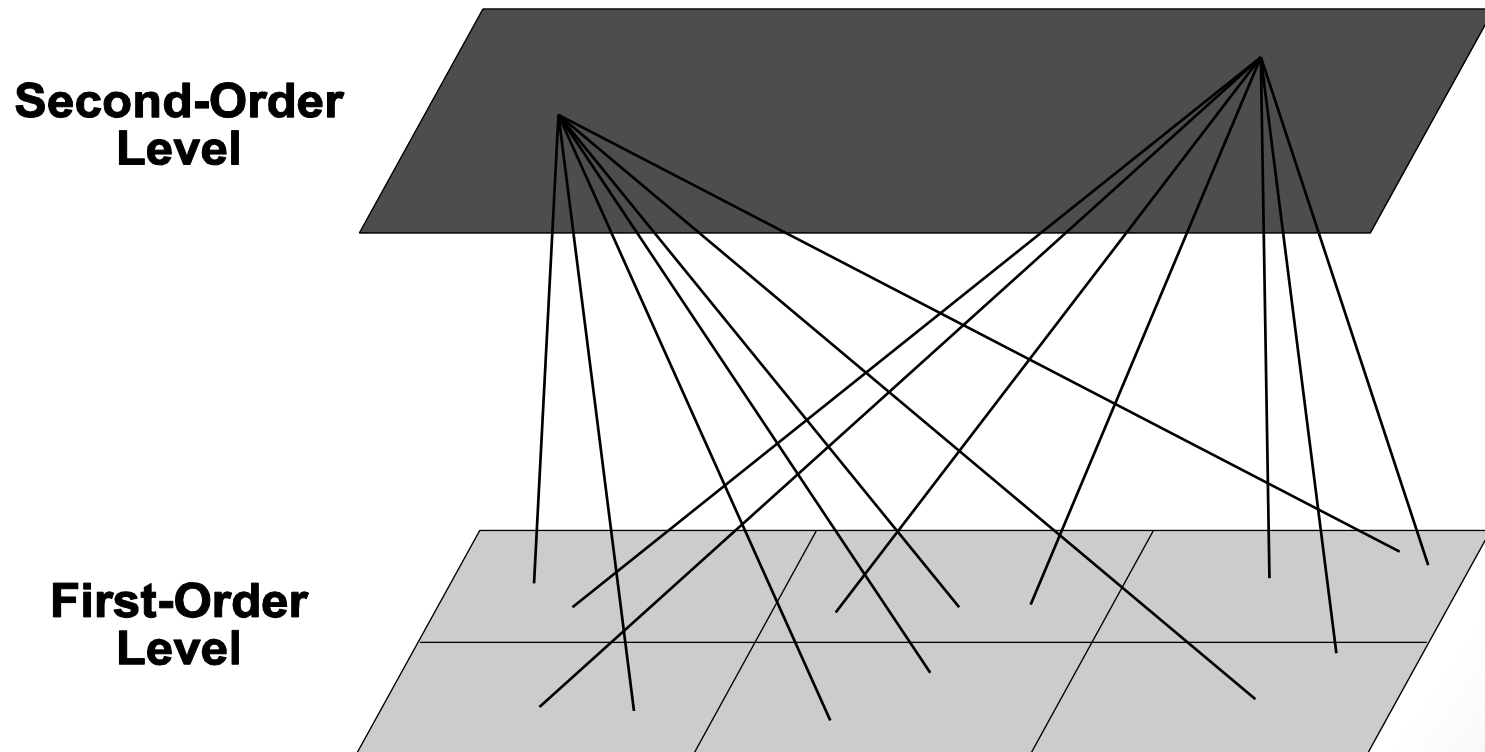
# A Three Level/Domain Architecture for Science



# Science Landscapes around the 1950s and 1960s



# The Post-Disciplinary Configuration



# New Cybernetics I: Re-Entries, Second-Order Domain/Level

Second-Order Level/Domain through Re-Entries:

“Computation of computation, cybernetics of cybernetics, geometry of geometry, linguistics of linguistics, logic of logic, magic of magic, mathematics of mathematics, pattern of pattern, teaching of teaching, will of will.”

