THE CAMBRIDGE DICTIONARY OF PHILOSOPHY, SECOND EDITION

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CAMBRIDGE UNIVERSITY PRESS

1569). Under the influence of Erasmus, Melanchthon mentioned, in the 1533 edition of his *Common Places,* three causes of good actions: "the Word, the Holy Spirit, and the will." Advocated by Pfeffinger, a Philipist, synergism was attacked by the orthodox, predestinarian, and monergist party, Amsdorf and Flacius, who retorted with Gnesio-Lutheranism. The ensuing *Formula of Concord* (1577) officialized monergism. Synergism occupies a middle position between uncritical trust in human noetic and salvific capacity (Pelagianism and deism) and exclusive trust in divine agency (Calvinist and Lutheran fideism). Catholicism, Arminianism, Anglicanism, Methodism, and nineteenth- and twentieth-century liberal Protestantism have professed versions of synergism. **See also** ERASMUS, FIDEISM, JUSTIFICATION BY FAITH. J.-L.S.

synergy. See SYNERGISM.

synonymous definition. See DEFINITION.

synonymy. See MEANING.

syntactic ambiguity. See AMBIGUITY.

syntactic consistency. See CONSISTENCY.

syntactic term. See GRAMMAR.

syntax. See GRAMMAR.

syntax, logical. See LOGICAL SYNTAX.

synthesis. See HEGEL.

synthetic. See ANALYTIC–SYNTHETIC DISTINCTION.

synthetic a priori. See A PRIORI, KANT.

Syrian school. See MIDDLE PLATONISM.

Syrianus. See COMMENTARIES ON ARISTOTLE, MIDDLE PLATONISM.

system, axiomatic. See AXIOMATIC METHOD.

system, interpretive. See OPERATIONALISM.

system, logical. See FORMAL SEMANTICS, LOGISTIC SYSTEM.

systems analysis. See COGNITIVE SCIENCE, COMPUTER THEORY, SYSTEMS THEORY.

systems theory, the transdisciplinary study of the abstract organization of phenomena, independent of their substance, type, or spatial or temporal scale of existence. It investigates both the principles common to all complex entities and the (usually mathematical) models that can be used to describe them.

Systems theory was proposed in the 1940s by the biologist Ludwig von Bertalanffy and furthered by Ross Ashby (*Introduction to Cybernetics,* 1956). Von Bertalanffy was both reacting against reductionism and attempting to revive the unity of science. He emphasized that real systems are open to, and interact with, their environments, and that they can acquire qualitatively new properties through emergence, resulting in continual evolution. Rather than reduce an entity (e.g. the human body) to the properties of its parts or elements (e.g. organs or cells), systems theory focuses on the arrangement of and relations among the parts that connect them into a whole (cf. holism). This particular organization determines a system, which is independent of the concrete substance of the elements (e.g. particles, cells, transistors, people). Thus, the same concepts and principles of organization underlie the different disciplines (physics, biology, technology, sociology, etc.), providing a basis for their unification. Systems concepts include: system–environment boundary, input, output, process, state, hierarchy, goal-directedness, and information.

The developments of systems theory are diverse (Klir, *Facets of Systems Science,* 1991), including conceptual foundations and philosophy (e.g. the philosophies of Bunge, Bahm, and Laszlo); mathematical modeling and information theory (e.g. the work of Mesarovic and Klir); and practical applications. Mathematical systems theory arose from the development of isomorphies between the models of electrical circuits and other systems. Applications include engineering, computing, ecology, management, and family psychotherapy.

Systems analysis, developed independently of systems theory, applies systems principles to aid a decision maker with problems of identifying, reconstructing, optimizing, and controlling a system (usually a socio-technical organization), while taking into account multiple objectives, constraints, and resources. It aims to specify possible courses of action, together with their risks, costs, and benefits. Systems theory is closely connected to cybernetics, and also to system dynamics, which models changes in a network of coupled variables (e.g. the "world dynamics" models of Jay Forrester and the Club of Rome). Related ideas are used in the emerging "sciences of complexity," studying self-organization and heterogeneous networks of interacting actors, and associated domains such as far-from-equilibrium thermodynamics, chaotic dynamics, artificial life, artificial intelligence, neural networks, and computer modeling and simulation.

See also ARTIFICIAL INTELLIGENCE, COMPUTER THEORY, INFORMATION THEORY.

F.H. & C.J.

szu. See KUNG, SZU.