gewählte Klassifikationsmodell, und besonders hierin ist sein theoretisches Verdienst wie sein praktischer Nutzen zu sehen. Dadurch stimmt es weitgehend überein mit dem Ziel der Inhaltsanalyse wissenschaftlicher Informationstätigkeit. Trotzdem kann es nicht als graduelle Verfeinerung bekannter Thesauri benutzt werden, weil es prinzipiell anders konzipiert ist. Die Klassifikation der Verben bezieht morpho-syntaktische Kriterien in die semantischen Klassen ein, die das Aussagengefüge von inhaltlichen Merkmalen verbinden. Bei automatischer Textanalyse erhielte man z.B. zugleich mit den semantischen Angaben auch die grammatischen, speziell die syntaktischen.

Folgende 11 Hauptgruppen sowie eine Restgruppe, in dem Buch "Modelle" genannt, wurden zugrunde gelegt:

A Sachverhalte betreffende Modelle
B Vorgänge und Prozesse betreffende Modelle
C Existenz von Individuen und Objekten betreffende Modelle
D Existenz von Individuen und Objekten voraussetzende Modelle
E Eigenveränderung von Objekten im Raum
F Zustöße (Einfluß der Umgebung auf Individuen und Objekte)
G Bewirkungen (Einfluß von Individuen und Objekten auf die Umgebung)
H Kontrollierte Eingriffe, gerichtet auf sich selbst, die Umgebung und andere
J Kontrollierte Oberbegriffe auf Objekte und Individuen
K Kontrollierte Schaffung und Zerstörung von Objekten und Umgebung
L Kontrolliertes Eigentum (Transaktionen)
M Sondermodell

Den Modellen, die alle nominale Bezeichnungen tragen, sind als Untergruppen die Kategorien zugeordnet, die sämtlich durch Verben bezeichnet sind. Bei intellektuellem Suchen dürfte zwar der Linguist sich rasch zurechtfinden, weil er die grammatischen Kategorien der Verben beherrscht, aber weniger schnell der Indexierer. Dem Werk fehlt nämlich ein alphabetischer Wortindex, der den Benutzer auf kürzestem Wege zu den gesuchten Kategorien führte. Obwohl dieses Klassifikationssystem theoretisch leicht abrufbar ist, ist seine praktische Handhabung nicht einfach. Die Einteilung weicht doch erheblich von der gewohnten Synonymie-Gruppierung ab, wenn es der Satzplan von Handlungsabläufen gebietet.

Die theoretische Fundierung erfolgte sehr ausführlich und war gründlich durchdacht worden. Erstaunlich ist es, daß dabei das Gesamtsystem flexibel und offen für andere Gesichtspunkte blieb. Trotz der vielen Vorzüge dieses Werkes frage ich mich, ob es nicht ein Jahrzehnt zu früh erscheint, ob man heute seine Möglichkeiten, besonders für automatische Sprachverarbeitung, auszuschöpfen versteht. Der Verlag G.Narr hat in dieser Reihe bereits mehrere bedeutende Bücher herausgebracht und auch dieses wieder sorgfältig betreut; ich habe nur 3 Druckfehler bemerkt (S.42, 47, 134).

Thomas Ballmer lebt nicht mehr. Das Vorwort läßt ein tragisches Ende vermuten. Seine Frau Waltraud Brennenstuhl hat die gemeinsam begonnene Arbeit zu Ende geführt; dafür muß man ihr ausdrücklich danken.

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NALIMOV, V.V.: Space, **Time, and Life. The Probabilistic Pathways of Evolution.** Ed.by R.G.Colodny, Transl.by A.V.Yarkho. Philadelphia,PA: ISI Press 1985. 110 p. ISBN 0-89495-048-7

The ongoing search for a more comprising understanding of man in his world which goes beyond the Newtonian boundaries still brings forth an often overwhelming wealth of publications, mainly originating from the physical, biophysiological or the epistemological domain. Leaving aside the more speculative attempts as, for example, New Science, more recent outstanding contributions are e.g. those by E.Oeser (Psychozoikon, 1987), H.R.Pagels (The Cosmic Code, 1982). Or they originate from the systems approach, varying between cybernetics I and IV and culminating up to now in systems biology (H.Maturana, F.Varela: Autopoiesis and cognition, 1981; Der Baum der Erkenntnis, 1987). In all cases the concept of self-organization seems indicative.

