INTAS-Project-Seminar, July 2002, 1st – 8th , Yalta/Crimea

Report by Christian Fuchs (christian@igw,tuwien.ac.at)

The meeting took place in the first week of July at the Hotel Yalta in Yalta (Crimea, Ukraine). It was the first annual project meeting of the participants in the INTAS-research project "Human Strategies in Complexity. Philosophical Foundations for a Theory of Evolutionary Systems" funded by the European Union. The subtasks 1.1. and 1.2. were discussed in depth and common positions were reached. The project participants agreed that articles will be written about the topics presented at the seminar which should be finished at the end of September 2002 and will be published as a brochure at the Institute of Philosophy at the Russian Academy of Science Moscow in early 2003.

Participants:

Vienna:
Klaus Brunner
John Collier
Günther Ellersdorfer
Norber Fenzl
Christian Fuchs
Wolfgang Hofkirchner
Bert Klauninger
Franz Ofner

Kassel:
Annette Schlemm

Kiev:
Irina Dobronravova
Yury Melkov

Russia
Vladimir Arshinov
Vladimir Budanov
Vjacheslav Voitsekhovich

Schedule:

Tuesday, July 2nd, 2002

1	9-10.30	1.1. Causality and Emergence	ontology of evolutionary systems
2	10.45-12.15		
3	13-14.30		
4	14.45-16.15	1.2. Principles of Synergetics	Unified Theory of Self-Organization - general aspects
5	16.30-18		

Wednesday, July 3rd, 2002

	9-10.30	1.2. Principles of Synergetics	UTSO – physical/chemical aspects
7	10.45-12.15		UTSO – biological aspects
8	13-14.30		UTSO – socio-cultural aspects
9	14.45-16.15		UTSO – general aspects
10	16.30-18	1.3 Explanation and Prediction	Epistemology and methodology of evolutionary systems

Causality and Emergence

Concerning the ontology of evolutionary systems *Wolfgang Hofkirchner* pointed out a shift from mechanism/holism to the paradigm of self-organisation. Epistemologically there is a shift from deductivism Vs. nondeducibility to the principle of qualifying preconditions (incomplete explanation or prediction). Ontologically there is a shift from analysis VS. synthesis to the principle of propensities (less-than-strict-determinism). Axiologically there is a shift from complete control VS. non-intervention to governance and the principle of systems design.
In a hierarchy of complex systems there are dissipative (physical) system, autopoietic (living) systems and re-creative (social) systems. These are evolutionary stages. Each of these three levels has three hierarchical aspects: capabilities of elements, relational capabilities and system capabilities. In dissipative systems the capability of the elements is reflectivity, the relational capability is interactivity, the system capability is synergism. In autopoietic systems the capability of the elements is adaptability, the relational capability is referentiality, the system capability is regenerability. In re-creative systems the capability of the elements is pro-activity, the relational capability is mutuality, the system capability is productivity.

Klaus Brunner and Bert Klauninger showed that there are two levels of emergence: synchronically the parts-whole-relation (hierarchy, irreducibility) and diachronously the relationship between the old and the new (novelty, unpredictability). Incomplete-determinism means that the new is not fully determined by the old and the whole is not fully determined by the parts. The four Aristotelian causes can be mapped to these two relationships. The causa efficiencs concerns the effects of the old to the new, the causa finalis the effects from the new to the old, the causa materialis the effects of the parts to the whole and the causa formalis the effects of the whole to the parts. Actuality is the juncture of these four forces.

Irina Dobronravova pointed out that self-organisation concerns the becoming of a new whole where small fluctuations can have large effects. The parts are elements of a non-linear medium. A complex evolutionary system creates its unity through diversity all by itself. In a bifurcation point there is a choice between two certain possibilities. Prigogine spoke of “far order” as long-scale fluctuations. This choice, i.e. the emergence of a set of possibilities, is a sign of synergetic integrity. There are strictly certain possibilities in the non-linear medium, not everything is possible. So the initial point of emergence of novelty is the emergence of the medium integrity. It appears as an emergence of set of possibilities for further choice by long-scale fluctuations. In Hegelian terms choice by chance in a bifurcation point defines a “real necessity” which “contains the chance” of the previous choice.. Non-linearity itself can be considered as a ground of self-organisation and the critical value of the control parameter as

its condition. Both ground and condition determine the emergence of fluctuations as efficient causes of becoming of the new wholes.

