The crisis of contemporary science

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The crisis of contemporary science

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Abstract

Purpose – To present a new approach to scientific thinking (paradigm) that avoids the shortcomings and inconsistencies of the prevailing Newtonian approach.

Design/methodology/approach – The signs of a science in crisis are reviewed and some of its shortcomings are compiled and connected to some misleading fundamental assumptions of the reigning paradigm of science. Calls attention to a current fundamental misunderstanding of the human capacity of observation – especially the negligence of the conceptual feedback loops of the human mind that make up the core of human learning capacity.

Findings – When using a subject-oriented approach (SOA) to science, which takes off from the individual knowing the subject (methodological solipsism), it is possible to consistently construct a knower's science where all today's misleading assumptions can be successfully removed. This effort results in an abstract constructivist epistemology, where the reversed cause-effect chain severely upsets the classically trained mind – especially in natural science.

Research limitations/implications – There is a great deal of work left to examine the soundness of these ideas and pave the way for such a profound re-orientation of traditional science that as a first step will be concerned with elucidating and explicating a wide range of problems and concerns in set and decision theory, logic, and mathematics. This is essentially to launch a research programme in these areas that as a next step includes all natural and social sciences that will appear in a new light when viewed from a first person, SOA.

Practical implications – There is no other way for science to evade the prevailing crisis but to involve, in its very Kuhnian sense, a radical change of paradigm. In this view, the realist confusion, which is responsible for the genesis of Cartesian dualism and a row of other inconsistencies met with intoday's science, will slowly vanish, as will the embarrassing gulf between the natural and social sciences as well as humanism. This new "world-view" that seems radical to the scientist will appear natural to the everyday man – but its impact on human culture will be monumental.

Originality/value – The SOA to science is based on a reversed cause-effect thinking that will have a heavy influence on the way people think about the world and is accordingly a concern of all human beings as well as each researcher – of whatever of discipline.

Keywords Sciences, Object-oriented programming, Sociocybernetics

Paper type Conceptual paper

Introduction

Most scientists take for granted – or anyhow very often behave in such a way as if they do – that the philosophical foundations underlying science are secure and unshakeable. They are given as part of the Newtonian paradigm that in fact defines the beginning[1] of modern science (Jackson, 1996) and since these days, physics and mathematics has become the very templates of scientific activity. For some reason, very little efforts are spent on the metaphysical foundations of science and more than one scientist has quoted, with some tinge of irony, that "philosophy of science is about as useful to scientists as ornithology is to birds". Another story tell us that according to

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aerodynamics, the bumblebee is unable to fly. However, the bumblebee continues to fly anyway since it does not know about aerodynamics. By the use of such comments, and the like, some scientists seem to suggest that you can successfully engage in an activity lacking of a theoretical understanding of it. This evidently goes for the bumblebee and flying – but what if the activity you are engaged in is to "explicate theoretical understanding?" This is really all what science and all other human knowledge building is about and in this situation, we must ask, if the (conceptual) tools we are using really can do the job we have in mind. In the case, we do not, we will surely one day find ourselves struggling intotally vain – put in the same situation as the bumblebee would have been when trying to fly using its legs. The bumblebee evidently has learnt to fly because it by happenstance took advantage of a useful tool of flying – and in the same vein scientists continually must ask themselves what "tools of understanding" they must use and how useful, the present ones are. Science and mankind must pay more attention to such fundamental questions, otherwise, we run the risk doing science in a vainly manner. In fact, I would already here advance the claim that today's many-voiced claim of a successful science mainly relates to its factor of success in terms of the one-sided thinking of western market economy, the dominance of which has left the theoretical precautionary measures of basic science and human knowledge building for miles behind, rather than some soundness is its principles. We must ask, what criteria we use when we are so prone to consider our scientific culture for "successful" when it enables us to land a man on moon, when it, on the other hand, is totally unable to understand the ravaging conflicts between different cultures and human beings.

On the theoretical plane, there is an urgent need to reconsider the very foundation of western science and ask how come we as the first step furnish the world with "things" that are in a sense pre-given by God or some other authority as if this was the only possible point of departure. Maybe, as once suggested by Brentano, we should enter the path of science by means of the only experience given to human beings in contemplation – namely their private impressions – and thereby, in the spirit of Husserl set aside the unanswerable question of an existing physical reality. In that sense, we will suggest a pure abstract – or systemic approach.

On the methodological plane, the traditional science furthermore prescribes to exclude the feelings that accompany each human impression – as if human sensation and feeling in some way were separable. Another reason the inner feelings cannot be neglected is that they have heavy outcome on human decision processes. To the trained scientist, this is a counterintuitive path to enter upon, which is, as we soon shall see, well motivated by the alarming but unfortunately most often suppressed signs of a western science in deep crisis. In this situation, the discipline of sociocybernetics has, albeit accidentally, become a productive melting pot for ideas that will pave the way for a necessary revision of the prevailing Newtonian thinking, i.e. the science of future – or a "Scienza Nouva"[2] in the words of Vico (1968). By making use of the methodological tools as developed in early cybernetics that was further developed, mainly by H. von Foerster, into a "second order" cybernetics where some strands of the sociocybernetic[3] research (Geyer, 1995) concentrated on the cumbersome observer/observed situation and by its particular interest in the abstract traits (or non-physical) of the knowing subject and societies happened to strike on a string, albeit counterintuitive, that offers a useful way out of the mentioned prevailing crisis.

In its formulation, Felix Geyer rightly advanced sociocybernetics as mainly a "challenge to sociological thinking" as it offered a systemic methodology developed by natural scientists also allowing for computer simulation methodologies that offers sociology, an experimental tool of research. When one pursue these idea of a challenge beyond the novelties of "second order contemplation", which in fact proves its own inadequacy, we have to accept that a subject-oriented approach (SOA) to science is needed. This approach indeed challenges the whole Newtonian paradigm and most traditional western science and moreover proves to be the only way out of today's embarrassing dilemma. To understand this, we must first elucidate some strands sociocybernetics, and place it in a proper context and hint on its methodological distinctive mark that is helpful in revealing in what way modern science was misled.

What is sociocybernetics?

Sociocybernetics – a strange word indeed – which is probably totally incomprehensible to the uninitiated. Therefore, we must first motivate the joining together of the two terms "social" and "cybernetics" into "sociocybernetics" – and characterize the principal traits of this discipline. In doing so, one readily discovers that even the separate terms "social" and "cybernetics" are not very well defined and also in the need of explication – otherwise, the term sociocybernetics runs the risk of being regarded primarily as a funny catchword. This is not the case at all, however – my claim is rather the opposite – the approach as advocated by sociocybernetics will extend and replace the prevailing classical Newtonian paradigm that hitherto weirdly enough, also has permeated the socio-cultural domain.

We are thus able to forebode a change of scientific paradigm, which fortunately will turn out to be an extension of the classical paradigm in the same sense that the theories of relativity once extended the classical thinking. The backside of the coin is that a simultaneous radical reorientation of our scientific thinking is asked for and the traditional thinking of science embraced by the so-called classical object-oriented[1] approach (OOA) to knowledge must be replaced by an epistemology taking the stance of the observing subject and its very private knowledge – accordingly called the SOA to knowledge (Kuhn, 1962). The subject-oriented viewpoint seems scientifically counter-intuitive but nevertheless very natural for most living beings (especially, the unbiased eye of a child), since these are the impressions we get in everyday life. This view is radically different from the prescribed scientific view, which inspired by physics has become the western ideal of observation, namely that of the "detached observer" and for that reason, we in this new science must now regain the ability to also apply the first person perspective correctly.