Whereas these attempts arise mainly from a physicobiological background, Nalimov's latest book (1985) to date even more than its predecessors, signifies the uniqueness of his scientific contribution. He argues from the point of view of mathematics understood as the principle pertaining to the world in toto and even as a mode to understand man and his mental faculties. It is only logical that he begins with the "Number as a Symbol" (chapter 1) and the "Number as an Organizing Principle of the World" (ch.2). Passing from the number taken in its concrete values as in the physical world, the number in the living world becomes a measure. Physical constants correspond to numerical relationships, numerical constraints in the living world, as e.g. demonstrated by Chislenko's phenomenon. These numerical manifestations as to life, these numerical arrangements of the text of the world can be understood, as N. shows, from a comprehensive concept of probability, namely the Bayesian syllogism. Applying this to ontogenesis and phylogenesis, to biological and even cultural evolution, N. arrives at a concept of "Global Evolutionism as the Revelation of World Semantics through a Probabilistic Measure" (ch.3). Life is envisioned as something in a state of developing, in evolution following the rules of probability.

This mode of reasoning, which is very clear and lucidly written, delves beneath the easy-to-grasp surface and opens deeper layers for a more thorough contemplation. It would prove advantageous to study Nalimov's previous publications - to be mentioned below. The flow of argument, however, appears the more challenging - and therefore most rewarding - as its origin obviously is deeply rooted in Ancient Greek and Byzantine philosophy, mainly Plotin. It is unique when, using these sources, it transcends the rational-rationalistic approach of the West European hemisphere and complements this with the tradition of East European thinking, cf e.g. Gnostic attitudes and their number mysticism. As Nalimov's texts are written in a precise and clear language, single paragraphs are worth reading carefully as independent essays. This holds especially for the following chapter on geometry. Referring to Kant Nalimov reasons that space and time are but apriori forms of external, esp. internal contemplation. Understanding the world as a text revealing itself in space and time, or, since Einstein, in spacetime, the way we

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perceive our world, cognition and reality including science, become essentially geometric. Thus the question: "Is Pangeometrism Legitimate?" (ch.4.)

N. poses this question when scrutinizing the underlying structures of physics and biology as well as those of linguistics and textology. Man, N. claims (p.71), is himself essentially geometric, as is his consciousness, too. Here again he touches on non-rationalistic layers or on those which are not only rationalistic and which demand particular attention and effort to reveal insight. The following example leads back to science: "How is Theoretical Biology Possible in the Geometric Vision of the World?" (ch.5). Focussing on the crucial point of changeability versus stability, N. discusses the mathematization - if not necessarily the quantification - of thought and scientific thought in particular, distinguishing the empirico-mathematical trend, the paramathematical and, returning to his preceding treatise on number, the metaphor-mathematical or even the mytho-mathematical approaches. From here he tries to incorporate geometrodynamics (Wheeler 1968), that is, roughly, the fluctuation of topology.

The number as a symbol, geometry as both the descriptive and the generic mode to perceive reality concomittantly if logically, leads to what Nalimov terms the "Conclusion as Metaphysics of the Above Reasoning" (ch.6). Things about which we must remain silent could still be expressed metaphorically. Choosing the nodal question of all scientific endeavor, for the "unde", "ubi" and "quo", that is evolution, he argues the case for "creationism" versus "evolutionism". He considers spontaneity to be very similar to what might be called fulguration, phase transition or qualitative leap, catastrophe, symmetry breaks et al. And he ends up by characterizing his presentations "as but an attempt to sketch philosophical premises for a new research program. But are they sufficient?" (p.98).