Yuri Melkov pointed out that pointed out that the new sciences of complexity and self-organisation attempt to exclude old classical dichotomies and hence one can speak of a "post-non-classical" science. Classical, mechanistic science does not allow a distinction between fact and event and their philosophical investigation. In non-classical science, which emerged at the very beginning of the 20th century, a scientific fact is a reflection of the appropriate event under certain circumstances. Events are no longer considered as mechanistic effects of laws, there is room for chance and probabilities of certain events. In post-non-classical science there is a third way between determinism and indeterminism as well as between chance and necessity. Spontaneity combines chance and necessity. Spontaneity is the *unpacking* and unfolding of the "the continuum of senses" which is potentially hidden in nature. The possible future states of the system are pre-determined, a selection is made in a point of bifurcation. This is an aspect of chance .
The new science views its objects as wholes. The non-classical science discovered that the human being is an observer which belongs to macro-world, while the observed particle is part of subatomic world. The post-non-classical science reveals yet another level of knowledge: the human subject is not just an observer, but also a "*meta-observer*". In other words, the human being is no longer solely a subject, but a meta-subject as well, i.e. both human subject and the object of reality belong to a higher level of the whole.
The philosophy of modern science reveals that there is always a higher system (meta-system), a *meta-context*, which determines the possible contexts of events that leads to the formation of scientific facts.

Vladimir Budanov pointed out non-linearity, non-seclusion, instability, dynamic hierarchy and observability as the five principles of becoming. One should take a look not only at the self-organisation of one complex system, but also at the interactions between self-organising systems. The macro-level is constituted by influences of the micro- and the mega-level. The meta-level selects the behaviour in the macro-level at a point of bifurcation.

Vjacheslav Voitsekhovich pointed out that in every theory there is a main construct in each theory. For synergetics this construct is what he calls evos (evolutionary systems). Evos is the invariant substance of a self-organising system. Evos in biology would be the gene and in sociology spirit. In the discussion that followed it was questioned that evos in biology is the gene and suggested that it could be the cell or population; and it was mentioned that sociology is not dealing with the evolution of spirit, but with human actions and the developing relationships of human beings.

Principles of Synergetics

John Collier pointed out that there is complete freedom of development in indeterministic positions (Hopf, Lewis), laws are questioned. In hard deteminism (Peirce) everything is determined, there is no chance. In objective chance (Peirce, Aristotle) there are objective, independent causal chains that result in chance, chance here is determined chance. In positions of relative chance (Kolmogorow, Chaitin) chance and change are relative to the system and a specific level. Relative chance means choice by chance. And there is the position of self-control (Maturana) which is very close to hard determinism. The project team agreed that their own position concerning causality is one that corresponds to relative chance or a dialectic of chance and necessity. This position can also be called incomplete-determinism.

Norbert Fenzl pointed out that in complex systems there are local degrees of freedom. The degree of freedom of the whole system is not just a sum of the degrees of freedom of the parts because there are emergent properties. There is a dialectic of the local freedom space of the elements and the determining effects of the global system. Determinism and indeterminism are relative to the system and its elements. Emergence of new open systems is based on matter and energy flows. The discussion that followed showed that some project members think that emergence and indeterminism only occur at points of bifurcation whereas there is complete stability and predictability between such points; whereas other say that complex systems are in permanent non-equilibrium and movement, i.e. there is emergence all the time, but it depends on the level of analysis and observation if we speak of stability or instability/emergence or determinism or indeterminism at a certain moment in the development of a complex system.
Open systems are characterised by energy-input of higher quality (E1) and energy-output of lower quality (E2). The potential difference between these two qualities is exactly what makes self-organisation working. Open systems have three levels: micro (elements), meso (structure), macro (field of interaction). The basic characteristic of the structure of a system is its structural inertia, the resistance of organised matter against movement. The amount of *energy* required to overcome structural inertia is also called entropy. Permanent energy inputs result in the overcoming of structural inertia and in the reaching of critical points of no return (bifurcation points). Bifurcation means a reorganisation of order and the emergence of new order. This is also important for the notion of sustainable development because in the economy there is an input of labour power, machines, renewable and non-renewable resources etc. and an output of products and waste.