Sociocybernetics is a discipline where the social and natural sciences tend to intermingle, therefore, it should not come as a surprise that here the infirmity of classical worldview of science was experienced as a severe obstruction already at an early stage. The living subject, its organizations and society has since long been the object of discourse belonging to psychology and sociology and for that reason, a SOA here appears both as a natural and compelling necessity. Sociocybernetics extends these areas of interest by providing a methodology borrowed from of cybernetics – a discipline that many people hastily would juxtapose to the systems sciences. The term "socio" in stands for sociology, i.e. the study of human social behaviour, especially, the study of the origins, organization, institutions, and development of human society.

In that respect, the analysis of social institutions or societal segments as self-contained entities or in relation to society as a whole displays itself. The term "self-contained entities" here unmasks the close parallel to computer science and its recent interest in "interacting software agents" diverging also into to the life sciences – especially, biology. The origin of the physical, social, and cultural development and behaviour of man is of course implied in the term "socio" but, on the other hand, it also has strong connections to psychology and anthropology.

To align sociocybernetics with systems science is not entirely correct, since the latter take on a strict OOA and for this reason stays loyal to the classical paradigm of science. The organizational methodologies in use in sociocybernetics should be subject-oriented and very often are, however, the lack of paradigm is disturbing a situation we most often encounter in the social "sciences". The interest in human feelings and their acknowledged important function as a determining factor of human actions has never ever been a recognized part of a legitimised natural science and, therefore, no such discipline has been regarded qualified as a genuine science. Therefore, the "social sciences" have been considered rather a part of the humanities and human cultural efforts. However, when we put the prefix "socio" before "cybernetics" we do so to signify the interest and acceptance of human feeling and intuition as a common ground for decision and communication and, thereby we suggest a new methodology to use in sociocybernetics. But in doing so – and this is important to note – we also say goodbye to the epistemology of traditional science as embraced by the Newtonian paradigm. This is also why sociocybernetics is something different from traditional systems sciences in its reliance on the SOA – which essentially is a constructive epistemology, albeit this state of the art is sometimes unclear even to sworn sociocyberneticians.

Another characteristic is that sociocybernetics, like classical cybernetics, make heavy use of the concept of feed-back control and in that vein concentrate on its human/social and living aspect – namely the feed-back of feeling. This is a very powerful force in human life and decision-making that overshadows most of our deeds and actions that has been stubbornly rejected by classical science for several hundred years. The dictum of classical science has been: there is no place for feelings in science! This serious misconception has unfortunately led science severely astray. It is very easy to understand that a science with no place for feeling and intuition is unable to embrace biological living and no wonder that classical science is unable to tackle the problems met with in the life sciences and consciousness studies. This dictum of traditional science seems to call for a "science" at its worst – a plain technology for watchmakers.

In this interpretation, the prefix "socio" will stands for the most forceful and expressive factor of living behaviour – the feeling – that beside sensations also includes the bodily "inner" feelings. Therefore, the interdisciplinary research direction imported by sociocybernetics has helped us re-open the door closed by Galileo and Descartes and so carefully nailed by Newton. When we start scrutinising the science as practised since the time of the scientific revolution – not only with the observer's biased eye – but also with a knower's more open mind we will dig out quite another epistemology. In spite of scientists indiscriminate homage to scientific objectivity – and the irrational appraisal of human rationality, we will understand the "door of subjectivity" was not closed[4] at all (Kjellman, 2001a, b) – fortunately.

We will also discover that feed-back of feelings is the clue to human brain's astonishing ability to learn and involve in cooperative communication. Entering upon this path, we will slowly begin to understand why the classical reality conception and scientific objectivity is chimera and how come these ideas become so well celebrated. So now, let us return to trace the signs that reveal a science in crisis.

The early signs of crisis

Since, the time of the scientific revolution, experimentation and the succeeding mathematical analysis has become the ideal of science and this attitude has for that reason also had a heavy influence on the humanities. The methodology of science has more or less become synonymous with the one of physics – the Newtonian paradigm – that furthermore seems to have penetrated the whole of modern western thinking. Maybe, it is not fair to blame Newton and his contemporaries for the fact that they were caught under the spell of the naïve man's view of a God-given nature accessible to certain human knowledge, but science as a human endeavour cannot possibly swear its way out of the conceptual naivety that we still are.

This paper will dwell on the problematic situation that the Newtonian paradigm has fenced human imagination into position that make impossible a sound understanding of human knowledge acquisition and scientific methodology, a situation that gradually has put contemporary science into a state of severe crisis – while many of its practitioners just like the bumblebee happily unknowing (?) credulously just flies on coincidentally praising the outstanding success of science. This is a weird situation for sure, but most practicing scientists seem totally preoccupied with solving their own problems – deeply convinced that all fundamental problems in the modern sciences in due time will be satisfactorily resolved within the established paradigm of today's normal science. It seems, we like the bumblebee, see no reason to pay attention to the hidden presumptions and the basic definitions of the sciences we so diligently use and we care very little to discuss its very foundations. No surprise then that some researchers even seem to see a certain hazard in doing so and often tend to guard the gates of science against the fake and the mystical with a faith that sometimes take dogmatic proportions.

Consider, for instance, that during the latest 100 years, the many debates centred on implicit ontological issues about the ultimate nature of reality has mainly been undertaken by physicists. They are brought up under the seducing spell of the realist's doctrine and the succeeding epistemological issues about what science is able to find out, and are, no surprise, heavily biased by their firm belief in scientific realism.

Husserl (1937) strongly objected to such forms of fundamental and habitual distinctions and rightfully asked:

> Can reason and that-which-is be separated – where reason, as knowing, determines what is?

In doing so, he more precisely asked as to whether the "features" we attribute to the phenomena that, to us, seemingly "appear on the stage of the world" can be successfully separated from human knowledge. This question is crucial since we will find that such an affirmative separation is a fundamental assumption that underlies the Newtonian paradigm – in any case, if we bother to pay some attention to this all-pervading scientific question. The realist's attitude appears to be risky and Husserl claimed that he could identify a deep crisis of European Sciences (Husserl, 1937) when pointing out:

- a deeply felt lack of direction for man's existence;
- the sense of emptiness of European culture values;
- the collapse of belief in a universal philosophy;
- the paradoxical theories of relativity;
- the rise of the quantum confusion of physics; and
- the impact of Gödel's theorems on logics and mathematics.

He highlighted and revived the classical contrast between the subjectivist's and objectivist's epistemology, which he mentioned as the "opposition between Physicalistic Objectivism and Transcendental Subjectivism". However, very few was willing to listen to him since philosophy was totally out of fashion in these heydays of logical positivism.

His misgivings were ominous and he reflected at state of dissatisfaction that had risen as the repercussions of the findings of the late nineteenth century when the foundations of physics and mathematics was questioned. In the period between 1850 and 1880, German science was dominated by mechanistic materialism, which was a blend of Comptean positivism, materialism, and mechanism. The source of the crisis can be dated back to these days when the work of Helmholtz (1878), the physiology of the senses indicated that an adequate philosophy must make provision for the activity of the thinking subject in the growth of scientific knowledge – something mechanistic materialism did not do. Some years earlier, the mathematician Gauss in a letter to Bessel in 1830 also made the remarks that "numbers are distinct from space and time in that the former are just a product of our mind." Dedekind (1888) picks up on this theme in the introduction to his famous monograph and says:

> In view of this freeing of the elements from any other content (abstraction) one is justified in calling the numbers a free creation of the human mind.

