A GENERAL THEORY OF REGULATION: IMPLICATIONS FOR SCIENCE POLICY AND EDUCATIONAL POLICY

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Regulation (or control or management) occurs throughout biological and social systems. There are many examples. The iris in the eye regulates how much light the eye receives. Hunger controls when and how much we eat. A thermostat on the wall controls the temperature in a room. The driver of a car controls the direction and speed of the vehicle. A manager of a firm or a government agency regulates the policies and operations of the organization. Government agencies enforce standards in air and water pollution and food and drug production. The citizens of the U.S. decide, through their votes, who will represent them in Congress. In each case there is a regulator and a system being regulated, and there is a circular causal process connecting the two. Other disciplines tend to describe a system being regulated rather than the interaction between a regulator and what is regulated. A general theory of control and communication would focus on regulation independent of the material in which the process occurs. Hence, instances of the basic principles of regulation can be found in biological systems, in individuals, groups, organizations, nations, the international system, or in automatic control machines.

Cybernetics, the field which has developed this general theory of regulation, has evolved considerably since its early days in the 1940s. It has passed through a period of engineering cybernetics when most work was concerned with computers, automatic control devices, and man-machine interfaces; a period of biological cybernetics when the emphasis was on understanding cognition; and a period of social cybernetics when the focus has been on management, economics, and creating a stable interaction between the environment and human society. There has also been attention to the philosophy of science in an effort to ensure that it describes the social sciences as well as the physical sciences. Science expands by adding a new dimension – any new theory should reduce to the old theory, to which is corresponds, for those cases in which the old theory is known to hold. This "correspondence principle" can also be applied to the philosophy of science. Accordingly, two dimensions could be added to the classical philosophy of science – amount of attention paid to the observer and the effect a theory has on the system it describes. Both dimensions can be disregarded in the physical sciences, but not in the social sciences.

Expanding the philosophy of science would change how social science is done. There would be less emphasis on finding linear relationships and more attention to circular processes – positive and negative feedback loops. There would be more attention to decision methods, such as group facilitation, since social scientists participate in as well as observe social systems. There would be more attention to multi-disciplinary or interdisciplinary research to counteract overly narrow disciplinary research.

Presently the fields of systems and cybernetics are growing in other countries but declining in the U.S. as indicated by the addresses of the authors of articles in the journals in the field. Currently there are no university departments in the U.S. that teach systems and cybernetics, other than

systems engineering. The fields of systems and cybernetics have been developing a general theory of management, of information society, and of knowledge management. They offer theories that can help the social sciences communicate with each other more successfully. Consequently, increasing support for these fields would seem to be wise policy.

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