Unifying Epistemologies by Combining World, Description and Observer

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At a dinner in Vienna in November 2005 Karl Mueller mentioned Heinz von Foerster’s 1971 article “Computing in the Semantic Domain

Von Foerster described a triangle and labeled two sides syntactics and semantics

Mueller wondered what the third side would be
Origin of this paper 2

• I suggested “pragmatics”
• Later in thinking about the triangle it occurred to me that the three sides corresponded to three points of view in the history of cybernetics
• The triangle suggested a way to unify previously competing epistemologies
Description 1 2 Observer

World

1 3

Description 1 2 Observer

World

1 3
Von Foerster’s epistemological triangle
### Epistemological triangle

<table>
<thead>
<tr>
<th>World and description</th>
<th>Observer and description</th>
<th>Observer and world</th>
</tr>
</thead>
<tbody>
<tr>
<td>Syntactics</td>
<td>Semantics</td>
<td>Pragmatics</td>
</tr>
<tr>
<td>Representation concept of truth</td>
<td>Coherence concept of truth</td>
<td>Pragmatic concept of truth</td>
</tr>
<tr>
<td>British Empiricism</td>
<td>German Idealism</td>
<td>American Pragmatism</td>
</tr>
<tr>
<td>Inanimate Objects</td>
<td>Knowing Subjects</td>
<td>Social Reforms</td>
</tr>
<tr>
<td>Unquestioned Objectivity</td>
<td>Constructed Objectivity</td>
<td>Contested Objectivity</td>
</tr>
<tr>
<td>Form</td>
<td>Meaning</td>
<td>What works</td>
</tr>
</tbody>
</table>
Another use of the triangle

- In 1991 I made a table comparing constructivist cybernetics, or the work of von Foerster, with that of Popper and Kuhn
- It seems to me that the three columns in that table also can be mapped onto the triangle
- This suggests that second order cybernetics constitutes an important third perspective in the philosophy of science
<table>
<thead>
<tr>
<th>Popper</th>
<th>von Foerster</th>
<th>Kuhn</th>
</tr>
</thead>
<tbody>
<tr>
<td>A normative view of epistemology: how scientists should operate</td>
<td>A biological view of epistemology: how the brain functions</td>
<td>A sociological view of epistemology: how scientists in fact operate</td>
</tr>
<tr>
<td>Non-science vs. science</td>
<td>Realism vs. constructivism</td>
<td>Steady progress vs. revolutions</td>
</tr>
<tr>
<td>Solve the problem of induction: conjectures and refutations</td>
<td>Include the observer within the domain of science</td>
<td>Explain turmoil in original records vs. smooth progress in textbooks</td>
</tr>
<tr>
<td>How science as a picture of reality is tested and grows</td>
<td>How an individual constructs a “reality”</td>
<td>How paradigms are developed and then replaced</td>
</tr>
<tr>
<td>Scientific knowledge exists independent of human beings</td>
<td>Ideas about knowledge should be rooted in neurophysiology</td>
<td>Even data and experiments are interpreted</td>
</tr>
<tr>
<td>We can know what we know and do not know</td>
<td>If people accept this view, they will be more tolerant</td>
<td>Science is a community activity</td>
</tr>
</tbody>
</table>
Popper’s three “worlds”

• “World” can be thought of as Popper’s “world one”
• “The observer” is what Popper meant by “world two”
• “Description” can be thought of as Popper’s “world three”
<table>
<thead>
<tr>
<th></th>
<th>Engineering Cybernetics</th>
<th>Biological Cybernetics</th>
<th>Social Cybernetics</th>
</tr>
</thead>
<tbody>
<tr>
<td>The view of epistemology</td>
<td>A realist view of epistemology: knowledge is a “picture” of reality</td>
<td>A biological view of epistemology: how the brain functions</td>
<td>A pragmatic view of epistemology: knowledge is constructed to achieve human purposes</td>
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<tr>
<td>A key distinction</td>
<td>Reality vs. scientific theories</td>
<td>Realism vs. Constructivism</td>
<td>The biology of cognition vs. the observer as a social participant</td>
</tr>
<tr>
<td>The puzzle to be solved</td>
<td>Construct theories which explain observed phenomena</td>
<td>Include the observer within the domain of science</td>
<td>Explain the relationship between the natural and the social sciences</td>
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<tr>
<td>What must be explained</td>
<td>How the world works</td>
<td>How an individual constructs a “reality”</td>
<td>How people create, maintain, and change social systems through language and ideas</td>
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<tr>
<td>A key assumption</td>
<td>Natural processes can be explained by scientific theories</td>
<td>Ideas about knowledge should be rooted in neurophysiology.</td>
<td>Ideas are accepted if they serve the observer’s purposes as a social participant</td>
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<tr>
<td>An important consequence</td>
<td>Scientific knowledge can be used to modify natural processes to benefit people</td>
<td>If people accept constructivism, they will be more tolerant</td>
<td>By transforming conceptual systems (through persuasion, not coercion), we can change society</td>
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Three Versions of Cybernetics
Engineering cybernetics 1

• A realist view of epistemology: knowledge is a picture of reality
• A key distinction: reality vs. scientific theories
• The puzzle to be solved: construct theories which explain observed phenomena
Engineering cybernetics 2

• What must be explained: how the world works

• A key assumption: natural processes can be explained by scientific theories

• An important consequence: scientific knowledge can be used to modify natural processes to benefit people
Biological cybernetics 1

• A biological view of epistemology: how the brain functions
• A key distinction: realism vs. constructivism
• The puzzle to be solved: include the observer within the domain of science
Biological cybernetics 2

• What must be explained: how an individual constructs a “reality”

• A key assumption: ideas about knowledge should be rooted in neurophysiology

• An important consequence: if people accept constructivism, they will be more tolerant
Social cybernetics 1

• A pragmatic view of epistemology: knowledge is constructed to achieve human purposes

• A key distinction: the biology of cognition vs. the observer as a social participant

• The puzzle to be solved: explain the relationship between the natural and the social sciences
Social cybernetics 2

• What must be explained: how people create, maintain, and change social systems through language and ideas

• A key assumption: ideas are accepted if they serve the observer’s purposes as a social participant

• An important consequence: by transforming conceptual systems (through persuasion, not coercion), we can change society
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Cautions

• The fact that ideas can be plausibly mapped onto a triangle carries no meaning per se.
• However, an arrangement in the form of a diagram may reveal connections or missing pieces that had not been apparent before.
• A graphical representation of ideas is simply a heuristic device.
Conclusions and Implications

• Connects second order cybernetics with Popper’s worlds 1, 2, and 3
• Suggests that world 3 is more important than previously thought by cyberneticians and others
• Shows there is more than one interpretation of the injunction, “include the observer”
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Urbana, Illinois
March 29-April 1, 2007
Science one vs. science two

- Observation
- Description
- Well-tested knowledge
- Extrapolate/ forecast
- Accuracy/ precision

- Participation
- Prescription
- Agreement
- Create/ design
- Usefulness
Two strategies for building knowledge

- Accumulation
- More theories
- More abstract theories
- Separate disciplinary languages
- Administrative barriers between fields
- Disciplines remain separate

- Integration
- Add a dimension (CP)
- Revise the philosophy of science
- A common language
- Show similarities among fields
- Work together
Two ways to structure knowledge

• Most philosophers of science
• Cause and effect
• If A, then B
• Analysis
• Reductionism
• Theories

• E.A. Singer, Jr., Churchman, Ackoff
• Producer - product
• What is needed
• Synthesis
• Expansionism
• Methods
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<tr>
<th>Author</th>
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<th>Second Order Cybernetics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Von Foerster</td>
<td>The cybernetics of observed systems</td>
<td>The cybernetics of observing systems</td>
</tr>
<tr>
<td>Pask</td>
<td>The purpose of a model</td>
<td>The purpose of a modeler</td>
</tr>
<tr>
<td>Varela</td>
<td>Controlled systems</td>
<td>Autonomous systems</td>
</tr>
<tr>
<td>Umpleby</td>
<td>Interaction among the variables in a system</td>
<td>Interaction between observer and observed</td>
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<tr>
<td>Umpleby</td>
<td>Theories of social systems</td>
<td>Theories of the interaction between ideas and society</td>
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**Definitions of First and Second Order Cybernetics**
The cybernetics of science

NORMAL SCIENCE

The correspondence principle

Incommensurable definitions

SCIENTIFIC REVOLUTION
The Correspondence Principle

- Proposed by Niels Bohr when developing the quantum theory
- Any new theory should reduce to the old theory to which it corresponds for those cases in which the old theory is known to hold
- A new dimension is required
An Application of the Correspondence Principle