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Position Paper

Theme 2: Second Order Science: an Example of Emergence in Social Systems

1. Ubiquitous limits enforce a general reconsideration in understanding of science. Questioned is the role man acted in as a driver of development. Mere belief from early Shamanisms to the four now prevailing full religions substituted by rational approach. Rationality favoured the experientially founded, systematic exploration and employ of natural resources available. Religious self-understanding progressed from ex post rationalisation to rule and fact bound. rationality
The above review helps to understand, first, the base models behind ways to cope with the inner and outer environments of life. They are still dominated by a rather strict thinking in cause and effect, in experiment and the technical systematic interpretation of the results. Second, it displays that the development of humanity has been both accompanied and driven by socialisation – from group to imperia, from hunter-gatherer hordes to agrarian settlements. Philosophy developed, interpreting reality as experienced and co-acted with. Mental constructs based on rules as those of experiment, interpretation, logical conclusion and related modes of investigation emerged. The technical experiment was complemented by the thought experiment up to the (however officially despised) speculation. Greek formal philosophy, Roman pragmatism and the amalgamation in scholastic, alchemy and astrology in the medieval epoch resulted stepwise in science and advanced science. Philosophy and science both influenced social and societal development and were affected by social development: Montesquieu, Marx. The natural as the social environment provide the base patterns of how to receive and to interpret them as to co-act.

2. Complexity rises both in actual environmental conditions as consequently in the conceptions of science. Complexity in environments to be explored by confronts the modes of 'scientific discovery' with the necessity to reflect just these methods. It needs do so fundamentally: the purpose bound modelling, the retraceable, testable, controllable conditions of experiments and in particular the assessment and the interpretation of the results achieved. Research employs highly complex networks: that of the environments investigated and the according 'design of inquiry systems' (C. West Churchman). Systems thinking, applied to scientific investigation from the beginning, emphasized the role of the scientist as the part of knowledge gaining systems. It determines the methods of examination and, most important, of the interpretation. Cybernetics, and later systems thinking addressed the problems of 'subjectivity'. Constructivism, radical or moderate, behavioural research, but also philosophy (the Ghost in the Machine; G. Günther) questioned principally the 'objectivity' of science. Growing evidence ascertained that the subject of the scientist cogently always affects the processes of science. The fact can neither be neglected nor eradicated. It needs be investigated and assessed as to be able to locate and if possible measure its impacts. Surprisingly slowly and reluctantly still the 'epistemological turn' in science began to emerge.

3. The philosophy of science exists as long as science itself. Expressed loosely the early psychology of scientific efforts has its first roots in the psychology of the 20th century. C.G Jung discussed simultaneity with the physicist Pauli; conceivably the rising quantum world exerting its impact see the Copenhagen discussion and interpretation. T.S. Kuhn published the 'Structure of Scientific Revolutions'. Assumedly cybernetics inspired the dialogue between leading physicists on the 'world view of physics' and whether and how far the properties of the topic, the purpose behind and the personality of the scientist would affect the scientific process. As it if slowly was accepted, the rules of physics could not simply one to one be transferred to non physical scientific disciplines as

notably the anthropologies and the humanities. The latter in particular are subject cultural influences For intance it is not appropriate to cast the Western models over e.g. an African reality. Such considerations, indigenous first to disciplines, caused, e.g. in sociology an social psychology, for some years a methodical and methodological pat. A base for discussion has been provided by two approaches. The one is initiated by what could be called critical sociology and authors like Bourdieu in France, Beck, Heitmeyer in Germany or Chomsky in the US. Their rather subjective and ideologically tinted approach is opposed – complemented? polarised? - by the conclusions of N. Luhman. Luhman tries to transfer the system and systemic approach to social and societal research. He locates the foundation of society in the process of communication, in accordance with research findings in psychology and brain research. Information and communication research still on the rises also confirms the essence of social communication. One focus lies on the interaction of ICT with societal change – and not least with science. Proofs in mathematics for example are increasingly computerised.

