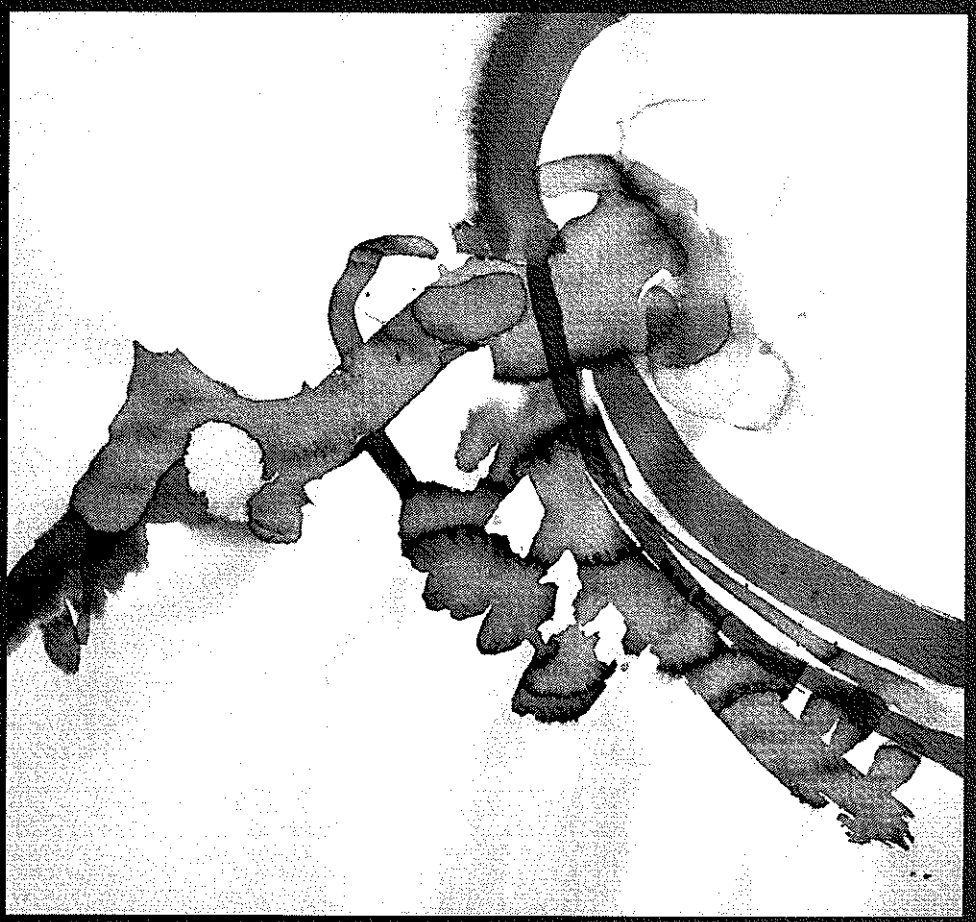
CYBERNETICS & HUMAN KNOWING

a journal of second-order cybernetics autopoiesis and cyber-semiotics

Volume 11, No. 1, 2004



Offprint

CYBERNETICS & HUMAN KNOWING

a journal of second-order cybernetics, autopoiesis and cyber-semiotics

C&HK is an international trans-disciplinary journal examining and reconceptualizing the emerging constellation of human understanding and practices of living in a post-modern information environment, drawing largely on second-order cybernetics. It addresses issues of understanding understanding, of knowledge-directed processes of perception, cognition, communication/information, autopoiesis and self-organizing systems, social organization, (computational) technology, and of languaging in all of its manifestations such as C.S. Peirce's semiotics.

All contributions are peer reviewed. Articles challenge existing disciplinary boundaries between philosophy, the humanities, the natural, social, library and information sciences, and such practical pursuits as the design of information systems and document mediating systems, education, management, therapy, and politics.

The journal is published quarterly — subscriptions include both print and internet editions.

Journal home page with abstracts and some full articles:
www.imprint-academic.com/C&HK
Full text: www.ingenta.com/journals/browse/imp

BACK VOLUMES

Full set of back volumes available at 50% discount

Cybernetics And Human Knowing. Vol. 11, no. 1, pp. 63-78

A New Way of Thinking and a New World View:
On the Philosophy of Self-Organisation I[1]

Wolfgang Hofkirchner[2]

Discussions about paradigm shifts in science and the world picture on the threshold of a new millennium are already commonplace. However, what exactly do they mean? This paper stresses that changes in thought are a response to changes in the social conditions of life. A distinction is drawn between ways of thinking and world views. The focus is on the methodological, ontological and praxiological assumptions that are required for the new sciences of complexity to help meet the global challenges facing humankind as the new millennium begins.

The context in which all strategies for human action are formulated today fundamentally distinguishes itself from that of earlier times. We live in an age of global problems. The impressions made by the atom bomb, industrial and agricultural catastrophes, hunger, suffering and death in the poor parts of the world, have raised consciousness of the destructive and fallible nature of the human technosphere, the fragile and finite nature of the human ecosphere, and the unsettled, unbalanced nature of the human sociosphere. These global problems are problems concerning the survival of humanity: first, they concern humanity as a whole (as object); second, they can also only be solved by humanity as a whole (as subject).

Assuming that these problems have an anthropogenous origin in the use of technical, natural and human resources of social systems, human efforts to cope with them are purposeful. In a sense, every action performed by a social subject, be it a nation state, societal institutions, or a single human, may be measured by what it contributes towards the alleviation or aggravation of the global challenges facing us.

Co-operation in meeting the global challenges presupposes communication of ends and means between all affected and communication, in turn, presupposes the recognition of the threat, its causes and possible solutions by all individual minds involved. Producing and implementing strategies for dealing with the *global problematique* is a collective endeavour—so to say, an act of collective intelligence—

1. This article was written in the context of the research project "Human Strategies in Complexity: Philosophical Foundations for a Theory of Evolutionary Systems" funded by INTAS (The International Association for the Promotion of Cooperation with Scientists from the New Independent States of the former Soviet Union) and the Austrian Federal Ministry of Education, Science and Culture. An early version of this article was published in Ukrainian language entitled "Zhyttia u sviti samoorganizatsyii: zmagannia styliv myslennia ta svitobachen" (Living in a world of self-organisation, Ways of thinking and world views contested) in *Practychna Filosofiya, 1*(7), 39-48 (2003). A second part will follow.

2. Associate Professor of Technology Assessment, Faculty of Informatics, Vienna University of Technology. Email: hofi@igw.tuwien.ac.at. Homepage: http://igw.tuwien.ac.at/zope/igw/menschen/hofkirchner

that requires new ways of thinking and new world views. A paradigm shift as far-reaching as never seen before is under way. It is about to change the nature of science and technology.