Vladimir Arshinov dealt with the question: What is synergetics? Normally it is argued that a scientific discipline is an X-science. In the case of synergetics it could be argued X could be defined as one certain multitude of views, but it should better be conceived as an open, uncompleted plurality of multitudes of views including knowledge from Haken's synergetics, Prigogine's dissipative systems theory, Kurdjumov's theory etc. Synergetics would be an interdisciplinary approach and an interdisciplinary philosophical position that would correspond to it would be Glasersfeld's radical constructivism. All knowledge would be constructed. The principle of observablility says that there are different levels of observation and depending on this level is the style of observation and what we can and do observe. What we observe depends on the time scale chosen. Observation is itself a self-organisation process. It was opposed to this epistemological view that radical constructivism is a solipsistic position that neglects the objectivity of reality. Ontology would deal with the world as it objectively is, epistemology with subjective constructions of how we conceive the world.

John Collier pointed out different forms of self-organisation: Self-production is the process of regeneration of the (essential or the bulk of) conditions for ones own existence (e.g. organism). Self-reproduction is the special case in which a process regenerates the conditions for its own existence in stages in which each stage generates the required conditions for the existence of the next stage. Autopoiesis means the same as self-production, but the usage of this term is restricted to systems that are closed to information. Self-assembly is a process by which more complicated forms occur without external guidance because of the properties of the parts. Autonomy is a property of self-productive systems in which the (central or bulk of) conditions for the existence of the system are definitive of the identity of the system. Such as system is essentially self-producing. An organic system is one in which the organisation is integrated. An anticipatory system is one that can adjust its current state to modify its behaviour appropriately to deal with a future state of itself or its environment. Synergy

systems are organised so that the organised system can do things that the components cannot do collectively but individually. The whole is greater than the sum of the parts. Closure to efficient cause implies that there is no external origination. Complexity refers systems that cannot be modelled precisely in all respects. Self-regulation uses feedback to keep its state within a range of values close to a set point. A system is self-directed if it uses feedback to guide its activity and also to alter its set points.
One of the most fundamental distinctions in processes that tend to promote organisation is between those where no new macroscopic constraints are formed (self-reorganisation) and those where new macroscopic constraints emerge (self-organisation). Self-maintenance, self-assembly, self-reproduction, autopoiesis, self-regulation, self-direction, autonomy, closed to efficient cause correspond to self-reorganisation because there is no emergence; organic, synergy, anticipation, complexity correspond to self-organisation.
In the discussion that followed it was mentioned that it depends on the level of analysis if there is emergence or not. E.g. on concrete levels of society there is emergence quite frequently (e.g. innovations and crises in the economy), whereas on more abstract levels such as the one of the social formation (e.g. capitalism) new qualities don't emerge all so frequently.

Vjacheslav Voitsekhovich pointed out seven principles of synergetics:

Ontology:
A. Principles of Being
1. Parmenides: being is, non-being is not
2. Homeostasis
B. Principles of Formation:
3. Openness
4. Non-Linearity
5. Parameter of Order

Epistemology:
6. Observability
7. Complementarity: For the description of the whole system different complementary languages are needed

For *John Collier* the necessary conditions for the possibility of self-organization are 1) an applied force, 2) internal cohesion (interactions), and 3) an internal entropy gradient.
The important characteristics of dissipative systems are:
1. Phase separation (state transition)
2. Free energy (exergy) source
3. Exportation of entropy from system (energy degradation)
4. Promotion of microscopic fluctuations to macroscopic order (spatial correlations in the Bénard case)
5. System organises itself so as to minimise local entropy production in the generalised direction of the applied force
6. The efficiency of energy throughput is maximised.

Günther Ellersdorfer pointed out that in biology reductionistic positions and holistic vitalism (Driesch, Bergson) failed. Biology is not based on mechanism and linearity, but on self-organising processes. Principles of biological self-organisation are epigenetics, autopoiesis and coherence. John Collier added that an organism is not operationally closed, but

interactively closed. Autopoiesis means a semi-open (interactively closed, selectively open), actively maintained organisation.

