



## Removing Constraints on the Advance of Cybernetics

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**Purpose** – Just as there are software versions, there are also versions of the prevailing conceptions of science and philosophy. Versions can differ by country or region. The purpose of this paper is to explain how the effort to develop cybernetics in the US has led to changes in the conceptions of science and philosophy in the US.

**Design/methodology/approach** – The approach of the paper is to explain what ideas in science and philosophy have been obstacles to the development of cybernetics and how those ideas are changing.

**Findings** – The effort to advance the science of cybernetics in the United States has required reconsidering some ideas in both science and philosophy.

In science there has been a change from studying inanimate objects to working with thinking participants, both individuals and organizations. In the past scientists sought to use the same methods in the social sciences as were used in the physical sciences. Those efforts worked well for a time, but a strong interest in the relevance of theory to practice has led to an awareness of the limitations of this approach. In management and operations research mathematical methods have been supplemented by group discussion methods.

Regarding philosophy, some key ideas in cybernetics appeared to be contradicted by rules against fallacious reasoning. The informal fallacies were a list of ideas that should be avoided. However, the informal fallacies caused people new to cybernetics to doubt the philosophical soundness of the field. Progress has been made possible by inventing new methods and changing our thinking about acceptable methods.

More recently, comparisons of cybernetics theories in several countries has led to awareness that Europeans are using a larger set of conceptual possibilities than Americans. Americans choose not to study a significant part of philosophy. The history of philosophy can be thought of as a conversation between the followers of Aristotle and the followers of Plato. Europeans are familiar with this debate, but Americans are not. Europeans study the history of philosophy in high school. They enter universities with a conception of how the knowledge in each field has developed from its roots in philosophy. Americans are familiar only with the Aristotelean approach to philosophy. One group of philosophers believe that knowledge is pre-given and needs only to be discovered. The other group believes that knowledge is created through our interactions with the world. The part of philosophy that has been neglected was less important during an industrial society but is becoming more important due to the growth of an information society.

There are several ways of describing cooperation among disciplines. Interdisciplinary research refers to research combining two or more disciplines, for example physical chemistry, statistical biology, or socio-economics. Multidisciplinary research occurs when several disciplines work together on a project, for example, mechanical, electrical and aeronautical engineers working together to design an airplane. Transdisciplinary research refers to a more general theory encompassing the theories of several disciplines. Examples are systems science and cybernetics. Transdisciplinary research is important because it leads to knowledge that is helpful in facilitating communication among people in different disciplines.



Transdisciplinary research has been neglected in the US because Americans do not study the history of philosophy. Consequently, people from different fields do not share a common understanding of the growth of knowledge. In Europe scientific fields are thought to be rooted in philosophy. For example, Adam Smith, who founded economics, taught moral philosophy. Europeans study the history of philosophy for two years in high school. They enter universities with an understanding of how the various disciplines arose from philosophy. In the US philosophy, beyond the philosophy of science, is widely thought to be not useful. Due to this belief there has been an overemphasis in the US on specialization and neglect of the history of ideas. The consequence is that Americans have greater difficulty communicating with people in other disciplines than do scientists in Europe. The part of philosophy that Americans are missing is important when conducting transdisciplinary research.

**Originality/value** – The value of this research is that it shows how Americans can become more effective at communicating across disciplines. Studying the history of philosophy and transdisciplinary theories such as systems science and cybernetics will aid the growth of knowledge in many fields.

**Research/ Practical/ Social/ Environment implications** - Changing assumptions in science and philosophy that limit innovation, will enable collaboration and cooperation among research fields and will help in generating more general theories, which is a goal in the effort to unify science.

**Research limitations** - Ultimate outcomes are speculative. Removing barriers in our thinking creates the possibility for more creativity, but it is not possible to know what specific new ideas will emerge.

## Keywords:

Cybernetics, transdisciplinary research, innovation, questioning assumptions, creativity, philosophy of science.