As it is in the nature of the challenges to be global, they have to be approached in a similarly global fashion. The split into disciplines which are both alien and deaf to each other is an obstacle for consistent comprehension, which takes into consideration as many of the manifold aspects as are necessary in order to take measures to reach the desired goals without being frustrated by undesired effects. The urge, however, to transcend the borders of the disciplines, the trend towards transdisciplinarity, and the search for a base of understanding between the domains of science, has been growing.

What is known as sciences of complexity, theories of dynamic, open, non-linear systems, second-order cybernetics, self-organisation theories, form an element, if not the core, of this overall shift. This thinking in complexity cuts across the natural and social sciences.

According to this thinking, all science serves to support efforts to master the global challenges. According to it, more and more researchers discover evolutionary systems no matter what real-world object they may be investigating, for the provision of specialised knowledge about the functioning of different self-organising systems is essential to influence them in such a way as to trigger the most promising development paths. Finally, according to it, diverse methodological approaches are less and less viewed as impediments that endanger the unity of science; rather, they are increasingly regarded as useful means towards the same end and as an enrichment of science as long as the common basis of the different methods is not violated. The basis of this shift concerns ways of thinking as well as world views.

Ways of thinking

Ways of thinking can be seen as ways of considering how to relate identity and difference, how to relate the one and the many, how to relate unity and diversity. This question seems to be the most fundamental question you can conceive of while having in mind that thinking can be defined as an operation of identifying the one among the diversity and differentiating the many within the unity.

There are, in terms of ideal types, several ways conceivable:

- one establishes identity by eliminating the difference (unification);
- another eliminates identity by establishing the difference (diversification);
- a last one establishes identity in a line with the difference (integration).

Regarding the establishment of identity by the elimination of the difference, the question arises as to how the unification comes about, that is, how the less differentiated problems or objects or phenomena do relate to more differentiated ones. Taking two possible answers into consideration, we can finally distinguish between four ways of thinking:

- a first one that establishes identity by eliminating the difference for the benefit of the less differentiated side of the difference; it reduces the side with the higher degree of differentiation to the side with the lower degree of differentiation; this is known as *reductionism* (A); it yields *unity without diversity*;
- a second one that establishes identity by eliminating the difference for the benefit of the more differentiated side of the difference; it takes the higher degree of differentiation as its point of departure and extrapolates or projects from there to the lower degree of differentiation; it is the opposite of reductionism (A) and might be called *the projection perspective* (B); it too yields unity without diversity;
- a third one that eliminates identity by establishing the difference for the sake of any side of the difference; it abandons all relationships between all of them by treating them as disjunctive; it is opposed to reductionism (A) as well as to the projection perspective (B) and could be called *the disjunction perspective* (C); it yields *diversity without unity*;
- a fourth one that establishes identity as well as difference favouring neither of the sides of the difference, rather attaching to each side the significance due to it; it integrates the lower and the higher degree of differentiation by establishing a relationship between them that, in particular, might be characterized by the following criteria: firstly, both sides of the relation are opposed to each other; secondly, they depend on each other; thirdly, they are asymmetrical. When all these criteria are met the relationship is usually called *dialectic* (Hofkirchner 1998). This approach opposes reductionism (A), the projecton perspective (B), as well as the disjunction one (C). It will be called *the integration perspective* (D). It yields *unity in diversity.*

World views

The most fundamental implications of ideas whatsoever, insofar as they go beyond being judgements on a particular matter that forms only a single part of the world to express an attitude towards the world as a whole, are called world views (in the sense of the German *Weltanschauung*). Theorised world views, that is, world views theoretically reflected, represent philosophy.

A world view has three dimensions:

- one refers to reasoning and the employment of instruments to gain knowledge; the question answered here is "By which means do we explain and/or understand the world?"; philosophical disciplines like epistemology and methodology and logic are dealing with that; this dimension may be called *approaching the world* (1);
- another one refers to assumptions about the order of the real world; the question put here runs "Is the world ordered by necessity and/or is it ordered by chance?"; that is what ontology is about; this dimension may be called *archetyping the world*, because it yields certain mental archetypes of the world (2);

- a last one refers to the devising of guidelines for action; the question belonging to the domains of ethics, axiology, praxiology is "Can we actualise the virtual and/or virtualise the actual?" the actual being the world as it is and the virtual being the world as we envision it; thus, this dimension is called *(en)visioning the world* which produces visions (3).

These three dimensions are interlinked in the following way: a specific approach (1) is consistent with a certain variety of archetypes (2) but excludes particular archetypes and a specific archetype is consistent with a certain variety of visions (3) but excludes particular visions; a vision (3) can be based upon one certain archetype (2) only, and an archetype (2) upon one certain approach (1) only.

Ways of thinking in world views

The next step is to cross-table ways of thinking and world views and identify the paradigms that have grown obsolete inasmuch as they have proven counterproductive in respect to the global challenges and the paradigm that promises humankind remedy (see Table 1).

Table 1: Ways of thinking and world view dimensions

		Explaining vs. Understanding	Presupposing Necessity vs. Chance	Actualising vs. Virtualising
Unifying	Reducing	Naturalistic Rationalism	Materialistic Determinism	Modern Activism
	Projecting	Culturalistic Rationalism	Idealistic Determinism	Antimodern Activism
Diversifying		Culturalistic Irrationalism	Idealistic Indeterminism	Antimodern Passivism
Integrating		Reflexive Rationalism	Less-than-strict Determinism	Responsible Activism

The traditional cluster of ways of thinking and world views is characterised by the divide of rationalism and irrationalism, determinism and indeterminism, activism and passivism. Each of the divides prolongs an unresolved contradiction between the prevailing occidental scientific thought called the "classical" paradigm here, on the one hand, and submerged humane feeling called "nonclassical" paradigm here, on the other, that in vain has attempted to compensate for the deficiencies of the first (see

Toulmin, 1990). The, so-called "postnonclassical" paradigm[3] tries to do justice to both of the strands while overcoming their one-sidedness by promoting the idea of the unity of methods, reality, and practice.

A fresh perspective on comprehension

Naturalism and culturalistic rationalism revolve around one basic method of explanation and prediction on which all rational methods of comprehension are deemed to converge (see Table 2).

Table 2: The paradigm shift from deductivism and irrationalism to dialectical reasoning

From the Rationalism–Irrationalism Divide...	to an Integrative View
Principle of Complete Deducibility (Deductive Rationalism) vs. Nondeducibility (Irrationalism): **Analysis** vs. **Synthesis** (Causal Explanation/Prediction vs. *Verstehen*)	Principle of Investigating into the Proximate Necessary Condition (Reflexive Rationalism): **Inference in Jumps** (Dialectic of History and Logic: Ascendence from the Potential to the Actual and from the Abstract to the Concrete)

Speaking in terms of formal logic, an explanation or prediction is the deduction of a conclusion from premises such that the conclusion describes what is to be explained or predicted, and that the premises are made up of descriptions of what together is expected to do the explaining or predicting. After Hempel and Oppenheim this scheme is called deductive-nomological, if it couples empirical and theoretical knowledge by subsuming facts (empirical) under some law (theoretical) that covers those facts.

Given a universal implication as a first premise, which represents the covering law, and an instantiation of its conditional component as second premise, which represents specific conditions not spelled out in the covering law, the application of the rule of *modus ponens* implies an instantiation of the consequence of the law as a conclusion which represents just that final condition which was or will be observed. The conclusion must be realised when the premises are the case. *Per definitionem* the truth is transferred from the premises to the conclusion.

Naturalistic deductivism assumes an extra-human, physicalistic or biologistic way to look. In any case, it reduces phenomena of a higher degree of differentiation in the conclusions to phenomena of a lower degree of differentiation in the premises.

---

3. I borrow the wordings *classical–nonclassical–postnonclassical* from V. Stepin who introduced them to the scientific community some ten years ago, albeit in Russian (personal communication, I. Dobronravova). I admit that my wordings may have a different meaning.

Culturalistic deductivism takes the human being as given. This leads to anthropomorphic subsumptions. Thus, the premises of the argument are made to contain projections of human conditions, that is, projections from phenomena of a higher degree of differentiation onto phenomena of a lower degree of differentiation.

Naturalistic and culturalistic deductivism hold that all phenomena can be explained and predicted likewise. But this is not always so. Because there are cases in which such explanations and predictions do not work—and the reason why they do not work is not ignorance, that is, missing observations or missing hypotheses, but overlooking of the differentiation between necessary conditions and sufficient conditions.

A so-called two-cultures thinking tries to find the solution in a different way of understanding (German *Verstehen*) which is a central term in the tradition of phenomenology and hermeneutics. It offers a quite different option and postulates a quite different approach of comprehension which is distinct from the *nomothetic* way: an *idiographic* way. Sectors of reality that can not be explained shall be described and interpreted according to some sense. Since this sense can be any one, this touch of arbitrariness leaves this two-cultures thinking open to criticism for lacking of rational substantiation of its background ideas.

According to the method of explanation and prediction preferred, deductivism stresses analysis by means of dissection as appropriate method of recognition. Non-deductive culturalism, on the contrary, has a rather synthetic approach.

Summing up, naturalism and culturalistic rationalism can be characterised by the principle of complete deducibility and the irrational two-cultures thinking by the principle of nondeducibility. To accept this contradictory state of the art would mean to forego the commonalities of differing methods. A fresh look is needed to get out of the trap.

In contrast to the view imposed by rationalism, it is not unscientific to get by without deductive methods; and in contrast to the dualistic culturalism, it is not sensible to divide the applicability of scientific methods along the line dictated by the differentiation of nomothetic and idiographic. Both the rational and irrational philosophies are concerned with the description of events and the comprehension of their arising, be this in the form of explanation, prediction or understanding. Such comprehension is achieved when a demonstration of those conditions succeeds, to which a participatory role can be attributed at the onset of the events. Sometimes, such conditions may constrain to precisely one case. The onset of events is then a sequence, which happens out of necessity. What happens out of necessity must of course be possible. Other times, the conditions may constrain to a number of cases. The sequence of events is then a process that implies chance elements, but which would be made impossible in the absence of the conditions. The appropriate conditions may thus be described as necessary conditions, which create the possibility of all conceivable cases.

Thus, that immediate necessary condition is sought that makes possible what shall be comprehended. Having found it, explanation and prediction, as a rule, remain

incomplete. There is a leap from potentiality to actuality which can only be covered if the necessary condition does at the same time suffice, that is, the condition is also sufficient.

Acknowledging historicity, as a maxim, means, accordingly, showing the preconditions of what evolves by showing the possibility of the real. That is, it has to be demonstrated that in the case of comprehending something actual the *status quo ante* includes the actual as a potential or in the case of forecasting the *status quo* includes something to come as a potential implicit in the original actual.

Acknowledging logicity, as another maxim, means to ascend from the abstract to the concrete, which is no deduction in the formal logical sense. Step by step the reproduction of the object of comprehension is enriched with newly added specifications. Thus, we have an inference in jumps.

In contrast to the classical and respectively nonclassical approach whose leitmotif is looking for the *necessary and sufficient condition* and respectively looking for anything else because there is *no condition at all*, the postnonclassical principle is the search for the *necessary, but not in all cases sufficient condition*. This principle will allow reconciliation of the classical and nonclassical methods.

A fresh perspective on our real world

Determinism is the ideal toward which mainstream thinking in the (natural and social) sciences tends. This is materialism in that it denies ideal causes. All phenomena are explained by reducing effects to causes that are sufficient to produce those effects. If cause and effect are related in such a way that each cause is related to one, and only one, effect, determinism is held to be complete (see Heylighen, 1990). This view is considered to be that of strict determinism (see Table 3).

Table 3: The paradigm shift from strict determinism and indeterminism to assuming weak determination

From the Determinism–Indeterminism Divide...	to an Integrative View
Principle of Complete Determinacy vs. Indeterminacy: **Cosmos** vs. **Chaos** (Preformationism/ Merism respectively Teleologism/ Holism vs. Dualism)	Principle of Assuming Real-World Propensities (Less-than-strict Determinism): **Chaosmos** (Subject-Object-Dialectic: Ascendence from the Old to the New and from the Parts to the Whole)

Strict determinism assumes that the causal relations in the universe are as compellingly interconnected as are the logical relations in our minds.

In strictly determined events, mechanisms are said to be at work that necessitate the transformation of particular causes into particular effects. Here *causa aequat*

effectum or *actio est reactio* as Newton's dictum may be interpreted (Fleissner & Hofkirchner, 1997). Popper (1973) called this a clockwork view of the universe which the Demon of Laplace is likely to fancy. It takes the original meaning of the term *cosmos* seriously: total order.

As to the diachronous character of the world, the new is completely determined by the old so that there is nothing new at all. Accordingly, *e-volution* is understood as the unwrapping of something that is already there before it is unwrapped. Preformationists claim just that.