This seems to contrast with Kronecker's (1887) remark:

> Die Zahlen hat der liebe Gott gemacht, alles andrere is Meschenwerk[2].

thereby suggesting that the numbers was something unquestionable and, therefore, pre-given to human beings in their thinking and imagination. He also becomes a forceful critic of logicism when he argued vigorously that the "fundamental definitions were only words, and therefore do not even enabling us to decide whether a given object could count as a number". In his hesitation about the ultimate nature of numbers he gave a voice to the growing scientific alienation and thereby he foreboded the profound conceptual issues that later aroused when Russell pointed out an infirmity in the works of Frege. This flaw has since then has been known under the name of Russell's antinomy and neither logics, mathematics nor its set-theoretical foundation has yet recovered from this finding – that in a nutshell also in mathematics reflects the process of scientific alienation that begun by the time of the scientific revolution.

The same situation occurred in physics when the works of Planck (1959) gave rise to the modern quantum thinking, but the situation in physics became even worse, because here scientific description and explanation is very much the same endeavour. Scientists started to see that many of the phenomena in science that we are interested in do not come with descriptive manuals and cannot easily be inspected or taken apart

without disturbing their behaviour. Often one, single observation of a phenomenon will change its state and totally frustrate the build-up of a useful model – this was quite a new situation facing quantum physics. The groundbreakers found that classical way of scientific reasoning simply did not apply in the quantum realm any longer.

Inspired by Mach (1886), the theories of relativity were established by Einstein thus wiping away Newton's ideas about absolute time and space that hitherto had been a self-evident feature of classical physics. In his footsteps, Minkowski followed and he recast the dynamics of moving bodies in four-dimensional geometry and the physicists continued to discover even more quantum phenomena that in due course brought the observer to a central position also in their science.

Some years later 1931, Gödel (1962) dealt out, what as since then has been classified as a heavy blow to formal axiomatics. At the time of its discovery, his incompleteness theorems was a great shock and caused much uncertainty and depression among mathematicians sensitive to foundational issues, since it seemed to pull the rug out from under mathematical certainty, objectivity, and rigor – which hitherto had escaped the confusion met with in quantum physics.

Weyl (1949) stated:

> We are less certain than ever about the ultimate foundations – of (logic and) mathematics. Like everybody and everything in the world today, we have our crisis: We have had it for nearly fifty years: Outwardly it does not seem to hamper our daily work, and yet I for one confess that it has had a considerable practical influence on my mathematical life: it directed my interests to fields I considered relatively 'safe', and has been a constant drain on the enthusiasm and determination with which I pursued my research work.

Seemingly the ill-fated foundational issues continued to annoy the leading researchers but, as Weyl says, "does not even seem to hamper our daily work". Seemingly Gödel's remarkable finding has had no lasting impact on the daily lives of mathematicians or on their working habits; and today it seems no one loses sleep over it any more since inconsistent mathematics has become a part of daily practice.

The next blow to classical thinking was not far away and in 1957, Bell's theorem (Clauser and Shimany, 1978) showed us that quantum physics is incompatible with the proposition that physical measurements discover some unknown but pre-existing reality and made the same foundational issue a piece of the praxis also of physics. Moreover, this theorem stated that the idea of a pre-existing classical "reality" cannot exist alongside the principle of local causes (Einstein locality) and quantum theory, which seemed another convincing argument for abandoning the idea of a pre-existing reality in its classical sense. Bohr was the dominant figure in the mid-1920s discussions that led to the Copenhagen interpretation of quantum mechanics. He insisted that the developments in quantum physics necessitated a rethinking of the involvement of observer function. He emphasised the subjective nature of all experience and this interpretation in one blow split the physicist into two opposing camps. Von Neumann, Wigner and Wheeler (Wheeler and Zurek, 1983) were saw themselves forced to attribute a decisive role to the consciousness of the observer in the notorious problem of making measurements possible, but the daring step to frankly question the idea of scientific realism and rationality of science was to evidently too wide. In 1963, one could not be mistaken of the state of frustration exposed by Von Neumann (1963):

> . . .there have been within the experience of people now living at least three serious crises . . . . There have been two such crises in physics – namely, the conceptual soul-searching connected with the discovery of relativity and the conceptual difficulties connected with discoveries in quantum theory . . . . The third crisis was in mathematics. It was a very serious conceptual crisis, dealing with rigor and the proper way to carry out a correct mathematical proof. In view of earlier notions of the absolute rigor of mathematics, it is surprising that such a thing could have happened, and even more surprising that it could have happened in these latter days when miracles are not supposed to take place. Yet it did happen.

This situation was alarming, and for sure not only to von Neumann, but physicists in general are realists by profession so to speak, and for some reason, very few are willing to discuss the essence of the Newtonian paradigm and its strict dogmatic use – not only in physics. The majority of physicists have stayed loyal to realism – and even Bell himself remained a convinced realist. They found support in Popper (1972), Bunge (1977) and other philosophers that insisted any such emphasis would violate the objectivity proper both to physics and science.

No surprise that we late in the twentieth century witnessed a backlash in favour of realism in some circles when the semantic view as once introduced by Suppe (1989) (Morgenbesser, 1967) experienced a revival. At present, we see sustained efforts to replace the Bohr's instrumentalistic interpretation of quantum mechanics by newer accounts, such as decoherence[5] (Zurek, 1981) or consistent histories where the classical ideas of scientific realism seems to reappear in new guises. Despite von Neumann's (1932) warnings new versions of strong reductionism (Weinberg, 2004) for ultimate quantum explanation has also appeared and the new super-string theories (Green, 1999) indicates the physicists firm determination to defend the classical OOA. The voices from quantum chemistry (Scott, 1995) and biology are in opposition – as are those of Finkelstein (1996) and Stapp (1993). Unfortunately, this was not even the end of the road of trouble met with during the past century since the fourth crisis was about to come, when consciousness studies managed to drag classical science even deeper into its inherent state of crisis.

The study of human consciousness

During the twentieth century, the cognitive sciences had made us understand perception is mainly a non-deductive endeavour and at the turn of the century, we began to understand that the problem of consciousness (Chalmers, 1995) could not simply be approached from the third person perspective so clearly advocated for by classical science. Since, also the prevailing methodology of science is developed using the same paradigm – the classical approach to the problem of consciousness is likely to fail and so are also the attempts to apply classical interpretations. After all the entire standpoint taken by behaviourism and Skinner (1972) was very consistent with the ideas of classical science: "mental processes may exist, but they are ruled out of scientific consideration by their nature" – and so deep was the faith in the realist's doctrine in the early days that the scientists was even prone to leave the phenomenon of consciousness fully outside of the scientific endeavour and also managed to do so for more than six decades. This downgrading of the role of the human being in science has resulted in a deepening chasm between the two opposing two cultures – the natural sciences and humanities. It has led to a distrust of science on the part of people that are more interested in human problems and aspirations and inversely a disregard

of the tools and methodologies as used in the social sciences from the natural scientist's part.

It goes without saying that the daft idea of trying to leave the phenomenon of consciousness outside of the scientific endeavour cannot last long since knowledge acquisition is notwithstanding an activity deeply intermingled with human consciousness, no matter whether we call such an activity a natural or social science. In this situation, we must ask what kind of a science were we dealing with when the human brain, responsible for the entire edifice of science, could not be considered the legal object of scientific discourse. Such a science must for certain house some fundamental shortcomings or bewildering assumption.

The quantum physicists had recognised the conceptual difficulties at an early stage. When they turned to quantum mechanics, they brought with them conceptual tools that had been developed in Galileo/Newton's classical physics, statistical mechanics, and relativity theory. They soon found, however, that the new physics called for more but the daring step to question scientific realism and the rationality of science was to evidently too far. The most influential movement of this period is logical positivism that was influenced by Frege's developments in logics, Russell and Whitehead (1913) Principia Mathematica and the Machian program in physics. The logical positivists tried to connect to "reality" by means of logic and the use of an "observation language" thereby abandoning Mach's original subjectivist ideas in spite of the fact quantum physics is in many camps regarded a subjectivist program. However, physicists, in general, pay little attention to the basic definition of physics and most often they tend to equate physics to science and are thus unable to make a clear distinction between metaphysics and meta-science. They seem to take the fundaments of science for pre-given and unshakeable and dazzled by the beauty of mathematics, quite eager to develop mastery in the art of mathematical manipulation. The complication of complex mathematics take on the same role as the emperor's new clothing and they sometimes excel in the presentation of cryptic formulas sadly forgetful about the behind laying phenomena. The need for rapid technological advances that has emerged under the pressure of the modern market economy has almost supplied blinders upon a science that the passed century that simply has tried to drive across the conceptual difficulties encountered.

However, some physicists proclaim we are approaching a point of paradigmatic turnover and apart from Bohr and Einstein, we find Bohm, Wigner and Wheeler (Wheeler and Zurek, 1983) as the most prominent exceptions, a spokesman (Prigogine, 1996) for the emergent sciences of complexity points out:

> I believe that we are at an important turning point in the history of science. We have come to the end of the road paved by Galileo and Newton, which presented us with an image of a time-reversible, deterministic universe. We now see the erosion of determinism and the emergence of a new formulation of the laws of physics.

As students of science we were, in the middle part of past century, typically given the impression that the more fundamental laws are increasingly certain. It may come as a surprise, then, to discover that some of the most basic assumptions underlying science are very questionable – and discover that basic building bricks of science are founded on a misunderstanding that in principle make modern science into an unscientific endeavour. We must agree with Prigogine: the edifice of science is shaking since the classical Newtonian paradigm has proven insufficient, a fact that already quantum

mechanics showed early in the past century – but almost no one has dared the ultimate guess: that science as practiced today is both inconsistent and deeply misleading.

What is the problem?

One fundamental problem is the Newtonian paradigm with its underlying realist doctrine – which has cemented the naïve man's view of a world pre-given to perception. Taken together with the fact that classical physics has become the prototype ideal of science, this situation has created a science facing a lot of serious problems that still are far from overcome. We might try to elucidate the predicament of classical science by the following short remarks that by no means are complete:

- the crippling chasm between the natural and social sciences;
- the vainly quest for the ultimate nature of things;
- the occurrence of self-organizing forces in living systems;
- the lack of sound interpretations of quantum physics;
- the paradoxes of logics and set theories;
- the vainly quest for truth and a paradoxical truth conception;
- the theory-laden-ness of human perception;
- the banishment of human feeling and intuition; and
- that a science of knowing and human consciousness is impossible within the prevailing scientific framework.

Surveying these points one can easily get the impression that the whole project of science is a failure but fortunately such premonitions are premature. On a closer analysis (Kjellman, 2003), these seemingly disparate shortcomings can be compiled as to belong to some fundamental assumptions that lead astray namely:

- there is a world pre-given to direct human perception;
- human perception is a mapping process which works independent of the individual user;
- observation is a valid tool of human decision; and
- scientific judgements can be subjected to truth evaluations.

Even the mentioned group of assumptions can be further reduced, as we shall see in next section, and at the lowest level of explication, we will find the villain of the piece – a fundamental misunderstanding of the human capacity of observation. Since, observation has been considered the secure base for scientific certainty since the time of the scientific revolution such a flaw will influence all branches of science – and do so a fundamental level of conceptualisation.

We can trace the early understanding of this flaw at least back to Kant (1781) that claimed the "thing-in-itself is inaccessible to human knowing" a claim that has re-emerged in quantum physics and early cybernetics. Central to the paradigm of cybernetics as formulated by Wiener (1948) was the feed-back loop the emerged from control theory and operations research during the Second World War and by the discovery of the self-organising forces of human brain the early cyberneticians also took an interest the observation capacity of man. The very moment one starts to

further develop these ideas with a focus on the modern understanding of the neural feedback connection path a totally different picture of human observation capacity emerges and then the pieces of today's fragmented science slowly begin to fall on their places.

The removal of these misleading assumptions mentioned will, on all fronts, close the debate between realists and their anti-realist opponents, which is still very much open. Here, the central issue is a foundational one, as explicated by Schrödinger (1967, p. 117), namely "the two general principles that form the basis of the scientific method, the principle of the understandability of nature, and the principle of objectivation" – but he very carefully points out – as if he were hesitant – that he only is a presenter of the established rules in charge:

> … some people seemed to think that my intention was to lay down the fundamental principles which ought to be at the basis of scientific method or at least "which justly and rightly are at the basis of science and ought to be kept at all cost". Far from this, I only maintained and maintain that they are – and, by the way, as an inheritance from the ancient Greeks, from whom all our Western science and scientific thought has originated.

The "understandability of nature" tacitly implies that "nature is both pre-given and singular" that it the naïve man's view underlying each creation narrative. The "principle of objectivation", on the other hand, is a more involved principle that attributes a most remarkable feature to the skilled human observer namely "objectivity" (non-subjectivity), i.e. a principle stating that the extraction of observer-independent knowledge is possible. So what Schrödinger discusses above is the fundamental postulates of the realist's doctrine: the pre-given-ness of reality and its status as the legitimate object of scientific discourse on the basis of direct observation. We will soon recognize that these postulates of realism, in spite of their obviousness, are very daring indeed – and reasonable only considering the whole story of human evolution. Maybe, we are ready to straightforwardly accept the thesis that "the world is single and pre-given", but "observer-independent" seems, on the other hand, very presumptuous – and today, we have collected enough evidence to suggest that this idea is not even plausible.

And this is not the end of the road of trouble! On a closer inspection, even the truth conception turns out to be very paradoxical, which is even more surprising since even if philosophers during the past 2,000 years have disagreed in their views concerning about what "really exists" their use of truth conception has always been unanimous: something is "true" only if a decision on that matter can be made on a level above the human being – by some super-observer/decider. This "quest for truth" also turns out to be essential in our saying that science strives for "objectivity" – it simply strives to unveil the truth of the (eventual) super-observer – in whatever guise such a phenomenon can manifest itself. However, it is important to understand that unless we as scientists are prone to define one, there is simply no such super-observer/decider. We are at risk, there is neither a pre-given God nor Nature[3] that can assist us as instruments in this important "quest for truth" as referred to by the realist. Tarski (1944) gives a "precise form" to the correspondence theory of truth that operates on the classical dual world conception that was cemented at the time of Cartesius. The realist inclination is no doubt responsible for this genesis of Cartesian dualism and another row of inconsistencies met with intoday's science. In the case realism is proven useless – then not only the objectivity of science – but also the classical conception of

truth will stagger and in this situation, science cannot for sure be equated to some "quest for truth" any longer.

The branch of philosophy of science that deals with modelling the existence of things in the presumed real world is called ontology (or metaphysics). This branch is aimed at accomplish clarity of thought by a careful study of its concepts and recognises that scientific research proceeds on a number of metaphysical hypothesis. The following list of ontological principles (Bunge, 1977) used in traditional scientific research must suffice here:

> There is a world external to the cognitive subject. If there were no such world it would not be subject to scientific inquiry. Rather we would resort to introspection or to pure mathematics instead of attempting to discover the unknown beyond the self.
>
> The world is composed of things. Consequently, the sciences of reality (natural or social) study things, their properties and changes. If there were real objects other than things it would be impossible to act upon them with the help of other things.

We here once more recognize the postulate of an ontologically pre-given world composed of "things" as the subject to scientific inquiry. To do science means, in short, to convert such metaphysical base assumptions into structures that can be conveniently handled in some modelling environment for the production (computation) of useful predictions. Bunge starts by simplifying physical matter and one of his maxims enjoins us to hypothesize unobservables in order to account for appearances. He strips the real things of all their properties and what remains is the qualitatively indeterminate particular, the bare individual, that are endowed with the capacity of associating, i.e. of forming composite entities. The association of bare individuals is then a beginning of complexity and thus an important step towards realism. A fully qualitied individual, if substantial or concrete, is called a thing and a complex thing with coupled components is termed a system. This is how Bunge tackles the basic problem of traditional metaphysics, i.e. that of substance and attribute. By these steps, he readily explicates the realist reductionist's approach taken by classical physics at the same time habitually placing the observer's eye "outside" the phenomenon of observation.

Without further ado Bunge side steps the following fundamental question: is it really possible to develop theoretical understanding of all processes of knowledge from the "outside" position as prescribed by Newtonian science? One might rightfully wonder since human understanding is an "inner" activity, and theoretical understanding for that reason rises in (inside) a mind only. However, classical physics has, for reasons already mentioned, firmly cemented the directly opposite view: that we are able to build useful knowledge of the world by "watching it from outside". This naïve man's villain has furthermore become part of the legacy of modern knowledge acquisition in all forms that is the cause of wide-spread confusion and has plunged mankind into a severe state of alienation that is so characteristic of our modern times. Yes, there is a crisis – and the crisis is profound indeed in the way the prevailing paradigm totally prevents a sound understanding of human knowledge acquisition both at a scientific and cultural plane.

Is there a useful way out?

We have witnessed how set theory, mathematics and logic during the years have met with some conceptual difficulties that parallel the situation in classical physics – in the sense that they all seem to concern the involvement of the human observer. No surprise

then that these difficulties has spread to the cognitive sciences and consciousness study, disciplines that deeply influence human knowledge production on all levels. Given this background, we find urgent reasons to scrutinize the foundations of natural science and in particular, the Newtonian paradigm and its supporting realist's doctrine and ask:

- Is it rational, then, to behove that in science, we are approaching some truth of a pre-given singular external world – or even to assume the "thingy furniture" of such a world to exist?

And in the case, we can accept the definition of such an existence, we may further also ask:

- Is it rational, then, to presume that the observation of these things (existences) in some sense or another can be considered "independent of the actual observer doing the observations?"

It seems traditional science fails – and fails on a fundamental level since so many branches of science has come to a point of severe crisis. In this situation, the all-pervading problem become how to tackle this important issue. Laudan (1977) launches three alternatives:

> Confronted by the acknowledged failure of the traditional analysis to shed much light on the rationality of knowledge, three alternatives seem to be open to us:
>
> (1) We might continue to hope that some as yet undiscovered minor variation in the traditional analysis will eventually clarify and justify our intuitions about the cognitive well-foundedness of science and thus prove to be a worthy model of rationality.
>
> (2) We might, alternatively, abandon the search for an adequate model of rationality as a lost cause, thereby accepting the thesis that science is, so far as we know, blatantly irrational.
>
> (3) Finally, we might begin afresh to analyse the rationality of science, deliberately trying to avoid some of the key presuppositions which have produced the breakdown of the traditional analysis.
>
> Enormous efforts have been devoted, particularly in the last decade, to the pursuit of strategies (1) and (2).

Considering the enormous efforts spend on (1) and (2), i.e. attempts to rescue the prevailing Newtonian paradigm with such meagre results, one is apparently directed to pursue the remaining alternative (3) and "begin afresh to analyse the rationality of science" by avoiding "some key propositions . . . of traditional analysis." We will do so by questioning the principles already mentioned but before doing so, we need a better understanding why philosophy of science need the hypothesis of a pre-given world of to erect the edifice of science in the lack of a useful model of human observation capacity. This problem is directly connected to the functioning of human consciousness by the following recognition. The perceptual path passes the human brain, and, therefore, man needs a model of its brain before he is even able to make a model of an eventual world. Here is the point where the edifice of classical science virtually falls down because the foundational bricks give away. We will connect to this point in the next section, but first take a look at the alternatives.

The idea that the world is pre-given to man in acts of cognition has dominated western human culture and the history of science. Since, it takes the objects of cognition for pre-given let us call this view the OOA and conclude that this naïve man's view is habitual and tacitly assumed as a leading principle of Newtonian science. Very few scientists have tried the opposite subjectivist's approach – the SOA – and this point of view has seldom been articulated. The philosopher, Putnam (1981) recently said: "It is impossible to find a philosopher before Kant (and after the pre-Socratics) who was not a metaphysical realist, at least about what he took to be basic or irreducible assertions." This assertion can be disputed since Berkeley, for instance, cannot be accused of realism, but nevertheless, we can safely state that very few actually exist that has taken to opposite subjectivist's view. The realistic ideals and the influence of the Newtonian paradigm have proved to be so strong that even the social sciences partly adhere to this view – in spite of the fact that here man is the centre of interest; small wonder then that even man has became "objectified" and almost crippled by the prevailing scientific view and that mankind as a whole now suffers badly from this severe form of alienation. To find a sphere of activity where the subjectivist's view is at least tried, but not yet fully accepted methodologically, we must turn to the humanities and in doing so readily find Husserl (1937):

> All of modern philosophy, in the original sense of a universal ultimately grounding science, is, according to our presentation, at least since Kant and Hume, a single struggle between two ideas of science:
>
> (1) the idea of an objectivistic philosophy on the ground of the pre-given world
>
> (2) the idea of a philosophy on the ground of absolute, transcendental subjectivity the latter being something completely new and strange historically, breaking through in Berkeley, Hume, and Kant.

Ironically enough Husserl's ideas passed almost unnoticed into the community of natural scientists, mainly catching the interest of the social scientists. So instead of maintaining its reconciling function, also classical philosophy split into two branches – the philosophies of the natural sciences and those oriented towards the social sciences and hermeneutics. For that reason, the debate in physics, most typically quantum mechanics, has become the central core of philosophy of science, if not to say took its place. For several reason, this split became an obstacle to further progress. The physicists, for instance, did not clearly recognize that quantum physics met with an old problem encountered in the social sciences – the situation that the observing scientist influences its object of observation. On the other hand, many philosophers by profession, so to speak, were blindfolded by the scientific debate and the Newtonian paradigm – obviously forgetful of its limitations.

However, a decisive clue was provided by Kuhn (1962), when he from an almost humanist's conviction held that metaphysical commitments are tacitly understood by practicing scientists in the form of social conventions, that are typically neither articulated nor subjected to scrutiny. However, these metaphysical assumptions may change at times of what he calls "scientific revolutions". He also claimed the existence of a paradigm capable of supporting a normal science tradition is the characteristic that distinguishes science from non-science. Much of modern sociology lacks a paradigm and thus fails to qualify as science according to that view. Consciousness studies also fails but for the reason that this field of inquiry is incompatible with

classical physics that has constituted the paradigm of science and rationality since the time of the western scientific revolution. Kuhn thus give us another reason to scrutinize the foundations of the Newtonian paradigm and in such doing the conventionalism as advocated by Poincaré (1952) and Duhem (1954) will add useful insights to the theoretical framework of science.

Kuhn claims a paradigm embodies a particular conceptual framework through which the world is viewed, as well as a particular set of experimental and theoretical techniques for matching the paradigm with this world. A further component of paradigms consist of the general metaphysical principles that guide work within a paradigm and in a wider context such principles also guide human perception and thinking. So in that sense, we can within the paradigm of normal science find a sub-paradigm that is basic to not only to normal science but to all cultures of human knowledge – namely the base assumptions underlying normal human perception and thinking:

> Surveying the rich experimental literature from which these examples are drawn makes one suspect that something like a paradigm is prerequisite to perception itself. What a man sees depends both upon what he looks at and also upon what his previous visual-conceptual experience has taught him to see. In the absence of such training there can only be, in William James's phrase, "a bloomin' buzzin' confusion" (Kuhn, 1962, p. 113 – my boldface).

To a computer scientist this suggests a useful pathway to a new understanding that can be directly connected to the problem of human consciousness by asking: what is it in the classical paradigm of science that excludes consciousness studies from its discourse? The root problem here seems to be that the realist's doctrine assumes the features of our world to be both pre-given and independent of the individual observer – simply because this seems to be an unavoidable prerequisite in order to maintain the "objectivity of science". This move, whose prime function seems to be a desperate attempt to rescue scientific realism, is a misunderstanding and the side-effect of this conceptual locking give rise to forth crisis and most serious of them all: namely that scientific knowledge appears to be incomplete in that there is no place in it for the consciousness of the observer – nor, in general, for volition ("free will") or any of the other attributes of consciousness.

Kuhn was some years later backed up by Putnam (1981) and Lakoff (1987), pointing out that the "internalist" – the first person observer – cannot by reference give meaning to the objectivist's (externalist or third person observer's) account of science – which meant a heavy blow to scientific objectivism. They showed it is a principal (biological) limitation imposed on human observation/conceptualization and in that view, the "reality" as we understand it is structured and conceived by the conceptual schemata we use for the explication of things. Thus, human knowledge concerning reality is not pre-given at all, but rather established by means of human conventions. Thereby they readily confirmed Kuhn's earlier suggestions that call for a more pragmatic approach, a view that is also advocated by Rorty (1980).

It seems physicists in general have problems to differentiate between subject-orientation and "subjectivity" and instead prefer to cope with the situation in attempts to restore the ideas of classical reductionism (Aronson *et al.*, 1994) and oddly enough realism also spread into the field of consciousness studies where the physicists, guided by Penrose (1994), have tried what they call the quantum approaches to consciousness, thus pursuing the tradition of physics by suggesting that the problem

can be solved by further reduction – as if they were totally ignorant about the fatal consequences of suggesting processes of endless regression (von Neumann, 1932). We find that different varieties of materialism, of which there are many, still catch the minds of most scientists and the philosopher Dennett (1991) has even mentioned materialism an "opinion approaching unanimity". His book *Consciousness Explained* has, at least in the materialist camp, been widely quoted and praised as providing the definitive answer to the puzzling aspects of the mind-body problem. This seems a huge overstatement and an almost disgraceful attempt to heap the deep crisis of contemporary science. It is not to be wondered that Dennett totally misses his goal of explanation and does not even come near to understand the biological modelling function of human consciousness.

The subject-oriented approach to science

In the light of what has been said, we find that contemporary science is stuck in a profound crisis that seems to touch upon its very fundaments. All attempts to come to the rescue of the prevailing Newtonian paradigm has, as indicated by Laudan above, not been very successful, and since I happened to formulate a two-step model (Kjellman, 1992) of scientific modelling in the early 1990s that clearly indicated that the idea that an individual could attain a "state of scientific objectivity" was a possible chimera so let me try to explain the train of thought behind the SOA. At that time, nobody seemed to deny the full validity of the principle of the privacy of subjectivity but since the subjective/objective situation (apart from the eventual direction of information transfer) is perfectly symmetric I wondered why nobody before had even mentioned the possible privacy of objectivity – a principle that indicates say that the "objective man"(if there by accident should be any) cannot directly communicate this eventual fund of "objective knowledge" to anyone else. So in this situation, we must ask who is the one eventually possessing this fund of objective knowledge – and how come most scientists unwarrantedly behave as if they have access to such a fund of knowledge. Is this "objective man" a God, an Einstein, or maybe the "world-in-itself?" An evil-boding question emerged: maybe this is plain fiction?

Since, my two-stepmodel indicated that no living being attain any other state but being subjective I dared to try a SOA simply for the reason there was no other way out. Unknowing and by accident, I happened to follow Laudan's suggestion (3) above, in an attempt to recast the process of perception using a non-objective (subjective) foundation. Since, I already in 1995 found (Kjellman, 1996) that objectivism was not a viable alternative and found Berkeley's approach more promising I decided to try a SOA. At least I hoped to come up with the answer that neither objectivism nor subjectivism is useful as a basis of consensual science, i.e. that consistent science is a vainly enterprise, that is Laudan's alternative (2) above.

In 1999, revised in 2002, I was able to show that within its own framework of thinking, the traditional OOA is inconsistent and misleading for the reason, we first need a model of the human brain to be able to erect the edifice of a consistent science. However, the big surprise was, on the other hand, that SOA is viable and useful one. Furthermore, some years later (2001) I also made plausible that also the prevailing realist's doctrine is built on misleading premises. In that light, it seemed to me that the theoretical foundation of science is erected on very shaky grounds.

One principle, we have seen, is that science, in its strive for objectivity, has chosen to take the "pre-given world" as the phenomenon to be portrayed by objective knowledge and this inclination meant a choice of the OOA – giving rise to a materialistic human culture that created a huge and crippling cleft between the natural and social sciences.

To me, as a computer scientist, the SOA is far from counterintuitive and accordingly I took of on this project some 15 years ago, from quite another point of departure (2002). In the introduction of my thesis, the stage is set:

> Scientific activity and modelling in particular . . . are supposed to stay above the influence of [such] subjective elements – because scientific knowledge is objective knowledge – this is at least the very claim of modern science. However, science has never explained the essence of such a claim on knowledge and even if such is possible – as a matter of fact it has very much failed to explain in what way knowledge relates to the presumed object (source) of this knowledge. On the contrary, classical metaphysics and scientific ontology, tacitly assume that there is an object – called Nature – which by means of a process of mapping influences the observer's mind – and also in some mysterious way allows the trained scientific observer to stay outside his/her role of human being in making these observations. The scientific mind that is supposed to be the mind of clarity in that view comes out as a very confused one – and we will discover this confusion is deeply buried in the prevailing realist's doctrine.