Again, the present work proves to be an unusually imaginative and remarkable book. The small volume contains not only a wealth of stimuli, e.g. when posing non-trivial fundamental, at first glance often puzzling questions. Even if he never says so, N. asks for - to use a congenial poetic formulation - "Was die Welt im Innersten zusammenhält" (What is is that keeps "the world" together internally?). Or, expressed more scientifically: N. inquires into the innermost logic which governs the principles of being and life. This he does from the basis of hard science, which, e.g., is a far cry from the New Science approach. He begins from the inborn chance and necessity of the sciences, as Monod would probably have put it, to transcend themselves, but never contradicting or leaving their laws.

True to its comprehensive title and subtitle, the book is to be understood as a preliminary quintessence of the author's previous publications. In the "Labyrinths of Language. A Mathematician's Journey" (1981a) the foundation is laid, establishing the probabilistic semantics within language and the reality it represents. "Faces of Science" (1981b) mosaically points out the close interrelationship of language as a shaping filter and scientific statement and its mutual dependency on basic linguistic concepts. The book "Realms of the Unconcscious. The Enchanted Frontier" (1983) deals with the shared basic structures of what is called the conscious and the unconscious, with the governing principles of man's perception and his thus perceived world. It lays the foundation for the understanding of "Time, Space and Life" as a first conclusive approach to life in general as seen from the Bayesian syllogism. Man himself and his personality in particular will be the conclusive focus of his forthcoming book (with the proposed title): "The Probabilistic Theory of Meanings and the Semantic Architecture of Personality" (ISI Press 1988?).

The power of Nalimov's contributions lies not the least in their capacity to lead to a reconsideration and re-evaluation of treasured positions as to how the world really is and how, therefore, it is proper to investigate it and try to understand it. Furthermore, they stimulate the necessary thought as to what meanings are to be attached to the phenomena thus observed. They do not refrain from offering a new frame of reference. Relying on the Bayesian syllogism, N. attempts a universal and hence mathematical imago mundi. He tries to integrate into this vision of the world hard and soft sciences as well as current general tendencies in epistemology, e.g. the nearly ubiquitous geometrization. In doing so, he is naturally forced to ask more questions than he is able to supply corroborated answers for. His strength lies more in a general stimulation than in detailed exemplification. Sometimes, especially when presenting the Bayesian approach, a little more detail, a few more examples would have helped understanding.

Any attempt at a conclusive evaluation is made futile by the profound fields and the openness of Nalimov's questioning contributions. Instead it seems rewarding to single out the possible significance of N.'s treatises on number, measurement, and taxonomy for classification, including the epistemological aspect.

Seen from aspects of retrieval systems, N.'s text could be labeled "On the Order of Human Perception", or, "On Human-bound Classification". To go back to the fundamentals of evolution means at the same time to touch the basic structuring of the world and of the perceptional/descriptional/ communicative organization which creates our reality. Any text, e.g. on quantum physics, on general systems, on systems biology, or on self-organization will prove that. Of particular interest in this context is N.'s geometric vision of the world, to which his reasoning amounts. His arguments may be grouped as follows:

- mathematics: a general, formal (!) principle of ordering, embracing practically every form of order as a potential to describe it ranging from the hard to the soft modes;
- physics: the paradigm for process and structure, for invariants and determined variation;
- life and perception as a biological phenomenon: the paradigm of discreteness, continuity, fields of constraints and of variation;
- consciousness and the unconscious: perception as a unique, individual event or a chain of events;

or, turning to regularities (in general): as a basis to constitute order and to let it evolve:

- fundamental constants in physics, relationships in the living world; postulated states of stability versus variability, spontaneity vs. incremental change in the domains of consciousness including culture and history;

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- laws, regularities, probabilities vs. uniqueness, singularity

and therein:

- the central role of the number as the organizing principle per se and of geometry as the perceptional principle (Anschaulichkeit) and that of consciousness and even self-consciousness;
- geometrical systems symbolizing numerical relationships; when and because they contain meaning, constituting the principles of symbolic description = representation;
- perhaps: the number as the underlying principle of any categorical system, seen as a general principle of constitution;

or, condensed into the following topics: number, measurement and geometrical representations as:

- fundamental principles of existence/emergence
- corresponding categories of man's perception
- corresponding systems of knowledge including meaning, thus giving directional boundaries (to what, with which consequences, etc.)
- structural principles as to control and to let them evolve
- comprising symbolic languages based on geometrical relationships; symbols functioning as forms shaping fields, e.g. of knowledge.