As to the synchronous character of the world, the whole is completely determined by its parts. There is no whole that is "more than the sum" of its parts. The world is explained by summarising all its parts. This may be called *merism* (e.g., atomism).

The opposite of the materialistic view is idealistic determinism. This determinism may be as strict as that of materialism; the difference is that the causes do have an idealistic element. Some of the humanities tend to be biased this way. Evolution of whatever is said to evolve seems to be strictly governed by a *telos* that determines current developments by future. It is a pull-model, in contrary to the push-model of materialism. This is known as *teleology*. Moreover, wholes seem to exert a strong pressure by way of downward causation on their parts. This is called *holism*.

The opposite of both materialistic and idealistic determinism is dualistic indeterminism. It denies that effects are caused and holds that therefore there is no sense in ascribing cause-effect-roles to events or entities. From this perspective the world is heterogeneous, fragmented and disintegrated, and it falls apart in disjunctive sets. Dualism overlooks continua and is neglectful of the old and of parts which dichotomises old and new as well as parts and wholes. Old and new do not depend on each other; neither do parts and wholes. Evolution is as undetermined and history as arbitrary as the order and the logic of the structure: it is chaos, total disorder. Becoming and being is like with clouds (as Popper put it) which are unpredictable and irreducible.

The unity of reality, however, can be envisaged by recognising that deterministic events are but a special case of events in the universe. Deterministic events occur with objects only. In the case of subjects, events are not strictly determined, the effect is not predictable because it is a kind of subject that intervenes in the chain of cause and effect and introduces a degree of freedom that cannot be forced into a single alternative.

It is not only humans who display subjectivity. The making of something subject to oneself which makes oneself a subject undergoes a process of unfolding so as to let us distinguish between different types of subjects in the universe according to the degree of subjectivity they manifest. The minimal unit of subjectivity is a something that is provided with a minimal quantum of degrees of freedom to act. This something is the most rudimentary and most primitive subject. It differs fundamentally from being an object, that is, something that does not dispose of options to act.

An object which has no options available strictly acts according to the Aristotelian *causa efficiens* and *causa materialis*, while a subject's act does include *causa finalis*

and *causa formalis* as well, for there is some end toward which the subject directs its action and there is some form which the subject implements through acting. End and form are options at the disposal of the subject. They are selected out of a plural of options which make up the degrees of freedom.

Thus, *causa non aequat effectum, actio non est reactio*. This is neither strict determinism nor indeterminism, but a less than strict determinism. It attributes cause-effect-roles, but does so without coupling them unambiguously so as to let causes have different effects or to let effects have different causes (see Heylighen, 1990).

Subject-object-dialectic paints a new picture of the world: it is neither cosmos nor chaos, but bears features of both; it is *chaosmos*—a term coined by the French philosopher Edgar Morin (1998).

Regarding the aspect of becoming, the universe and its constituents are considered open in the sense that future is not predestinate. The old is only the necessary condition for the new, i.e. the new cannot come into existence unless the old provides the preconditions for the start of the new. But the new is not completely determined by the old. There is a degree of freedom in the new that cannot be reduced to components of the old.

Regarding the aspect of being, the entities of the universe form a layered structure in which the entities that arose in later stages of the evolution process are found on higher levels, the older entities on lower levels. The parts are only the necessary condition for the whole, that is, without parts there is no whole, but the parts alone do not necessitate the existence of the whole. The whole, being not completely determined by its parts, does in turn not completely determine its parts. An irreducible degree of freedom resides in the whole as well as in the parts.

Thus, contrary to the strict determinism of materialism and idealism and contrary to the indeterminism of dualism, ontologically, the core of the postnonclassical paradigm is the principle of less-than-strict determinism which can be characterised by the assumption of *propensities* rather than eternal *laws* or the lack of any regularities. This is an idea of late Popper (1997). The motto is neither "same results from same conditions" nor "bolts from the blue," but "great oaks from little acorns."

A fresh perspective on strategies

Modernism is the ideology of modernity. Modernity is that age of history of humankind in which a particular type of civilisational development is said to predominate. This mode of civilisation has its roots in the Christian-occidental mode of science and technology whose innovations are seen as the driving force of society. Today, the western type of science and technology, the related industrial and computerised takeover of the natural world, and the resulting uniform culture of capitalism, democracy and human rights are the main features of modernity.

The conviction of modernism is that progress in science and technology is automatically translated into progress in society. Thus everything that can be made shall be allowed for. That's practicism. That's the reduction of the virtual (that which

is desirable) to the actual (that which turns out possible). This modernist view may be traced back to the Bible. It can be called *dominionism*, because it aims at erecting a dominion over the world we live in. It is an optimistic view for those who are in power: it implies that everything can be managed, steered, planned, that is to say, everything can be controlled totally, if there is the will to do that (see Table 4).

Table 4: The paradigm shift from dominionism and passivism to a precautionary guiding of action

From the Activism–Passivism Divide...	to an Integrative View
Principle of Complete Controllability (Totalitarian Activism) vs. Uncontrollability (Passivism): **Expensive interventions** (Practicism—Belief in Progress—respectively Wishful Thinking) vs. **Nonintervention**	Principle of Piecemeal Engineering (Responsible Activism): **Changing the world by observing its laws including the law of unintended consequences** (Dialectic of the Feasible and the Desirable: Ascendence from the Less Good to the Better)

Interventions aim at producing final states which are desired by functionalising cause-effect relationships in that way that the causes equal the initial states from which you depart and the effects equal the desired states at which you will arrive. Interventions are operations linearly sequenced. Interventions may be expensive in that the means used is not as efficient though they are effective in that they yield the desired result. But it may be a big effort to put the means at work. And the means may yield undesired results, too.

Anti-Modernism in the form of wishful thinking can be characterised by the same totalitarian activist belief in intervening in the world. It can be said to differ from modernism only in emphasising the final cause, for it prioritises values, ethics and morals opposite to those of modernity. For wishful thinking there is no such thing that is not capable of being made. The virtual is projected onto the actual. It comes in two varieties: utopianism and romanticism. The first is looking forward, oriented towards a future that leaves behind modernity, while the second is looking back, oriented towards premodern states of the past.

Anti-Modernism in the form of the ideology of postmodernity, refuses interventions at all. From the experience of modernity being confronted with all the undesired results—side-effects in other domains of our world, local and far-distance effects, and short- and long-term effects—which are detrimental to our survival it concludes the imperative of non-intervention: the world is taboo. Nature, Creation, fellow humans are treated as inviolable.

Hence, the principle of complete controllability and respectively the principle of uncontrollability are typical of modernism and wishful thinking and respectively postmodernism. Both principles, however, are counterproductive. They do not assure

the unity of practice. They do not show a way of how to get a grip on the complex and global problems.

On the one hand, carrying on along the path of modernity cannot make itself plausible (in the way that a simple increase in science and technology with the same economic drives and political framework conditions could bring about a qualitatively changed situation), if the present situation is in debt to a lower quantity of the same development. In this conservative variant, continuity is made absolute and the necessity or possibility of a jump in quality is denied. Either the solving of global problems is seen as something with which, in the framework of the modern age, can be coped with, without needing any modifications of civilisation's development, or the existing situation is attributed with a problem-solving capacity on a vastly different scale, because obstacles are not recognised. In neither case is there a need for action.

On the other hand, the call for a U-turn would throw the baby out with the bathwater if it proposed something radically different here and now, without consideration of development so far. It believes it would have to do without any modern science or technology, just as it would have to forego modern economy and politics. This nihilism makes discontinuity absolute, and denies the possibility or necessity of the continuation of certain relationship structures in societal development, it dualises the bad reality and desired good to the point that every possible course of action becomes superfluous.

Apart from these two alternatives, there is a way out that stresses the possibility and necessity of both discontinuity and continuity in the scientific-technical development which is enclosed in the societal one. Eventually, after centuries of predominance of the modern, Western-controlled (natural) sciences, a paradigm change is on the way. However, this new view does not need to, indeed must not, be a return to pre-modern contemplation.

The global problems have their cause, finally, in socio-political developments, but they are accelerated by scientific technological progress, and they can also only be brought towards a solution when social and technological changes are interconnected. Science and technology can do justice to their original purpose—to alleviate human life and generally make that life more pleasant—only when they are no longer left to pursue their seeming natural course. Instead of being left to their own dynamics, they should be deliberately put into operation after appropriate reflection and careful consideration, and should be managed with conscious control, in other words, when their programme is executed with respect to the ideals of the survival of humanity in a future in which it is worth living, and when a constant control of the results of the implementation of the programme is instituted. That means, that science must devote careful consideration to its technological consequences in society, must anticipate possible desired or undesired effects, and must carry out any appropriate readjustments or reorientations.

This may be considered the principle of piecemeal engineering as coined by Popper. Taking into account that reality is something that inheres propensities and therefore is something contingent, piecemeal engineering is prepared to observe the

law of unintended consequences at least to the same degree as it tries to observe any other law in order to change the world according to the dictum of Francis Bacon. So, it is not complete control and it is not no control over subject-similar entities, it is a kind of smart, fuzzy, indirect control instead. It sets the stage for ascending from the less good to the better. It reconciles the feasible with the desired. That's responsible activism.

Objects of action, of reality and of consideration

Having dealt with the paradigm shift from the reductionistic, projective and disjunctive way of thinking to the integrative one in all three dimensions of the world view, it is worth underlining the close relationship between the dimensions within each paradigm.

Let us distinguish between objects of action, of reality and of consideration. Objects of action (O_a) are the ones which are acted upon. Objects of reality (O_r) are the ones existing as such. And objects of consideration (O_c) are the ones in our heads. Eventually, they are identical.

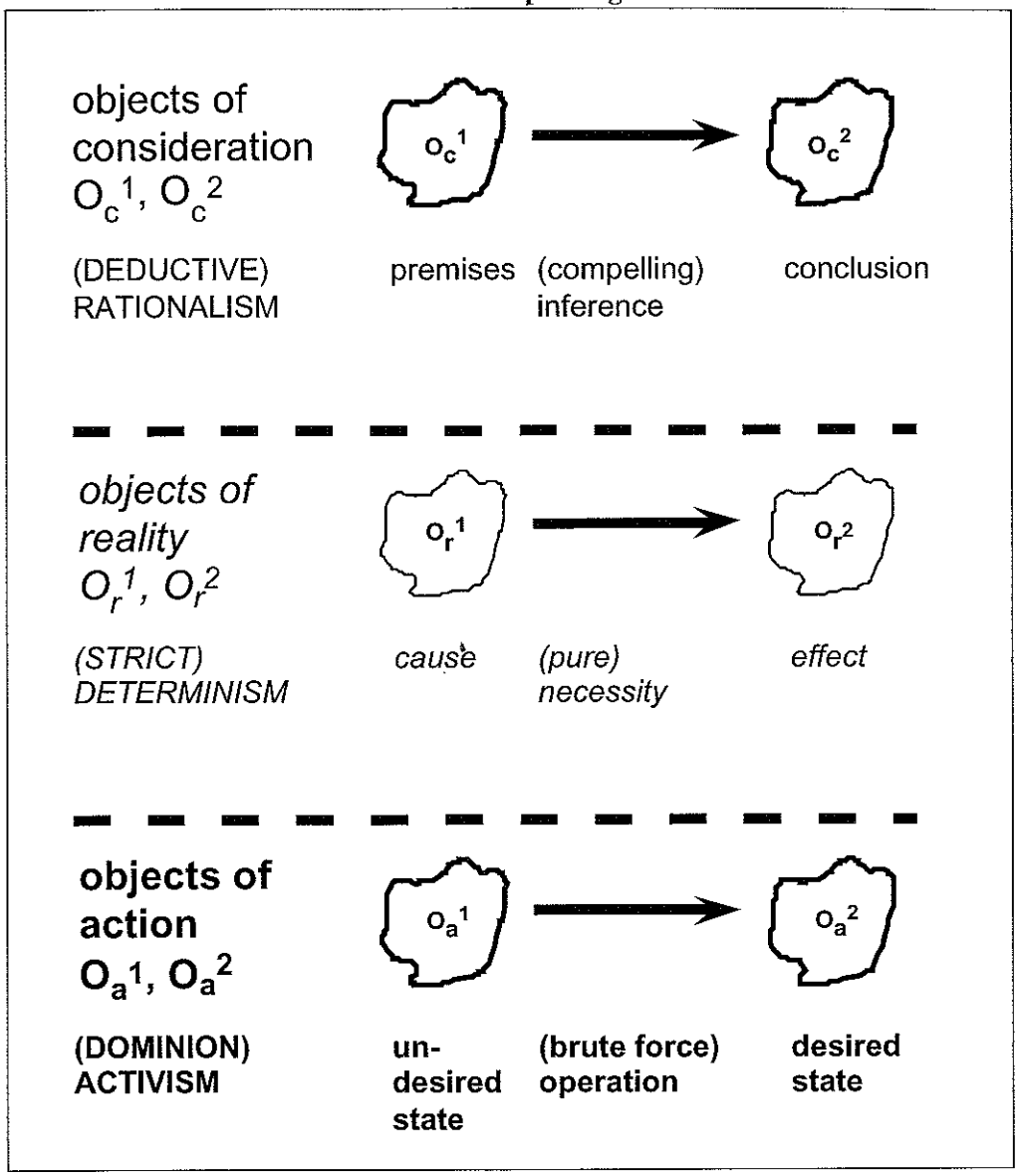
And let O_x^1 and O_x^2 indicate either the same object at two different points of time or two different objects at the same time and let the arrow indicate a linear transformation and the broken arrow a transformation involving ambiguity.

According to the way we (think to) act on objects, we fancy how they exist independently of our actions. And according to the way (we think) the objects exist, we apply methods of investigation and representation to them.

And according to the way we (think to) link objects in action, (we think) they are able to be linked in reality, and according to the latter (we think) they have to be linked in our considerations.

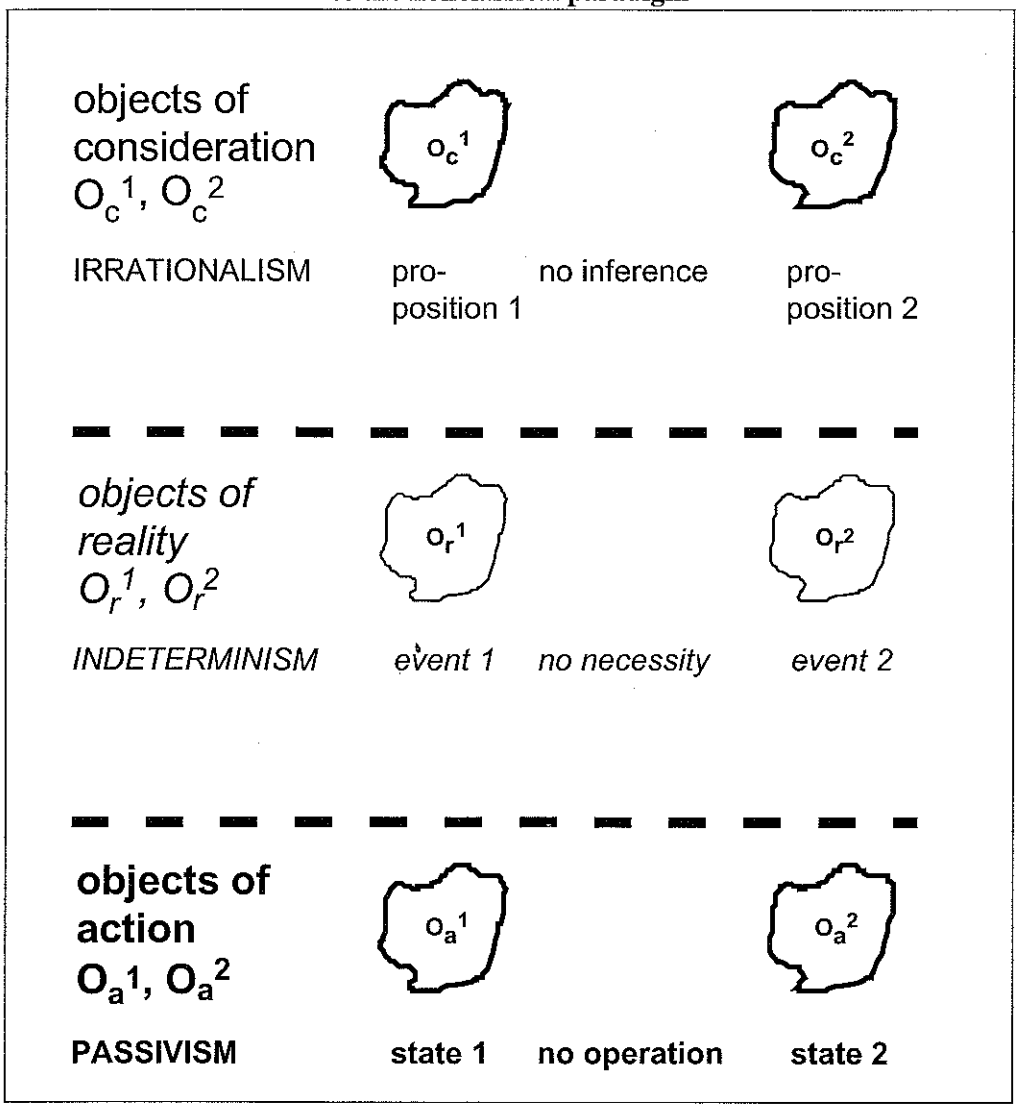
Now, the paradigm which is to be overcome can be characterised in the following way (see Figure 1): given dominionism, the action is a brute force operation which leads from one object to another like an initial state leads to a well-determined final state which is the desired one; this corresponds to reality, given strict determinism, in which one object is connected to another like a cause that is connected to its necessary effect; this, finally, corresponds to consideration, given deductivism, for which one object necessitates the other like premises that necessitate the conclusion in a compelling inference.

Figure 1: Objects of consideration, reality and action according to the classical paradigm



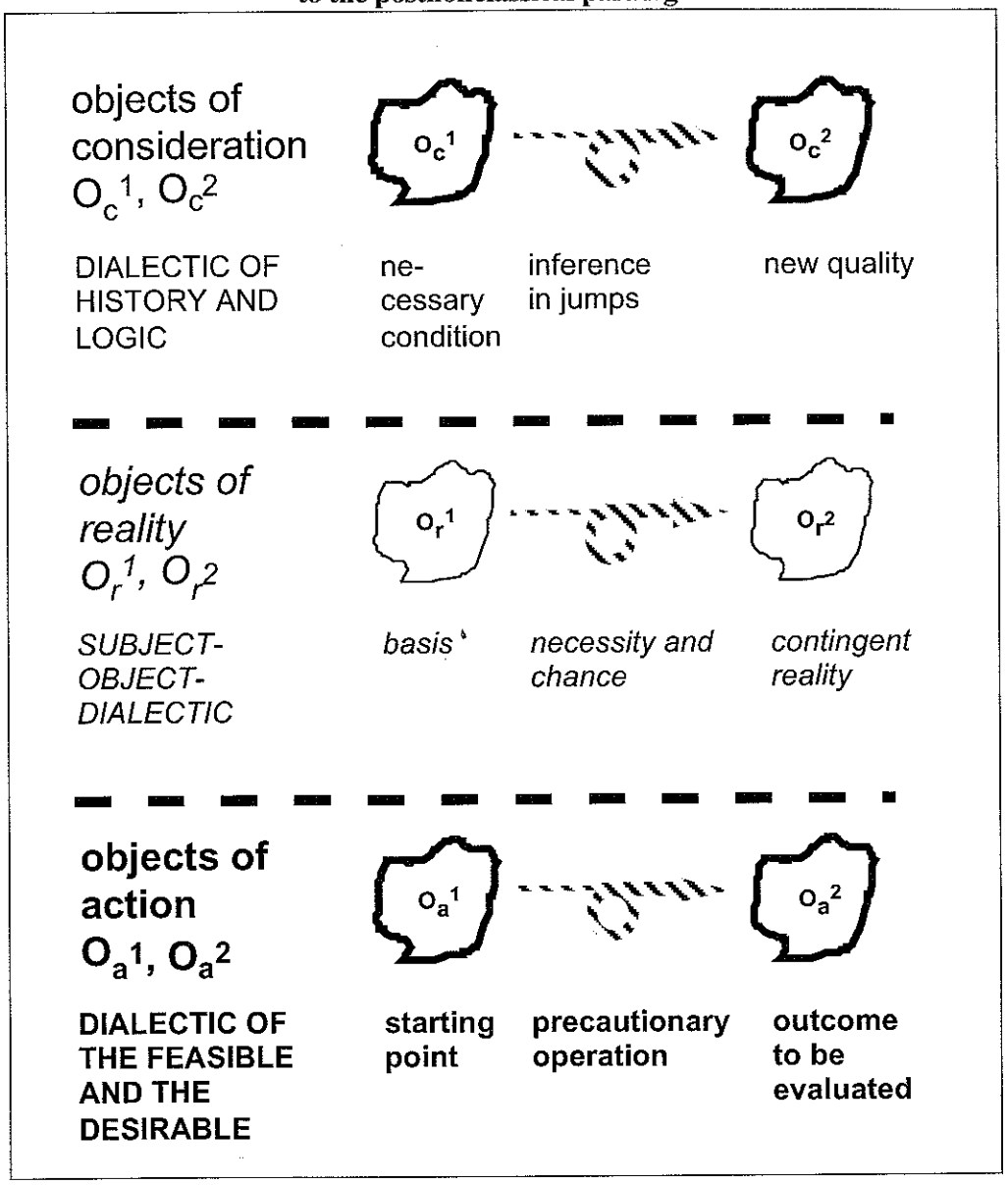
Contrary to that, the nonclassical paradigm cuts all connections (see Figure 2): there is no operation at all that leads to a desired state, there is no necessity at all that leads to an effect, and there is no inference at all that leads to a conclusion.

Figure 2: Objects of consideration, reality and action according to the nonclassical paradigm



The postnonclassical paradigm may be characterised as follows (see Figure 3): the objects of consideration are coupled in a dialectical manner, the first one representing the necessary condition for the second, and the second representing a new quality (dialectic of history and logic); this corresponds to the first object of reality being the base for the second one that is created in a contingent way like the subject-object dialectic suggests (necessity and chance together); this, finally, corresponds to objects of action that, in a dialectic of the feasible and the desirable, are constantly evaluated while they are operated on.

Figure 3: Objects of consideration, reality and action according to the postnonclassical paradigm



Thus, strategies in the new millennium have to be based upon the real-world implications and comprehension implications of the new way of thinking and new world view.

References:

Fleissner, P., & Hofkirchner, W. (1997). Actio non est reactio. An extension of the concept of causality towards phenomena of information. *World Futures* 49 (3-4/) & 50 (1-4), 409-427.

Heylighen, F. (1990). Autonomy and cognition as the maintenance and processing of distinctions. In F. Heylighen, E. Rosseel, & F. Demeyere, F. (Eds.), *Self-steering and cognition in complex systems: Toward a new cybernetics* (pp. 89-106). New York: Gordon and Breach

Hofkirchner, W. (1998). Emergence and the Logic of Explanation. An Argument for the Unity of Science. *Acta Polytechnica Scandinavica, Mathematics, Computing and Management in Engineering Series 91*, 23-30.

Hofkirchner, W. (1999). Ways of Thinking and the Unification of Science. In: Proceedings of the 43rd Annual Conference of ISSS (The International Society for the Systems Sciences), Allen, J. K., Hall, M. L. W. and Wilby, J., (eds.), ISBN 09664183-2-8 (CD-ROM)

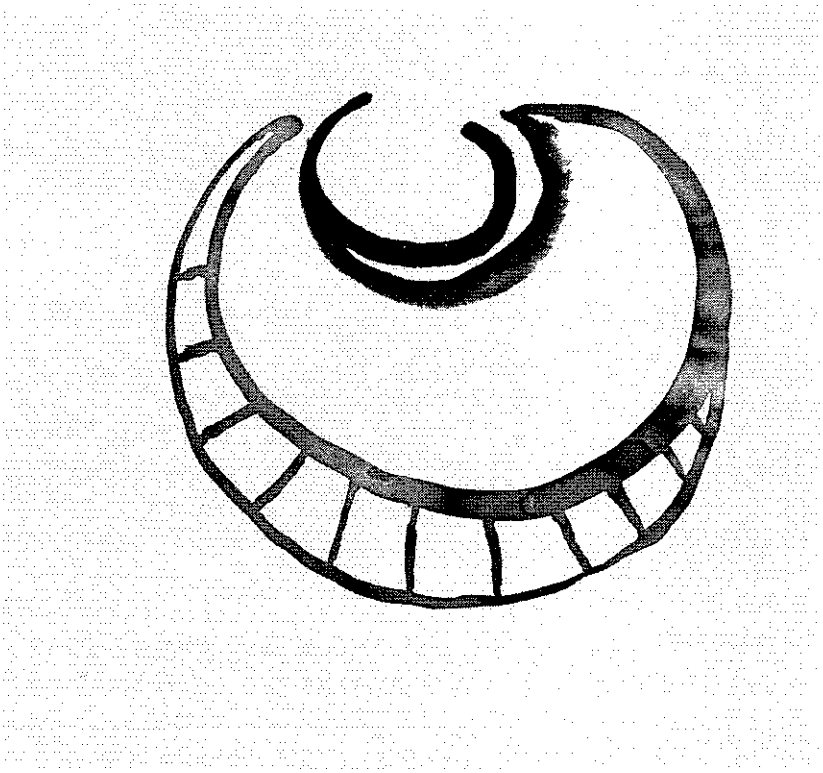
Hofkirchner, W. (2001). The hidden ontology: Real-world evolutionary systems concept as key to information science. *Emergence, 3*(3) 22-41.

Morin, E. (1998). *Homeland Earth: A manifesto for the new millennium.* Cresskill, NJ: Hampton Press

Popper, K. R. (1973). *Objektive Erkenntnis.* Hamburg: Hoffmann und Campe.

Popper, K. R. (1997). *A world of propensities.* Bristol: Thoemmes Press

Toulmin, S. (1990). *Cosmopolis: The hidden agenda of modernity.* New York: Free Press.



SUBSCRIPTION ORDER FORM

Name .....

Address .....

.....

.....

Credit card subscribers must give cardholder registered address

Home telephone..... Email.....

Vol. 11 (2004), published quarterly (4 issues per annual volume)
Individuals: $69 (£43) Institutions: $133.50 (£83.50)
Prices include surface delivery. Airmail extra: $22.50 (£13) per volume

☐ Please enter my Individual/Institutional subscription for Vol. 11 ☐ Airmail

BACK VOLUMES 1–10 (1994–2003). Rates as above. All issues currently available.

☐v1-10 (***50% discount***)
☐v1 ☐v2 ☐v3 ☐v4 ☐v5 ☐v6 ☐v7 ☐v8 ☐v9 ☐v10

Payment Details

☐Cheque (pay 'Imprint Academic') — $US (US bank), £ (UK bank)

☐Please charge: ☐ VISA ☐ MASTERCARD ☐ AMEX ☐ SWITCH ☐ DELTA

Card No..... Expiry date ..... Signed .....

☐*Option:* Tick here for details of our Credit Card Standing Order scheme (automatic renewal)

☐ Please tick if you do not want to be on our mailing list

Secure online ordering: www.imprint-academic.com/C&HK

Subscription Office:

Imprint Academic, PO Box 200, Exeter EX5 5YX, UK
Tel: +44 1392 841600 Fax: +44 1392 841478 sandra@imprint.co.uk www.imprint.co.uk

---

To: The Head Librarian/The Library Committee
From.....

Department .....

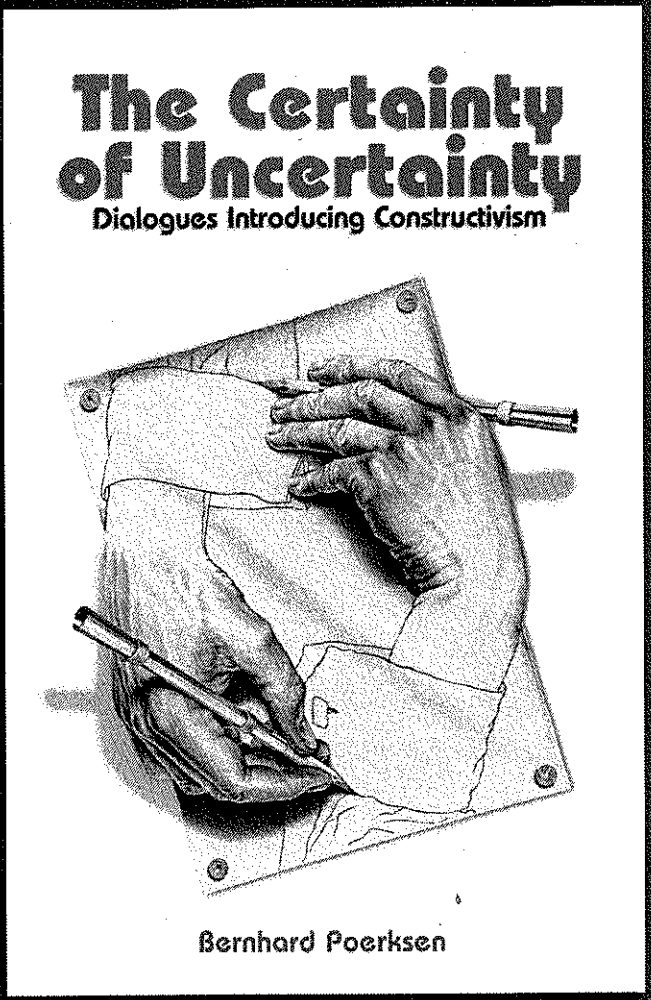
I/we have studied the journal *Cybernetics and Human Knowing* (ISSN 0907 0877), and recommend that the journal be purchased for the Main/Department Library.

INSTITUTIONAL SUBSCRIPTION RATES: Vol. 11 (2004): $133.50 (£83.50).
Prices include surface delivery.
Airmail extra: $22.50 (£13).

BACK VOLUMES 1–10 (1994–2003). Rates as above. All issues currently available
SPECIAL OFFER: Place an order for Volume 11 (2004) and purchase all the back volumes at *50% discount.*

Sample copy requests / Enquiries / Orders to:

Imprint Academic, PO Box 1, Thorverton, Exeter EX5 5YX, UK.
Tel: +44 1392 841600 Fax: +44 1392 841478 sandra@imprint.co.uk www.imprint.co.uk



New from Imprint Academic

The Certainty of Uncertainty

by Bernhard Poerkson

ISBN 0 907845 819
£14.95/$29.90, 200 pp. (pbk)

PO Box 200, Exeter, EX5 5YX, UK
Tel: +44 (0)1392 841600
Fax: 841478
Email: sandra@imprint.co.uk

Bernhard Poerksen is junior professor of journalism and communication science at the University of Hamburg. He was awarded a Ph.D. for a thesis on the language of neo-Nazis and wrote books together with Heinz von Foerster and Humberto R. Maturana.

Nothing that can be said is independent of us. Whatever can be said is coloured by our dreams and aspirations, by the way our brain works, by human nature and human culture. Whoever claims to know or to observe is – according to the central constructivist assumption – inescapably biased.

This book presents the views of the founders of constructivism and modern systems theory, who are still providing stimulating cues for international scientific debate. The conversations of Heinz von Foerster, Ernst von Glasersfeld, Humberto R. Maturana, Francisco J. Varela, Gerhard Roth, Siegfried J. Schmidt, Helm Stierlin and Paul Watzlawick with Bernhard Poerksen, display a kind of thinking that steers clear of rigid fixation and reveals the ideal of objectivity to be a myth. The conversations turn on the results of brain research, the breakthroughs of cybernetics, the linguistic determination of thought, and the intrinsic connection between epistemology and ethical practice.

Throughout, the central figure of the observer is examined with sophisticated wit and just enough irritating grit to create the pearl in the oyster. Constructivism thus emerges as a philosophy of possibilities that keeps generating new points of view, insists on fundamental scepticism with regard to certainties and dogmas and provides the foundation for an ethics of perception: Each of us is responsible for their own viewpoint.

toc & sample full text: www.imprint-academic.com/books/poerksen.html