Christian Fuchs pointed out principles of social self-organisation and distinguished three levels of social analysis: 1. society in general (universality): categories which describe all types of society (social relationships, actors, structures, institutions, organisations), there are three subsystems of society (economy, politics, culture); society is considered as a unity of social systems which are constituted through the duality of structure, i.e. mutual re-creative relationships of actors and structures that are producing themselves synchronically and developing in space-time diachronically. 2. A social formation is a concrete historical and societal epoch that is characterised by a concrete expression of social structures and relationships that remain cohesive from beginning till the end of the formation although they change dynamically on a still more concrete level. There is homogeneity within diversity of social structures and relationships of a formation of society. The formation of society we live in is capitalism. 3. A mode of development describes a temporal coherent unity of economic, political and cultural aspects of a social formation.
Diachronically social self-organisation concerns the emergence of phases of crisis of society where the future development is not determined, it is a historical point of bifurcation of social dynamics. But the development of society as an evolutionary-self-organised system in such an unstable phase and is not left to chance fully, it depends on a dynamical dialectic of chance and necessity. On the one hand it is determined that antagonistic structures of society will again and again result in phases of crisis. The exact point of time cannot be predicted due to the complex causality that generally shapes self-organising systems. Concerning a point of bifurcation in society, the historical development is relatively open, but it nonetheless depends on certain subjective factors, i.e. on agency and human intervention which can increase the possibility that certain paths will be taken and that others will be avoided. In capitalism crisis is caused by structural economic, political and cultural antagonisms, the result is not determined, it can be the emergence of a new capitalist mode of development, the ultimate breakdown of the social system or on an upper level the emergence of a new formation of society as a negation of the negation.
Taking a synchronic look at society, self-organisation has to do with the relationship of social structures and actors. Existing approaches on this relationship include individualism, structuralism and individual-society-dualism. Opposed to such views is actor-structure-dialectics (Bourdieu, Giddens). An integrated view of social self-organisation argues dialectically and avoids the shortcomings of these approaches and suggests that social systems are re-creative systems. By social interaction, new qualities and structures can emerge that cannot be reduced to the level of the actors. This is a process of bottom-up emergence that is called agency. Social structures also influence individual actions and thinking. They constrain and enable actions. This is a process of top-down emergence. The whole cycle is the basic process of systemic social self-organisation that can also be called re-creation because by permanent processes of agency and constraining/enabling a social system can maintain and reproduce itself. It again and again creates its own unity and maintains itself. Re-creation also refers to the ability of all humans to consciously shape and create social systems and structures, an ability that is based on self-consciousness and, in Giddens' terminology, the reflexive monitoring of action. Social systems are re-creative ones because they can create new reality, the socio-cultural human being has the ability to create the conditions for his further evolution all by himself. The human being is a social, self-conscious, creative, reflective, cultural, symbols- and language-using, active natural, labouring, producing, objective, corporeal, living, real, sensuous, anticipating, visionary, imaginative, designing, co-operative, wishful, hopeful being that makes its own history and can strive towards freedom and autonomy. Social systems are self-transcendental self-organising systems because due to

the human abilities the actors and the system can go beyond their own reality and create new reality.

Franz Ofner dealt with the question of how consciousness emerged and referred to the works of George Herbert Mead. The first step towards consciousness of meaning takes place if the gestures are such that the individuals making them can perceive them. This is the case with vocal gestures. As a result the individual making the gesture is enabled to participate in the other's response. The consequence is that the individual assumes the same attitude towards his own gesture as the other individuals do. This procedure of taking the attitude of the others towards his own gestures is the core of Mead's approach to explain the appearance of meaning and consciousness.
The gesture calls out in the individual making the gesture the *image of the response* of the other individual, that is, the individual responds to his own gesture in the form of imagery. Thus, the connection between gesture and response is internalised, and becomes, in this way, conscious and meaningful. Significant gestures emerge. The procedure of taking the attitude of the others enables the individuals to create a self and social objects which are internalised. Thinking arises if communication processes take place within the organism of individuals in the sphere of imagery.
What is lacking within Mead's approach is a process of identification: the perceived content and the imagined content which is already existent in us due to past experience, have to be identified if consciousness is to appear. It is this identifying act which gives us the experience that we observe what we are perceiving.

Vjacheslav Voitsekhovich argued that the specificity of the human being is "reprogramming", i.e. the ability of changing his own believes and purposes. The Sanskrit word cult-ur means worship to light. The main problem of social life is alienation (Hegel). Alienation is caused first of all by egoism. Modern globalisation results in new kinds of alienation such as the imperialistic standardisation of culture and the threat of the destruction of mankind. It is an ethical task for the scientific community to solve this problems and find humanistic strategies for evolution.