An Axiological Approach To Uncertainty

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"I have the right to suppose that a thing is possible so long as its impossibility is not proved".

Leibniz, The Theodicy, 1710 (Answer to II.Ob.Abridgment)

1. Axiology

Axiology opens useful perspectives to the approach of the field of the not-yet-known or of the not exactly known. It ought to precede and prepare epistemic performances and may assume the task to prevent inevitable epistemic failures. On the other side axiology cares for objectivity requirements and tends to reject current or whimsical belief-based assumptions.

According to Leibniz, everything is possible, excepting what is proved to be impossible; whence the conclusion that the object of our knowledge is either the possible or the proved impossible. Human mind used to distinguish several degrees of the possible for which common language provides terms like *virtual, probable, real, necessary*. Let us call these degrees distinct shapes of a quality and add that for each such shape we can afford a measure expressed by means of logical or mathematical symbols. One should emphasize that these symbols have nothing to do with the category of quantity, since they are used only to suggest a certain position from the lowest to the highest on a scale beginning with virtuality and ending with necessity. While quantity means something sharply definite or crisp, quality, on the contrary, implies lack of both precision and clear-cut determination. From a pragmatic point of view quality will serve better than quantity the taxonomical objectives. Rutherford's definition of the quality as poor quantity is to be labelled as obsolete, since its author had been working it out before physicists were to come to terms with uncertainty.

2. The Category of Quality

The category of quality is described by Aristotle in the "Organon". His description deserves to be known for two reasons: (i) he underlines the fact that quality, in contrast to quantity, admits degrees, and (ii) Greek terminology for quality and creation exhibits an etymological kinship and this fact reveals their ontological meaning. "Qualitas" in Cicero's translation corresponds to the term "poion" which Aristotle used in the "Organon", while "poiein" means in Greek "to create" from which "poiesis", i.e. " creation" derives. It may not surprise that in Greek the terms for "quality" and "creation" are kindred if we remember that in German "Beschaffenheit", i.e. "quality", derives from "schaffen" which, like "schöpfen", means "to create". Etymological and semantical relations between words and corresponding concepts deserve a pertinent scrutiny if we are interested in foundational matters concerning the human knowledge.

3. The Concept of Axiom

Taking into account the categorial relation between quality and substance, a certain quality is to be understood as a "substantial quality", i.e. a property which belongs to a substance and by the intermediary of which that substance gets a certain position in a hierarchy, possibly a privileged one. Semantical analysis leads naturally to the *concept of axiom*, which initially meant a premiss on which disputants were to agree before starting their dispute (cf. Aristotle's "Topics"). The same term in Plato's works concerns a proposition that needs no proof because its truth is evident to everybody and, consequently, is unlimitedly believable. The term "axiom" has had a brilliant career in all languages with a particular meaning borrowed from geometry, where it got a dominant role in demonstrations.

"Axiom" kept its meaning of a concept or proposition accepted by everybody without demonstration because it is "worth" being considered true, i.e. it has the quality or property or "value" of truth. Axioms refer, thus, to qualities transformed by a general agreement into principles. We may conclude that concepts expressed by terms like creation, quality, axiom(also rendered by "value") are keys to hierarchically ordering the universe of discourse. The operation of ordering supposes an operator, i.e. a human being whose action is intended to extend and deepen the knowledge of the universe and to express this knowledge, in the ensuing discourse, by significant results that are"worth" being communicated.

