ETHICS AS EMERGENT PROPERTY OF THE BEHAVIOR OF LIVING SYSTEMS

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Keywords: Ethics, Systems, Emergence, Growth, Development, Sustainable Development, Interactions, Relationships, Quality, Quality of Life, Systemic Openness, Life Support Systems

Contents

Summary

Many contemporary ethical theories have been developed such as those generated by different religions and rational inquiries, with reference to social rights, law, bioethics, and business ethics. This contribution focuses on the identification of an ethical view (normative ethics) suitable for combination with modern scientific concepts such as “Systems” and “Emergence.” Ethics is presented as emergent from the behavior of (social) agents following micro and local rules.

When social sets are transformed into social systems by a minimum set of ethical rules, without the activation of a sophistication process of the basic rules, the social systems so generated will remain, in time, always of the same kind: examples are flocks, herds, swarms, and ant-nests. This point of view allows detection of the process of emergence of an ethics, and evaluating and managing it. The crucial systemic aspect is that the emergent ethics of a social system is not equal to the set, the sum of the ethics of its single components. This is also true even if the components each have the same set: the emergent ethics of the system is different from the ethics of the components.

In this view competition and cooperation among different ethics may be considered, as

regards their effectiveness, (a) to transform social sets into social systems; and (b) to aggregate social systems and maintain them in time and space.

As in physics, the ability to control self-assembly processes allows scientists to design applications, so in social systems, the ability to control the emergence process allows awareness of the consequences of the adopted ethics as emergent from micro-social rules. Applications in economics (growth, development, and sustainable development) are discussed. Relationships between the concepts of Quality and Ethics are also discussed, as an introduction to the ability to design futures and quality of life.

Knowledge and awareness of emergent ethics enables social agents and social systems to act as Life Support Systems, designing uses of resources and being individually and collectively responsible. This view of ethics applies irrespective of beliefs, values, and religion.

1. Introduction

The purpose of this contribution is to propose to the reader an approach to the topic of ethics as distinguished from that of morality, and how much it is possible to ground this on scientific concepts. Scientific concepts of Systems and Emergence, related to Collective Behavior, are used to discuss ethics as emergent from the behavior of interacting social agents. Considerations about the effectiveness of an ethics (but not judgment about its goodness) are then introduced. Such a conceptual framework allows discussion of representations of growth and development in an economy. The concepts of emergence and of systemic openness allow introduction of the concept of sustainable development as linked with the process of emergence of ethics.

Finally, relationships between ethics and quality are discussed from a systemic point of view in order to introduce the purpose of designing a future and quality of life. Social agents and social systems, inasmuch as they have knowledge and awareness of ethics emerging from interactions among their behaviors, are able to be individually and collectively responsible for their actions with regards to themselves, other social systems, nature, and future generations. This knowledge and this awareness enable them to design a sustainable development, and to act as life support systems, able to design sustainable uses of available resources in order to provide for all of the requirements for continuation of life.

2. Ethics

The word ethics is related to the Greek *ethos*, or *ethicos*, meaning habit or customs, and was introduced into philosophy by Aristotle, as referring to the part of philosophy which studies human behavior and the criteria for the evaluation of behaviors and choices. The word ethics is used in many related senses, distinguished as:

(a) Normative ethics. Rational inquiry that does not describe how people behave but how people ought to behave. This area, called also applied ethics and ethical theory, includes business ethics and medical ethics, and is related to moral philosophy. Examples of theories resulting from this view are Kantian ethics and utilitarian ethics.

(b) Descriptive ethics. The study of practices and beliefs of a social system, also called ethnoethics. It belongs to the social sciences.

(c) Analytical ethics. Philosophical inquiry analyzing ethical concepts, such as good and bad, right and wrong, virtue, and rights, with respect to character and conduct (for example, moral responsibility).

(d) Religious ethics. Body of doctrine concerning what is right and wrong, or good and bad, with respect to character or conduct. The reference is not to rational inquiry but to religion. Examples are Christian and Confucian ethics, and so on. The main difference from normative ethics is that the ethic does not claim to be established merely on rational inquiry.

(e) Positive morality. Body of doctrine (code of honor), adhered to by a set of individual members of a community or a profession, or other social group, concerning what is right and wrong, good and bad, in respect of character or conduct.

Cicero first used the Latin word *moralis* as a word equivalent to the Greek *ethicos*. Subsequently, Hegel introduced a distinction between the concepts of ethics and morality:

- Morality, originating from Socrates and reinforced by Christianity, is the concern of an autonomous individual. It belongs to the individual, subjective aspects of behavior;
- Ethics belongs to the set of moral values actually carried out in history (for example, institutions such as the family, the society, the state).

In many contexts, writers use the two words as synonyms, whereas in other contexts they are used in different or contrasting senses.