4. Second order science in terms of its impact on society increasingly makes the subjective influence of researchers assessable. A reason behind appears the growing mutual interrelation between societal and scientific developments. More important, the essential role of science in coping with societal change and its problems comes into critical view. Evidence and experiments have shown, that science has to refined as to its epistemological base as to be able deal with societal complexity in a highly complex and complicated society. Not least a growing number of research findings need be integrated as to be qualified to contribute to the resolution of challenges posed by societal practice . The methodical and methodological experiences gained in turn should propagate disciplinary based research experiments ready to be appraised in an interdisciplinary and transdisciplinary contexts. Accessibility of data and co-operation are furthered by the worldwide internet connection. Knowledge gained should be applicable or at least variatis variandis transformable into the particularities of differing cultures or –see international contracts – acceptable by virtually all cultures.
The cultural compliance adds to the attentiveness to the role of the observer discussed generally above. The focus lies as shown in the realms of societal sciences; analysis, interpretation and pragmatic problem resolution. The scientist as an observer belongs normally to a specific scientific discipline, to a culture, and responds to individual personal idiosyncrasy. The challenge is to identify those influences on the scientific process and its results. The task applies to virtually all applications of science as a means to cope with the (complexity and semiosis)of the life world. It concerns cultural transfer as well as the practicability of a solution e.g. of an urban traffic problem. It implies side and long term effects to be accounted for when considering topics in the complex networking they are part of.

5. To specify the topic of this paper: The ‘epistemological turn’ in science comes as an assignment to cope with the complex challenges of the 21st century. The scientist proves a decisive part of the scientific system and the scientific process. Scientific performance in the end serves as a means for society to cope with its inner and outer environments. In a world wide and rapidly changing global world scientific results need be culturally transferable. The role of the scientist as an observer needs be understood as well from its function in research as in transfer into practice.
From the point of research and its application and implementation the situation requires at minimum an interdisciplinary approach, consequentially maturing into transdisciplinarity. Research practice corroborates, that the properties of the scientist as an observer prove essential.

6. The role of the scientist as an observer and the consequences for the scientific process are addressed by recent scientific attempts. So are the sequels for the quality of results achieved and their implementation. Well discussed items as Platon’s cave metaphor, the attitude of expectance in the mind of the researcher, the self-deception by wishful thinking and like psychological insights

are taken as known. Complementing the general approaches in the realm of systems and cybernetics, specific attempts as follow may be distinguished.
Complexity dynamics, Semio- dynamics (Biosemiotics)
Life systems - Anticipatory systems CASYS
The late Robert Rosen and followers epistemology

Under these auspices: re-thinking evolution
Transdisciplinarity: the concept (2004 ff); re-understanding the impact > observer
Second order Cybernetics and Human knowing
Advanced mathematics (L. Rapaport BA, Jerry Chandler et alii) Logics; Geometrisation
Systems Biology (Maturana Varela)

7. Second order science can be seen an example of emergence in social systems as it has been stimulated by the extension of science to social and societal systems. The query has partly been answered by the above considerations from the point of evolution and the resulting conditio humana. Simplified, the ever more critical inquiry into the evolutional roots is but a continuation of the development of consciousness and higher consciousness. As such it is driven by ‘socialisation’ as a powerful evolutional force. More fundamental, evolvement reveals that the means to co-act and to co-evolve with inner and outer environments follow the complexity – and the exhaustion, the crowdedness – of the life spheres accessible. Sophistication of perception, and control of perception (not necessarily an infinite regress), is an evolutional necessity. Mental environments consist of and are determined by mental constructs, that is mental models resting on assumptions how the world ought be. An outstanding example is given by the agglomeration of terms in the world field of ‘justice, justness, true, right’ etc.
A closer look will focus on the facilities of social communication and of the means and accessibility of data/ information /knowledge/ knowing processing. They are – see above – also a continuation of the evolution of ‘control in living systems’ attuning in particular to the sphere of mental constructs. As evolution of evolvement also tells, new technological artifacts co-develop with all levels of life, including physiology and focusing on social communication. We live in a society dependent ultimately from the sufficiently rational attitude to our world. Rationality ins paramount in the sense of sustainability and a sufficient accordance between what we perceive and its ‘reality’, whatever reality may mean in such context. This attitude is embodied in science seen as a means to survive and proliferate. To remind: the bare and rising complexity of the life worlds enforces sophistication of the very control system on all levels.
Detail phenomena can be observed in the rapidly changing role of ‘new’media, general and in science. As paradigmatic example serves the Internet. Media will hopefully further transdisciplinary co-operation, in amalgamating results and designing inquiry systems adapted to inter- and transdisciplinary employ. Science, forced by material and social conditions in the life sphere, is experiencing many small paradigm changes on the disciplinary level. Hopefully they can be integrated as part processes of a comprehensive reconsideration of science. Its methodical base needs be differentiated and unified. Questioning and re-understanding the role of the observer is a part of the evolvement.

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