Another problem is that the spoken language frequently is used also in the natural sciences as a tool of modelling in such a sloppy way that sometimes any "conclusion" whatsoever can be drawn out of some "given" premises. The argument is, in that vein, that the traditional axiomatic methodology of description (modelling methodology) will totally break down unless there is a crisp (sharp) definition for each concept used to allow us to break the otherwise generated endless loop of decision any scientific decider is involved in.

For instance, since there is no generally accepted definition on what is real or not the use of a real/imaginary distinction should be strictly forbidden. The SOA shows that, in spite of its frequent use in the everyday parlance, such a distinction is totally useless to science and then Occam's razor (according to its own principles) should prevent science such use. The ignorance of this principle has, for the reasons mentioned above, severely mislead many scientists to engage in the hopeless wrangling about the essence of the elements of science. While claiming to respect the rules of science, the thesis ends up in the conclusion that the "world" cannot possibly be regarded neither as a real phenomenon nor an illusion – but rather something in – between – an allusion. Then one is also able to clean-cut the Kantian claim that the "thing-in-itself" is hidden to human knowledge by pointing out the hidden principal reason of conceptual inseparability.

This insight means an unsurpassable obstacle to the traditional OOA, which accordingly must be revised and widened into a SOA. In that vein, the unnecessary realist doctrine in frequent and tacit use in the natural sciences must also be modified. The argument goes that it is not just even enough to accept an constructivist position as espoused by second order cybernetics, i.e. that our third person models of the world are our constructions, though that is essential, we must also fully accept that all our theorizing and decision-making are taken from a first person perspective.

The key features used in the argumentation is the numerous neural feedback loops of the human brain as demonstrated by modern neurology, as once discovered by Ramón y Cayal. These loops allows for an effective adaptation of the brain for useful

interpersonal communication, which today is fully confirmed by the modern cognitive sciences. In this way, cybernetics has paved the way for SOA that, in turn, can offer a payback by providing a conceptual foundation to both to cybernetics, sociocybernetics (Kjellman, 2001a, b) and all other paradigm-driven activities of mankind – that we normally juxtapose to science. In the thesis, it is demonstrated that any such feedback programmed brain (interpreter) is unable to know (or grasp) an "outsider's" eventual knowledge of this environment – which is then accordingly ungraspable to private human knowing. In that view, the knower has to be content when he is able to calculate (lay out) a schematic model of it environment (Von Foerster, 1984), i.e. the classical reality reduces to a pure transcendental phenomenon (pure hypothesis) that Kant claimed. This claim was further advanced by Husserl (1917) that unfortunately found reasons to bracket this essential question as a whole.

Some steps toward a new understanding

Here is not the place to dig deeper into the paradigm of the SOA and we instead have better to touch on the train of thoughts that revealed the insufficiency of the OOA. Therefore, we return to its fundamental assumptions:

(1) there is a world pre-given to direct human perception;

(2) human perception is a mapping process which works independent of the individual user;

(3) observation is a valid tool of decision; and

(4) scientific judgements can be subjected to truth evaluations.

In the 2002 paper, the central claim is that since science has no useful model of the brain, the observing scientist cannot make a model of a world that is eventually pre-given. As we have seen, the Newtonian science tries to do so anyway and fails of course. However, one also finds that Newtonian science is a decent approximation – at least in the realm of physics – that of course accounts for the recognized partial success of science.

To pave the way for the understanding of the SOA, let us see how mankind possibly came to embrace Newtonian science and still are very prone to defend this worldview in spite of the embarrassing crisis of science. This is, to my mind, how the story can be told: according to the Bible, God has created the world. He is alone – and, therefore, there is one and only one world, which is pre-given by God (point 1). In human perception and inherent in the way we speak about this presumed unary life-world-creation, there is nothing that contradicts this view – apart from the fact that we on a regular daily basis have to face a multitude of interpretations of the "same happening".

Mankind has always embraced the view that the human eye is able to portray this world on the eye's retina, but in order for us human beings to communicate about these phenomena (that we incorrectly think occur on the retina), and at the same time refer to the "world" we must assume that we all receive percepts that are reasonably "similar", hence we also accept point 2. In this situation, it is rewarding to realize how closely connected points 1 and 2 are – they are more or less two sides of the same coin.

What are the prerequisites we need to think we communicate using "similar world-percept-copies?" First we must assume that there is only one world (1) otherwise

we cannot find the source of the copy, and furthermore that it is pre-given (not self-constructed). Next we the assumption we have "similar" copy-machines (2).

Then we must realize that predictions are strictly based on human decisions (3), and understand this methodology is reliable only in case the "life-world" is fairly stable. We need to operate against a background of "stable things" – that applies to the science we normally call physics. At the first stage, these "stable things" were joined together with "stiff connections" (gears and rods). Classical mechanics was born giving rise to Laplace's[4] idea of the life-world as a "predetermined mechanical clockwork". Later Maxwell's electrodynamism come to ruin this idea and the situation become even worse when Helmholtz/Mach introduced the subjectivism of the observer into the picture of science. The science of the "stable entities" started to falter but physicists, as recognized, belongs to a stubborn family and even the recent developments of the super string theories shows they still are still trapped in this world of invariance and stability. No surprise since they need stability to make the idea of "correspondence truth" viable, which in turn enforces Cartesian dualism that further reinforces the use of points 1 and 2 – otherwise they have to recede the legendary "quest for truth" altogether.

We find that the points 1-4 are tightly related and the crucial insight here is that in case the assumption of point 2 is incorrect, it will bring along in its fall all the other assumptions – and the whole edifice of natural science. Here is the place where cybernetics and the feed-back-loop of control-theory enter the scene. When placing a feed-back-loop on the path of perception between a source and an observer – no matter where – the observer can never ever reconstruct (or know) the "original" unless he has a valid model of its own path of perception (i.e. a reliable copy-machine). Classical science has tried to avoid this pitfall by using the approximation of a "transparent" perceptual path. However, the modern cognitive sciences (Bennett, 1989) has shown that such approximation is not valid at all – but rather that all observation is highly "theory-laden." Remember that human perception even can make the blind spot of the eye to totally disappear.

The situation is that science cannot possibly answer the question how it is possible to a feed-back-connected observer to learn to know its own perceptual path – when he by observation cannot learn to know anything from outside. For sure he cannot look into his own brain – since observation from outside is totally impossible in this situation. Neither can he ask somebody else – because the privacy of subjectivity puts a ban on this endeavour. The sad answer for classical science is – or at least the natural sciences – that observation cannot help him in this urgent matter. Accordingly we must conclude an observer's science in principle is obsolete and out of the question – thence we must give up the idea of scientific certitude based on human observation. To our surprise we find that an outside observer's science by principle is inconsistent – and no surprise then that we are able to list a long row points of crisis. In this situation, the only sane idea is to give up the idea of some knowledge "pre-given to man" in the form of "things" with "given" properties – accordingly observation must in the future be regarded only as a tool of confirmation.

