A PROBLEM-SOLVING BASIS FOR GENERAL SYSTEMS RESEARCH

Roger Cavallo and George J. Klir
Dept. of Systems Science, School of Advanced Technology
SUNY at Binghamton
Binghamton, New York, U.S.A.

I. THE NEED FOR A COHESIVE FRAMEWORK FOR GENERAL SYSTEMS RESEARCH

The recent orientation of our research—and that of the group with which we work at the School of Advanced Technology—has been directed toward a not unfounded reservation which we occasionally encounter and which is succinctly represented by Bunge's observation that "...some scientists have misgivings because GST's have not delivered all the goods promised by their most enthusiastic proponents."

Part of the difficulty in developing an adequate response to this criticism has stemmed from the diffuse and extensive nature of the concepts which may reasonably be included in the scope of general systems research. That is to say, there does not exist a generally agreed upon definition as to the constitution of general systems research.

From our perspective, one of the best concise definitions remains that given by Boulding in 1956:

General Systems Theory is a name which has come into use to describe a level of theoretical model-building which lies somewhere between the highly generalized constructions of pure mathematics and the specific theories of the specialized disciplines.
Boulding's definition may be visualized as in the following diagram:

A very similar perception has recently been advanced by Bunge who juxtaposes the specific disciplines with philosophy rather than mathematics [Bunge, 1969, 1977]. Bunge's considerations are based on a stratification of languages and place a language at one or the other extreme depending on the degree of semantic (extensive) reference which the language embodies. In this scheme, Bunge argues, the models used by general systems research are neither testable, in the sense that they can be refuted by a single utilization of them, nor is the concept of testability meaningless with respect to them since they retain the capability for conceptual and practical confirmation through augmentation with content generated by consideration of specific systems. Bunge uses the phrase "vicarious testability" and we may picture the situation as follows:

In each of the two areas described above, it is fruitful to consider that the place of a given language on either spectrum is largely determined through the way in which meaning is associated with that language; that is, whether meaning is determined largely intensively through the coherence of the language or extensively through reference to specific objects.

In this regard we may also consider the field of computer science which, separately from utilizations of its results in specific scientific investigations, also possesses the characteristic of largely intensively generated meaning. As many results of general systems research are highly dependent on large-scale computational capability and many others attempt to adapt machine-theoretic models to system-theoretic formulations, it is reasonable to also consider the following diagram in our overall scheme: