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CYBERNETICS

"Any portion of the material universe which we choose to separate in thought from the rest of the universe for the purpose of considering and discussing the various changes which may occur within it under various conditions is called a system."

-Willard Gibbs

A new emerging branch of science known as cybernetics is going to hit the world now. It is more than a science, art, philosophy or multidisciplinary subject, which is going to reign and rein the world. It is the reincarnation, unification and recreation of all good technologies, concepts and civilizations developed throughout the ages since creation, which is going to reinforce all technologies, materials and forces reinstating an ending world. The word cybernetics was first used in the context of "the study of self-governance" by Plato in The Laws to signify the governance of people. There are many definitions of cybernetics and many individuals who have influenced the definition and direction of cybernetics. Norbert Wiener, a mathematician, engineer and social philosopher, coined the word "cybernetics" from the Greek word meaning "steersman" or "the art of steering". He defined it as the science of control and communication in the animal and the machine. The word "cybernetique" was also used in 1834 by the physicist Andre-Marie Ampere (1775-1836) to denote the sciences of government in his classification system of human knowledge. For philosopher Warren McCulloch, cybernetics was an experimental epistemology concerned with the communication within an observer and between the observer and his environment. Stafford Beer, a management consultant, defined cybernetics as the science of effective organization. Anthropologist Gregory Bateson noted that whereas previous sciences dealt with matter and energy, the new science of cybernetics focuses on form and pattern. For educational theorist Gordon Pask, cybernetics is the art of manipulating defensible metaphors, showing how they may be constructed and what can be inferred as a result of their existence. According to Herbert Brun cybernetics is to cure all temporary truth of eternal triteness.

Cybernetics takes as its domain the design or discovery and application of principles of regulation and communication. Cybernetics treats not things but ways of behaving. It does not ask "what is this thing?" but "what does it do?" and "what can it do?" Because numerous systems in the living, social and technological world may be understood in this way, cybernetics cuts across many traditional disciplinary boundaries. The concepts which cyberneticians develop thus form a metadisciplinary language by which we may better understand and modify our world.

Several traditions in cybernetics have existed side by side since its beginning. One is concerned with circular causality, manifest in technological developments--notably in the design of computers and automata--and finds its intellectual expression in theories of computation, regulation and control. Another tradition, which emerged from human and social concerns, emphasizes epistemology--how we come to know--and explores theories of self-reference to understand such phenomena as autonomy, identity, and purpose. Some cyberneticians seek to create a more humane world, while others seek merely to understand how people and their environment have co-evolved. Some are interested in systems as we observe them, others in systems that do the observing. Some seek to develop methods for modeling the relationships among measurable variables. Others aim to understand the dialogue that occurs between models or theories and social systems. Early work sought to define and apply principles by which systems may be controlled. More recent work has attempted to understand how systems describe themselves, control them, and organize them. Despite its short history, cybernetics has developed a concern with a wide range of processes involving people as active organizers, as sharing communicators, and as autonomous, responsible individuals.

Many of the concepts included today in cybernetics had their origins long before the word "cybernetics" was associated with them. Self-regulating devices were constructed as early as several hundred years B.C. In the late 1700s Watt's steam engine had a governor. In 1868 James Clerk Maxwell published an article on governors. In the 1940s the study of regulatory processes became a continuing research effort. Two key articles were published in 1943 -- "Behavior, Purpose and Teleology" by Arturo Rosenblueth, Norbert Wiener, and Julian Bigelow and "A Logical Calculus of the Ideas Immanent in Nervous Activity" by Warren McCulloch and Walter Pitts.

These articles were followed by a series of conferences between 1944 and 1953 on Circular Causal and Feedback Mechanisms in Biological and Social Systems, chaired by Warren McCulloch and sponsored by the Josiah Macy, Jr. Foundation. The Macy conferences, which were attended by Ross Ashby, Gregory Bateson, Margaret Mead, Heinz Von Foerster, John von Neumann, and others, laid the foundation for a new scientific field.

In the early 1940's John von Neumann, although better known for his work in mathematics and computer science, did contribute a unique and unusual addition to the world of cybernetics: Von Neumann cellular automata, and their logical follow up the Von Neumann Universal Constructor. The result of these deceptively simple thought experiments was the concept of self-replication which cybernetics adopted as a core concept. The concept that the same properties of genetic reproduction applied to social memes, living cells and even computer viruses is further proof of the somewhat surprising universality of cybernetic study.

In 1948 Norbert Wiener, a conference participant, published his book, *Cybernetics*, and the conferees adopted this word as the name for the new field of study. The book generated considerable interest and some anxiety. There were fears that a science of communication and control could be used for manipulative purposes by unscrupulous governments. Wiener addressed these concerns in a subsequent book, *The Human Use of Human Beings*. In the years that followed, the name

"cybernetics" was widely adopted in Europe. However, its use in the United States spread more slowly. Most research and education in the U.S. continued to be specialized by problem area and academic discipline. The amount of research conducted on the basic principles of cybernetics remained small relative to the amount of attention focused on applied problems.

In 1964 the American Society for Cybernetics was founded to facilitate the work of those with an interest in the field of cybernetics as a whole. Between 1964 and 1974 the American Society for Cybernetics held several conferences and began a journal, but during the late 1970s the society was less active due to the illness and death of some of its key officers. The 1980s saw a resurgence of interest due in part to a desire by many people for more communication across disciplines and in part to a feeling that the original questions that were posed were not receiving sufficient attention. The Society now holds conferences, conducts seminars on the fundamentals of cybernetics, and maintains contacts with cyberneticians in other countries.

In order to provide an international forum for bringing together those actively involved in areas of interest on Systems, Man and Cybernetics, IEEE (Institute of Electrical and Electronics Engineers) conducts international conferences every year at various places around the globe to report on up-to-the-minute innovations and developments, to summarize the state-of-the-art, and to exchange ideas and advances in all aspects of systems science and engineering, human machine systems, and cybernetics. The 2009 conference (SMC2009) was held on October 11-14, 2009 at Hyatt Regency Riverwalk, San Antonio, Texas, USA.

Some of the Journals associated with Cybernetics are Annals of Systems Research, IEEE Transactions on Systems, Man and Cybernetics, Biological Cybernetics, Communication and Cybernetics, Control and Cybernetics, Cybernetics and Systems Analysis, Human Systems Management, Kybernetes, Cybernetic Medicine, Journal of Artificial Societies and Social Simulation, Cybernetics and human knowing and Cybernetics and Systems.

I do suggest the following words of Norbert Wiener for any practicing cybernetician to understand: ***to live efficiently is to live with appropriate information and to predict the future is to perform an operation on the past***.

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