When transferring this to model-building, N. arrives at two main principles with which he concludes his argument. The first is the stochastic element attained to the property of variability; the second the explanatory power of the probabilistic approach concerning the process of change.

When referred to classification principles these assumptions might lead to perplexing, or, on second thought, familiar questions. As touched on before: how does ordering allow for meaning? Is it feasible to postulate a classification built on the Bayesian Syllogism? Can an existing order be seen as a symbol, e.g. a classification be understood as a meaningfully related set of symbols? And, if applied to systems established: can they be distinguished using their symbolic qualities?

What, then, does "order of knowledge" in its generic definition imply? One will remember the fundamental considerations of I.Dahlberg (1974), Th.Ballmer's contributions (1984) and the subsequent notes of R.Ungvary (1984) or A.J.N.Judge's approach of a functional classification (1984).

To get closer to a preliminary answer, the following questions may be asked: (1) According to which order does man distinguish topics of his reality and why does he do so? The answer will deal with life generating and life preserving, with viability evaluating principles constituting distinctiveness, and structural coupling leading to consciousness and self-consciousness. Constants and relationships are to be inquired into, such as e.g. hierarchy, the basic (three-) dimensionality of our reality and so on. (2) How did (paradigmatically) self-consciousness develop? What is the position of man in evolution and how does it fit into the rules and the result of co-evolution? Classification should flexibly change with its subjects. Thus it should act as a continuing, self-organizing and perhaps teleonomic process, being an a c t i v e factor of evolution itself. (3) How are human artefacts, intangibles such as ideas, values, ideologies, etc. accounted for? How are they embedded in the physical, biological world, how do they manifest in human behaviour? Are there any rules for their representation in classification? Seen together, these quests form a fourth challenge: For a metaclassification based on not so much epistemological deliberations as under empirical and pragmatic aspects: how to control the world meaningfully, using both its constituting and its filtering, structural principles as well as procedural constraints, as flexible means of order. Is probabilistic classification possible?

What is asked for classification must, in parallel, be requested from language concepts as well. What does language mean as a quantitative leap in evolution? It seems worth while to re-read N.'s first publication on Language and compare it with the role systems biology assigns to language and to speaking. Helpful comments may be found in N.'s notes on biological taxonomy (p.37-).

Taken as a whole, this book is also an unusually rewarding lecture on science as the focus of human bondage. From his unique - scientific and cultural - background N. exercises the art of asking meaningful questions within the existing paradigmata to transgress them. Not only when referring to self-organizational concepts does he contribute to the continual change at the very basis of science. In many aspects it is also an example of evolution in itself, thus contributing essentially to what may be called the culture of science. It is this broad base, ranging from mathematics to metaphysics bound by culture, which makes the book and its ideas a necessary platform for discussion. The theses and hypotheses will not be the object of simple corroboration alone, of confirmation or refutation. They will stimulate new ways of looking at problems, evaluating facts, and attaching new meaning to them. Hopefully it will not be read only once, but will be remembered constantly for its impetus. As a unique book with great potential it requires re-reading to gain insights not revealed so far. It challenges the reader's ability to re-think, and to re-consider ideas. Its focus contributes to a concentration of manifold ideas, which will not all reveal themselves at first glance, but only in successive reading. There are many precisely coined notations waiting for further elaboration.

It is a great help to understanding that the book is clearly and often brilliantly written; the translation is impeccable.

One does not often think of science as a vision. Nalimov manifests an open vision, profoundly based, often fascinating, and always convincing.

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