4. The Concept of Value

It is agreed that in the historical age thinkers uttered their thoughts about things and events aiming to explain what exists, what can be known, and what is worth doing. Apparently both existence and knowledge are not necessarily tied to the criterion of value, while morality and practice, on the contrary, are obviously implying a valuation. This fact may explain why ontology and epistemology have earlier developed, and axiology remained for a long time associated with ethical and pragmatical matters. Much later, in the liberal society, economic developments have forwarded the *concept of value* which became soon a new source of axiological ideas. Towards the end of the 19^{th} century the background of axiology numbered several components crystallized in ethical, aesthetical, and economic works. It seemed that two of the Platonic triad represented by *goodness* and *beauty* already achieved an independent status as axiological thinking almost equal to the status of ontology and epistemology. On its way to autonomy, axiology attempted with Lotze, Windelband, Rickert and Scheler, to incorporate also the truth in its status tending to go beyond mere autonomy to supremacy inside the realm of philosophical disciplines. Leaving aside such claims, axiology can be credited with good chances to round up both thinking and action, which were artificially separated on didactic grounds, as they actually are intimately bound. Let us remember that the Latin word "cogito" derives from "ago" ! In the undertaking to link thinking with action, axiology may give an essential support if its ancient roots in the "Organon" in the category of quality as well as its connection with the Leibnizean concept of possibility are not forgotten or ignored. The aim of this paper is to explore whether an axiological approach of one of the most controversial issues of the today science, the uncertainty, is beneficial.

5. The Conceptual Family of Uncertainty

The modern science developed in the last centuries under the double sign of mathematicitty and determinacy. Its achievements changed the image of the world and inculcated the hope that the scientific progress may be infinite. Unfortunately, the triumphant march towards total certainty proved to be an illusion about the knowledge of microcosmic processes and scientists were obliged to take into account uncertainty as a state of things and not a merely provisional failure of cognitive nature. On the other side researches of the living and social world discovered processes where the reversibility hypothesis did not work as in classical physics. Consequently, scientists tried to re-shape their theoretical and experimental tools and to introduce new concepts for the scientific analysis. Several labels were erroneously considered synonyms and some confusion spread among research workers, but things became step -by -step clearer and now an acceptable survey may be outlined.

Uncertainty, indeterminacy, ambiguity, vagueness, fuzziness, crisis, undecidability, disorder, entropy, chaos are, of course, no synonyms as they are obviously different from a semantical standpoint as well as by denotation and historical roots, but they belong , undeniably, to the same *conceptual family of uncertainty,* meaning something imprecisely determined because of its own nature, not because of human failures or shortcomings.

There are two main sources of uncertainty and related concepts: (i) most qualities are possessed in different degrees, and (ii) the membership property may be enjoyed in different degrees. It results that gradualty favours the perpetuity of uncertain knowledge and hinders for ever an accurate determinacy in this respect. Scientists are to give up their reluctance to imprecision and come to terms with the indeterminacy if it is unavoidable. On the other side they are to find out ways and means to circumscribe the area of uncertainty, to state in detail its surmised inner structure (at least as a working hypothesis), as well as its external connections. All these attempts are to be undertaken with the Leibnizean principle in mind: all is possible

excepting what has been proved to be impossible. As already mentioned, gradualness is inherent also to "possible".

6. Aoristic Logic

The binary reasoning of the classical logic serves to prove eventually the impossibility, but for the realm of possibility the principle of non-contradiction is too strong and therefore it ought to be replaced by its weaker form, namely, the principle of alterity. This replacement also entails other consequences and the ensuing discipline may be called an *aoristic logic*, using a Greek term that suggests the indeterminacy as the favoured field of applications in the framework of an axiological approach.

The main task of the aoristic logic consists of selecting and verifying concepts and rules from the classical logic according to the specificity of the uncertainty, the structure of which includes one or more components called alternatives in order to suggest that they are in a finite number and enjoy full equiprobability. Such a structure is *ipso facto* ordered and owing to the equiprobability of the alternatives it possesses two essential properties: stability and homogeneity. Any reasoning on the structure of uncertainty implies the dual law of identity and alterity, which serves to obtain information ~~about a~~ particular area of uncertainty and to distinguish its component alternatives in order to discern the state of equiprobability of each alternative. The law of sufficient reason guides the chain of statements about the ordered structure of uncertain areas, cares for not confusing inherent order with induced order from outside, and warrants the reasonableness of any approach to the structure of uncertain entities. Valid statements on uncertainty are generated with two unary operators:"idem"(=), "aliter"(≠), and a dyadic operator :"neque-neque"(/) which is Sheffer's alternative denial. The truth-tables of these operators are:I_d (a)=a, I_d (a)≠b, A_l(a)=b, A_l(a)≠a. Sheffer's stroke has two entries:

A / B	t	f
t	f	t
f	t	t

The function is always true excepting if both arguments are true. Many-valued logical systems introduced a third value—called sometimes "neutral" or "uncertain"—but, excepting the deontic logic, it is not extensively used in particular problems.

The component alternatives of the aoristic logic have the value 1/n in the interval (0,1), where n is the number of alternatives, 0 means non-existence, and 1 means certainty. Uncertainty is not incompatible with dynamics. Indeed, if one or more alternatives get other values than 1/n, then the stability gets lost inside the uncertain entity. If an alternative divides into equiprobable alternatives while the other alternatives remain equiprobable, then the primitive uncertainty loses uncertainty, but two new uncertain entities are born: one as a restriction of the primitive entity and the other consisting of subalternatives of the previously divided alternative of the primitive entity. The process of generating uncertainty may continue indefinitely and the milestones of this process can be called levels of compossibility, that may serve as a measure of uncertainty: the greater the number of levels, the nearer the certainty.

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The "Fuzzy Sets: Theory and Applications" Seminar
A List of the Talks Held during 1997-1998

Date	Speaker	Topic
18/09/97	Mircea Sularia	Fuzzy Sets and Multi-valued Logic
25/09/97	Theodor Stihi	Multi-valued Logic
2/10/97	Liviu Badea	Dynamic and Modal Logic
9/10/97	Paul Flondor	Multi-valued Logic (L_3 and K_3)
16/10/97	Liviu Badea	Program Logic
23/10/97	Paul Flondor	Introduction to the Theory of Categories (first steps)
30/10/97	Paul Flondor	Introduction to the Theory of Categories (applications in logic)
6/11/97	Mircea Sularia	A Logical System for Multicriteria Decision Analysis (I)
13/11/97	Mircea Sularia	A Logical System for Multicriteria Decision Analysis (II)
20/11/97	Paul Flondor	The Problem of "Tall"
27/11/97	Paul Flondor	The Problem of "Tall" (continued)
4/12/97	Cezar Ionescu	Modelling Human Reasoning
11/12/97	Mircea Sularia	The Problem of "Tall"
18/12/97	Vlad Vieru	The Paradox of the Heap
15/1/98	Paul Flondor	Concept Learning and A Stochastic Process
22/1/98	Mircea Sularia	Attribute Representation
19/1/98	Bogdan Enciu	Symbolic Systems
5/2/98	Vlad Vieru	Sorites Paradoxes
19/2/98	Paul Flondor	On Peirce's Theory of Semiotics
5/3/98	Cezar Ionescu	Kolmogorov Complexity (I)
12/3/98	Cezar Ionescu	Kolmogorov Complexity (II)
19/3/98	Cezar Ionescu	Kolmogorov Complexity (III)
26/3/98	Constantin V. Negoita	Soft Computing
2/4/98	Vlad Enache	A Formal Model for "Dispute"
16/4/98	Mircea Sularia	Some Observations Regarding Kolmogorov Complexity
23/4/98	Osmatescu	Subtle Spaces and Technology Transfer
30/04/98	Liviu Badea	Quantum Logic
7/5/98	Paul Flondor	Machine Learning
14/5/98	Paul Flondor	Intuitionistic Fuzzy Sets
21/5/98	Marcel Stoica	Modelling Metaphors
28/5/98	Leon Batachia	A Method for Determining the Grades of Membership
25/6/98	Bogdan Enciu	A Value_Sytem Based Architecture