This chapter is not at all based on so-called ethical behaviorism, which holds that moral commitment is totally learned, or an internalizing of the behavioral norms of the society. Similarly, ethics are not taken to be just a set of rules processed in a framework of stimulus-reaction or control-and-regulation schemata.

3. Systemic Aspects of Ethics

Some general ideas about systemics may be induced and supported by contrasting the concepts of relation and interaction, by the distinction among the concepts of set, structured set, system, and subsystem, and by examples. The concept of open systems is also introduced.

3.1. Relations and Interactions

An understanding of the difference between the concepts of relation and interaction is crucial in order to introduce the concept of system:

- The concept of relation among (the characteristics of) elements of a set refers to

the character of the static ratio among them. Elements of a set may have relations among their characteristics (for example, the dimension, the duration, the weight, and so on, of an element is in relation *K* with the same characteristics of an other element). The ratio should be detected and evaluated by an observer, but usually it is conceived in objective manner, that is, independently from the observer itself, although possibly with instrumental and perspective errors of measurement. Relations among elements give rise to configurations of them enabling extension of their properties, thanks to synchronization, organization, iteration, and so on.

- The concept of interaction among elements of a set refers to the character of dynamic relation in the definition itself: two or more elements interact when the behavior of one affects the behavior of another. Interacting elements may give rise to new realities (systems), not deducible from the characteristics of the elements, and from the relations among them, and not only to new configurations.

3.2. Systems

In order to introduce the concept of System, it is useful to consider a kind of hierarchy constituted by the concepts of Set, Structured Set, and System. Examples are given in Table 1.

- **Set**. The concept of set is taken to be any collection of elements.
- **Structured Set**. Elements of a set may be organized in such a way as to establish a configuration based on relations among them. The concept of Structured Set is taken to be any collection of elements having a structure (that is, existence of systematic and constant relations among elements).
- **System and subsystem**. A system emerges from interacting elements (which may have relations amongst themselves). It is something which has its own characteristics, which are specific and not deducible from the elements, or from their relations and interactions. Interacting elements may be systems too; the subsystems. Because characteristics are created and detected by the observer and an element is detected by its own characteristics, relations may be only among characteristics.

Set	Structured set	System	Subsystem
Football Players	Players in order of age	Team	Defense
Cells	Cells per type	Living body	Organ
Students	Students in alphabetical order, or by sex	School	Classes
Words	Words linked by a syntax or in alphabetical order	A poem, a book, a story	Chapters
Players	Players ordered by language, age, and sex	Orchestra	Players organized by musical instrument
Soldiers	Platoon	Army	Division (as

			airforces)
Workers	Workers organized as an assembly-line	Company	Departments
Animals	Animals ordered by age, color, illness, etc.	Herd, swarm, flock, pack, ant-nest	Single animals

Table 1. Examples of sets, structured sets, systems, and subsystems.

The study of systems is called General Systems Theory (GST) with reference to scientific inquiry, and more generally, Systemics.

3.1.1. Example of a Methodology based on Systemics

An example of a methodology based on Systemics is the use of cognitive resources as given below. The methodology introduced here may be used in many fields.

Consider the problem of recognition of hand-written digits by a computer system. A non-systemic strategy is based on the process of selection of the better and more effective algorithm: we may have one considering the length of the sign, another considering the projection from left to right, another the projection from top to bottom, another examining the superimposition with standard signs, and so on. A systemic strategy is based on the ability to *use* the different available algorithms and to *learn* how to combine them to get the best from each one, including any mistakes made. Thus, a neural network may learn that when algorithm1 and algorithm2 recognize the digit one, that they are very reliable. And that when algorithm2 and algorithm3 both recognize the digit three then the system may assume the digit to be read is five. And that when algorithm4 and algorithm6 recognize the first digit as two and the second digit as nine then the system may assume the digit to be read is eight, and so on. Mistakes are suitable for learning how to use them when they are STABLE, assuring a foreseeable behavior even if it is not correct or ineffective NOT unreliable. The algorithm must be reliable in making the same mistake.

This is the same way that a child learns, at the early stages of his/her life, how to use the five senses and not only to select the best one. In this way, the available knowledge constitutes a dynamic knowledge, context-sensitive, in which the producer and user of it is theoretically a part of the knowledge itself, source of its existence, and no more just an observer; the basis of most of relativism. The same approach may be used in management or education.

3.1.2. Closed and Open Systems

An important difference to be considered is between the concepts of (a) Closedness and (b) Openness in Systemics. In general, a system is considered to be open when its boundaries are permeable to matter/energy. This original concept was conceived with reference to the ability of systems to process input (especially living systems), and to produce output in order to interact with other systems and with their environment. Communication has been a field where some sophistication of these concepts has been

developed (for example, semantic processing of the messages), and interactions among systems (sender, receiver, and transporter, for instance) have been considered. The example in Table 2 may provide some insight into the difference between openness and closeness.

Closeness	Openness
No changes in rules, internal data processing	Change in rules, adaptive, context-sensitive
No contradictions admitted, avoidance of contradictions	Use of contradictions
It is possible to disassemble and reassemble	Cannot be disassembled and reassembled
No learning	Learning
Automatism	Intelligent system (ability to solve problems)
Storage (ability to record and to find)	Memory (ability to reconstruct)
Syntax	Semantics
Observer external to the system	Observer integral part of the system
Inflexible	Flexible

Table 2. Systemic Closeness versus Openness

3.1.3. Ethics of a Social System

The crucial systemic aspect of ethics is that the ethics of a social system is neither equal to the set of the ethics of the single components, nor to the structured set induced by organization, formalization, rules, law, or codes.

In this chapter, the focus is on the ethics of social systems—such as societies, companies, schools, hospitals, institutions, armies, and so on—which are emergent from the interactions among people (social agents) having the same or different ethics. For example, a society may be composed of elements having the same ethics based on the principle of "do not kill," but having a kind of economic growth that is based on the underdevelopment of other societies, inducing poverty, life at below-subsistence level, and disease from pollution in them (see Section 7 on Sustainable Development).

The transformation of a social set into a social system is activated, as for any system, by a set of relation and interaction rules. Rules of interaction among components of social systems are assumed to be, if formalized, the normative ethics of the components themselves, and in any event, their practiced ethics.

3.1.4. Ethics of the Global Social System

More generally, ethics of a social system may be emergent from its interacting subsystems but have effects on single social agents and stakeholders.

National and international law manages interactions among subsystems as corporations. Interactions among countries must be disciplined by international law government by specific rules regarding particular areas. International conferences are organized to establish rules to discipline relationships and interactions on some topics among countries. The general idea is to establish generally accepted standards, which carry a global consensus.

For example, many international conferences have been organized on subjects related to international development and in an attempt to set standards: the first major conference of this kind was:

- The United Nations Declaration on the Human Environment, United Nations 1972, Stockholm. The first International Conference on the Human Environment.

Other international conferences, amongst the many, which have tried to achieve harmony and general consensus on the behavior of countries for particular aspects of social and environmental policies, have been:

- Third Conference of the Parties, Kyoto, Japan, December 1997, with the purpose of establishing generally accepted rules to limit greenhouse emissions.
- United Nations International Conference on Population and Development (ICPD), Cairo, Egypt, September 1994.
- Declaration on Environment and Development, Rio de Janeiro, Brazil, 1992.
- Conference of the World Trade Organization (WTO), Seattle, USA, December 1999. This was unable to establish rules for interacting national growth and development mainly because the expected scenario was not acceptable either for economic reasons or for the stakeholders.

Even if it is difficult to design some standard, well-accepted, general ethics for the interactions among countries, a “planetary” ethics emerges anyway. This results from interactions among ethics that are commonly practiced.

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Bibliography

Banathy B. H. (1996). *Designing Social Systems In A Changing World*, New York: Plenum Press. [A systemic methodology for designing social systems is proposed.]

Capra F. (1996). *The Web of Life*. New York: Doubleday-Anchor Book [This book provides a

comprehensive updated overview on Systemics.]

Forrest S. (ed.) (1990). *Emergent Computation*. Amsterdam: North Holland. [This technical book introduces the concept of emergence with reference to computational abilities resulting from the cooperative action of a number of individual elements interacting according to simple rules.]

Freeman R. (1984). *Strategic Management—A Stakeholder Approach*, Boston: Pitman Publishing. [This book explains how much the role of the stakeholder is important for strategic management.]

Minati G. (1998). *Sistemica*, Milan, Italy: Apogeo Scientifica. [This book provides an introduction to Systemics and applications to Ethics, Economy, and Education.]

Minati G. (1995), Detecting Ethics in Social Systems. In K. Ellis, A. Gregory, B.R. Mears-Young, and G. Ragsdell (eds.), Critical Issues in Systems Theory and Practice, New York: Plenum Press, pp. 697-701. [This contribution presents a basic methodology to detect ethics in social systems.]

Minati G., Penna M. P., and Pessa E. (1997). A conceptual framework for self-organization and merging processes in social systems. In F. A. Stowell, R. L. Ison, and S. Jackson (eds), Systems For Sustainability. NewYork: Plenum Press, pp. 271-275 [This paper introduces a conceptual framework to represent the emergence of self-organizing processes such as flock formation.]

Minati G., Penna M. P., and Pessa E. (1998). Thermodynamic and Logical Openness in General Systems. Systems Research and Behavioral Science, John Wiley & Sons Ltd. 15 (3), pp. 131-145. [This paper introduces an extension of the concept of openness in Systemics.]

Stone C. (1975). Where the Law Ends. New York: Harper and Row [This book evidences the limit of the classical legal view in comparison to the stakeholder view]

von Bertalanffy L. (1969). *General Systems Theory*. New York: George Braziller. [This book is a milestone in systemic theory.]

Biographical Sketch

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