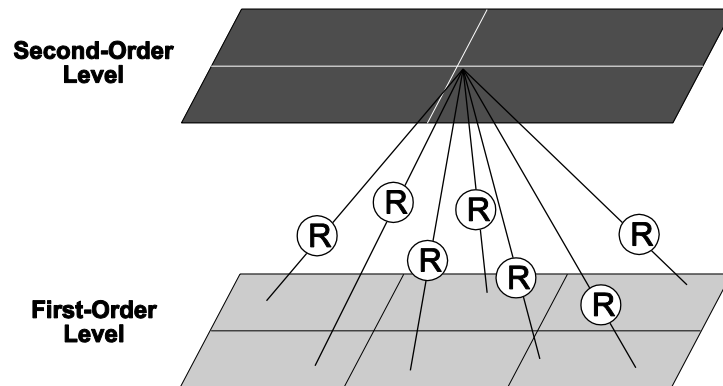
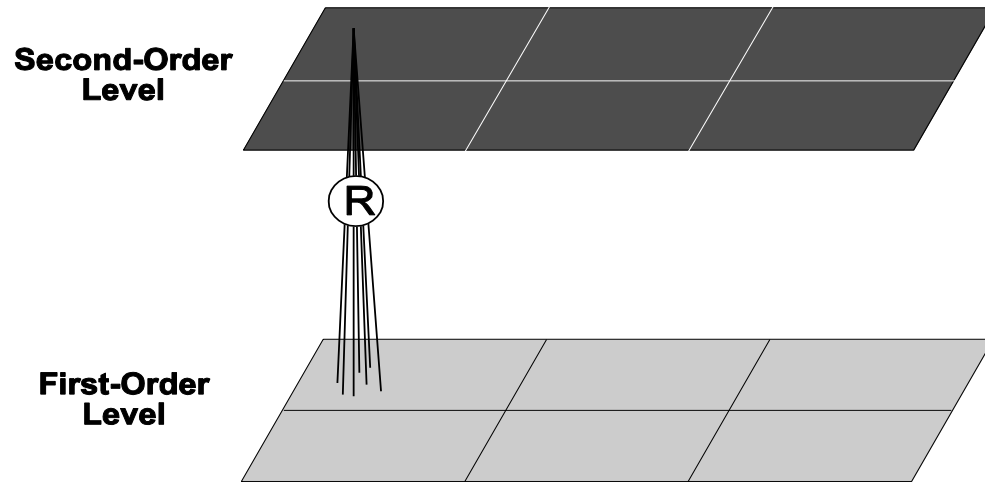
(Kauffman, 2005: 129)

A Vast and Largely Unexplored Science Frontier





# Different Types of Re-Entries



# Second-Order Science, Science II and Science 2.0

Three Seemingly Equivalent Concepts, but with very Different Semantic Domains: Science I/II refers to different stages in the evolution of science, Science 2.0 is focused on new netbased support for co-operation and second-order science is based on a new domain/level of analysis.

## Science I

Modern Science from the 16th Century to 1900/1950  
Science 1.0 as the traditional way of face to face co-op.  
First-Order Science as the Exploratory Mode of Analysis

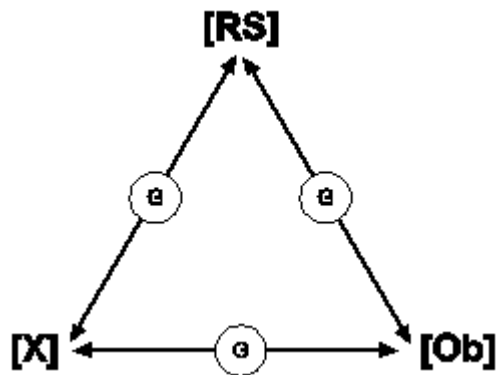
## Science II

Science from 1950 onwards,  
New Cognitive Architecture  
Scientific Co-operation with Web-Support and Social Media  
Second-Order Science as a Reflexive Mode of Analysis  
(Due to an Inversion of Novelty)

# New Cybernetics II: Operates as Endo-Science

Exoscience: Traditional Exploratory Science Mode  
„Objectivity“

Endoscience: Observer Becomes Part of the  
Field under Investigation

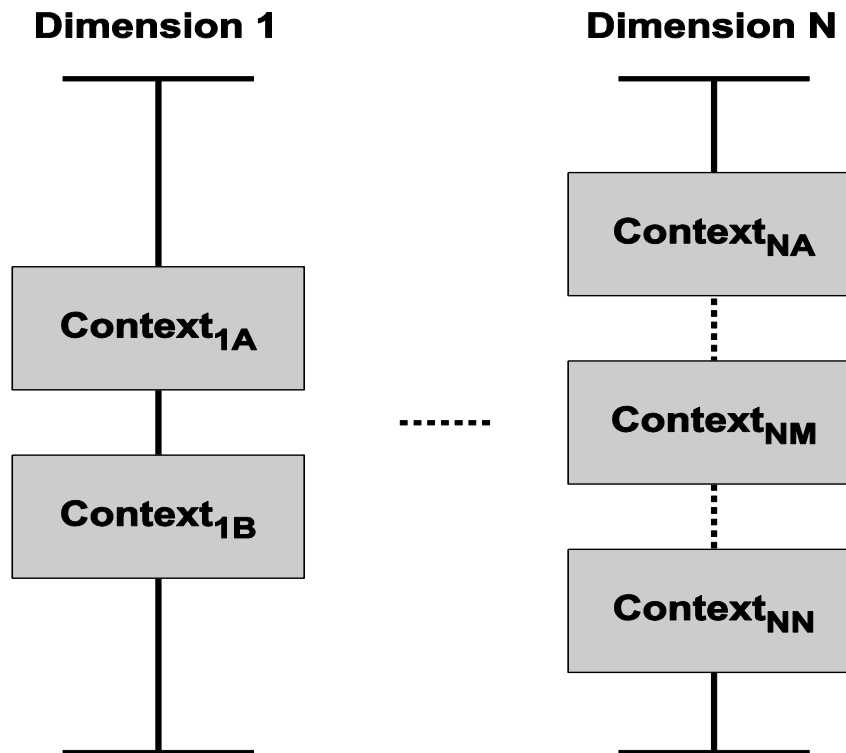


# Intersubjective/Intercultural Reproducibility as Primary Goal

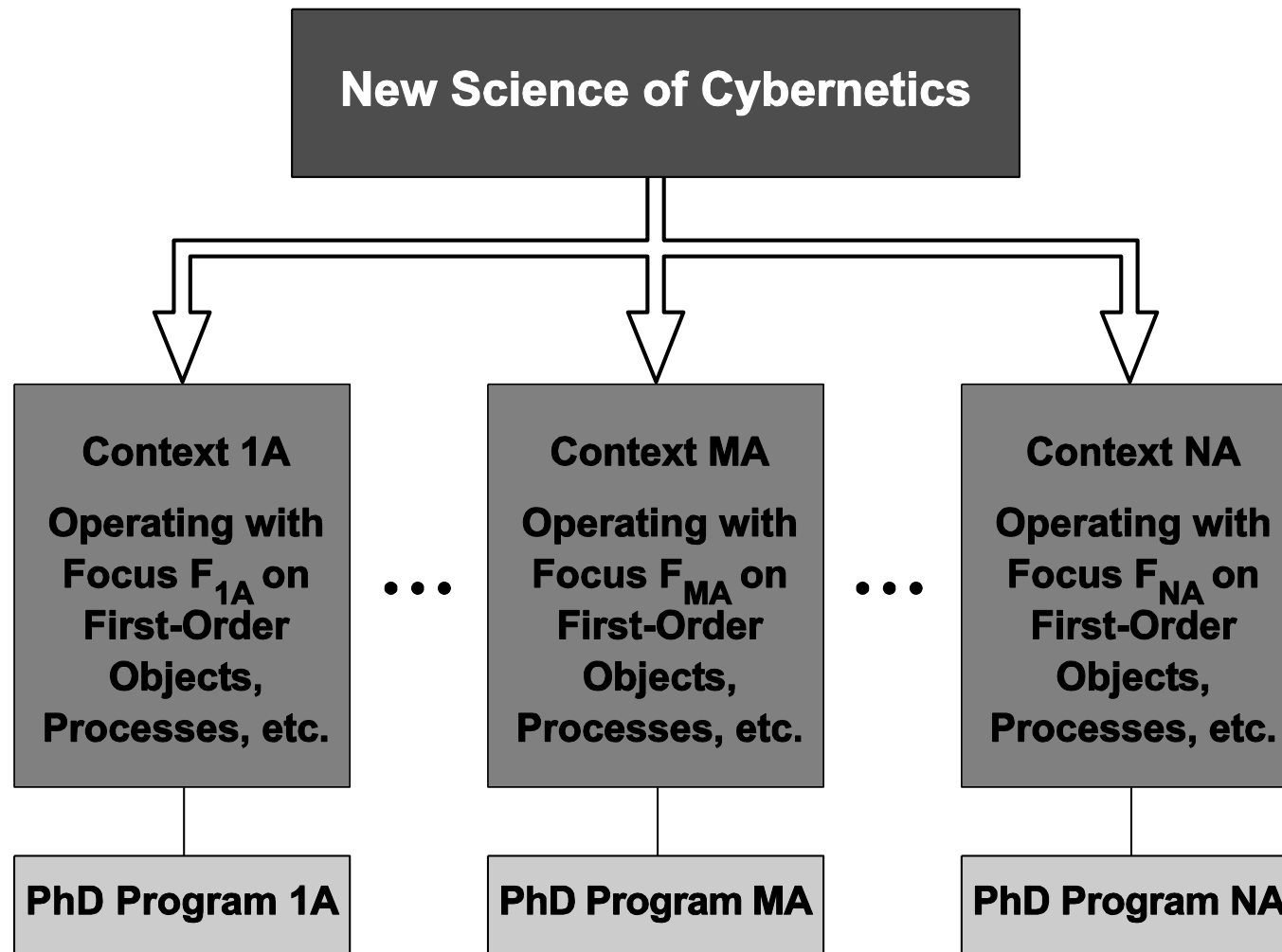
- Account of the Operations by an Observer  
Becomes Necessary
- Account in the Format of a Recipe Which  
Can be Used for Reproduction
- Recipe as Rule System with a Set of  
Recombination Operators

# Multiple Fields and Multiple PhD-Programs in New Cybernetics

Separation of Science Landscapes into N Different Dimensions and Various Contexts in Each Dimension



# Clusters of PhD-Programs in New Cybernetics



# General Outline for a Three Year PhD-Program (Level 3 Bologna)

12 Field Courses (60 ECTS) and 9 PhD-Related Courses (120 ECTS)

Distribution of Field Courses (X):

Foundations (X)

Widening, Deepening, Integrating (X)

Second-Order Methods and Methodologies (X)

Research Designs for Second-Order Analyses (X)

Science-Society-Relations (X)

Research Infrastructures for (X)

# Old and New Cybernetics

## **First-Order Cybernetics**

Trans-disciplinary Field for Natural, Technical and Social Systems at the First-Order Level

Steering, Controlling of Technical, Natural or Societal Systems

Emphasis on Information and on Information Technologies

## **The New Science of Cybernetics**

Post-disciplinary Field for the Science System as a Whole at the Second-Order Level

Steering, Navigating, through Science Landscapes at the First- and Second-Order Level, Quality Control, Innovation Engine for First-Order Research

Emphasis on Knowledge, Knowledge Enhancements and Embedded Knowledge Techn.



# Old and New Cybernetics

Main Emphasis on Strong  
Forms of Control

Central for Control and  
Communication in Natural  
Social and Technical  
Systems

First-Order Level Research on  
Nature, Society and Techn.

On Systems Observed  
Little Relevance for Self-Re-  
flexive Research

Observer Excluded from  
Research Processes

Objectivity

Main Emphasis on Coordination  
and on Weak Forms of Control

Central for Communication and  
Coordination for the Science  
and Research System in General

Second-Order Level Research  
on First-Order Research and  
Researchers

On Observing Systems  
Central Relevance for Self-  
Reflexive Research

Observer Included in  
Research Processes

Intersubjective Reproducibility

# Contact:

Karl H. Müller

Steinbeis Transfer Center

New Cybernetics

Vienna, Austria

[mueller@wisdom.at](mailto:mueller@wisdom.at)

0043 1 664 4191961