A knower's constructive science

To avoid inconsistencies, we need to find a way around the principal incompleteness of the scientific observer just mentioned. One possible way to do so is to formulate – not

an observer's science – but rather a knower's science. This is the way mathematicians tend to attack their problems – not yet intotal success – by anyhow. The point is that a knower's science does not crucially depend on observation – it can take guidance by observation, but must not bear on it. A knower's science takes off in a bootstrap manner from constructed axioms, and some rules how to join the axiomatic items. These axioms are founded in human convention only. This sounds terrifying but never mind – the point is that we must start form the "inside" and construct the world guided by our imagination (or allusion as I prefer to say) and this is the only way out of the objectivist's dilemma. We are bound to start out from "inside consciousness", pace von Neumann/Wigner but fortunately human conventions are driven by human experience. However, such a knower will have in its possession only probable (fuzzy) knowledge and is strictly directed to probabilistic reasoning.

A thinker used to intuitive thinking will now directly divine the resolution of the bewildering matter/wave-duality of quantum physics: each particle "is" fuzzy and since a fuzzy particle simply is a point "smeared out" in space, it is as such describable both in terms of a fuzzy point and a wave. What else there "is" we cannot know and we must realize that there is simply no answer to the intriguing "essence question" formulated already in the dawn of science. The photon or electron is neither a particle nor a wave. They are simply allusions that mathematically can be modelled as fuzzy particles or alternatively waves – pick your own choice. And in case you prefer something else you can simply describe them in terms of colloquial language. In the new SOA framework "reality" is not a legal point of reference any more – but human convention instead. Here categoreal thinking and conceptual schemata are the workable tools (Sowa, 1984) that readily will provide a new basis of scientific "objectivity" – that we have better call consensus.

This way of thinking is not new since within the humanities – such subjects as philosophy, literature, and the fine arts, that are concerned with man and his culture as distinguished from the sciences – modelling is also central but here was recognized a long time ago that modelling sometimes has very little to do with the truthful representation of objects of some presumed reality. Here the structure of the source is of subordinate importance and the models presented are rather intended to reflect (or communicate) the feelings and intuitions of the creator. The same way of thinking will now apply also to the natural sciences – namely that my priverse is a mostly a product of my own human imagination – my own private shining and colorful allusion – a creation that can be heavily influenced by my will and the will of the rest of mankind.

The social sciences have quite another problem in their total lack of paradigms and abundant misuse of language – and since doing science in the SOA simply reduces to modelling and forecasting aided by such models and the modelling frameworks available today's situation seems desperate. The social sciences do not confront an imminent shift of paradigm – they simply are forced to establish such a fundamental basis in order to establish a platform of consensual understanding.

The SOA furthermore shows that each human being carries – not the experience from God-given common reality – but only his or hers own highly personal reality inside himself – his PRIVERSE – in the form of a knowledge base of collected experience. This knowledge base is as unique and individual as are the features of the face and the recognition of this fact will have a tremendous impact on social life and

human culture. We will understand that the belief in mind-external knowledge is an idea not only hard to defend – but as a matter of fact both misleading and unscientific – and thus we can readily connect to the ideas introduced by Bohr's famous Copenhagen interpretation. This situation is easily captured in the slogan: knowledge rises in a private mind only.

Accordingly we (abstractly) create ourselves and the allusive environment we perceive around us. When we then turn to observation we find, in the words of Heisenberg: "What we observe is not Nature itself, but Nature exposed to our method of questioning". This means a shift from objective to "epistemic" science, to a framework in which epistemology – the method of knowing – also becomes an integral part of scientific theories. In the SOA is taken yet another step in this very "abstract" direction by the assertion that the object of science is neither Nature – in the form of something real or substantial – nor anything else apart from our impressions or ideas: what we expose to questions and present as the fundamentals of science is the "content" of our private consciousness (the working of our minds) and the way it has evolved in close communication and coexistence with other living beings. These sets of allusions – that make up the core of our priverses – are personal, individual and inaccessible to another living beings. This is the reason we are directed to the excessive use of different models as the only useful mean of communication.

Still another step along this line of abstraction is taken by the claim that human perception is noting else but an act of biological modelling – thereby presenting an important clue to the persistent consciousness puzzle and at the same time closing the loop to systems theory and the modern developments of modern IT-technology. Since, modelling has been and is a central endeavour in science and enterprise, and this role that will accordingly be even more central in the future – especially in the light of the spectacular achievements in the field of IT. The modelling concept, brought to such a successful use within the natural sciences and technology, is, however, not only a concern of these disciplines. When we also consider the spoken natural languages to be modelling frameworks as well, we come to see that modelling is the only means of human communication – both on the private and the collective plane.

Summary

A new scientific methodology is arising, foreboding a science aimed at understanding the workings of the individual human mind and its relation to science. It will place the forced upon subjectivity in a network of intersubjective communication that allows for the creation of a firm basis for a science of consensual understanding – firmly founded on human conventions, i.e. conventionalism. This methodology is called the SOA and takes off in a bootstrap manner from axiomatic conventions that are founded on human experience. However, it is somewhat inaccurate to speak of this approach as if it were totally new; it might be better to refer to it as a necessary scientific turnover to a subject-oriented emphasis. The radical nature of this turnover should not be underestimated, and especially the novelty of the reversed cause-effect chain of conceptual construction at first seems awkward.

In this framework, there is furthermore no place for a classical "reality" conception. The point is that there might be a single reality or not. Which is the case we can, as scientists, never know with certitude. If we like it we can embrace this idea as a pure "belief" in the same manner as many people believe in a God. However, science can

neither prove nor embrace the idea such reality is "real" without falling into inconsistency and in this way classical Cartesian dualism is hopelessly forlorn – to the better though. The reason should be obvious by now: since a neither a feed-back-connected observer nor a knower can know anything that is pre-given, we must be content by the construction of allusions (models) that on a later stage in awareness can be compared to the perceptual "images" of items of a "world that we think are pre-given" – as merely a hypothesis. Neither Mach's world of sensations or Husserl's of phenomena is certain in such a setting. We must agree with Prigogine: scientific certitude is a delusion – which unfortunately brings objectivity and correspondence truth along in its fall. On these grounds, the SOA is the only useful approach left for science to use to stay consistent and the change required to reach this state means a veritable change of scientific paradigm in its very Kuhnian sense.

We must realize that what is available to a being in scientific discourse is its strictly personal priverse. These individual priverses are probably similar[5] but nonetheless distinct and separate. In this way, we revive Everett's idea of worlds in parallel, and the conclusion is that mankind, as a group, will never be able to reconstruct a single world worthy of the name "reality" on the basis of such a gigantic set of parallel allusions. The prime reason is that the allusions features almost nothing from "outside" the human mind – and this situation will have far-reaching consequences for scientific modelling and human conceptualization.

Thus, the natural sciences will face a difficult adjustment into the required subject-oriented thinking that at first will seem very awkward. Such reorientation is much facilitated, though, by the fact the conceptual foundation of natural science is fairly well known and explicitly stated. The social sciences are, on the other hand, well experienced in the kind of thinking that SOA calls for – but are severely hampered in communication by their lack of paradigms and well worked-through methodologies. However, SOA offers the possibility to inject rigor into conceptualization of the social sciences and will here, by the unification foreboded, offer computer simulation and probabilistic decision analysis as new useful research tools, which in these disciplines stands out as far more useful tools of modelling but mathematics.

There is a great deal of work left to examine soundness of these ideas and pave the way for such a profound re-orientation of traditional science that as a first step will be concerned with elucidating and explicating a wide range of problems and concerns in set and decision theory, logic, and mathematics. This is essentially to launch a research program in these areas that as a next step includes all natural and social sciences that will appear in a new light when viewed from a first person, SOA.

The realist confusion, fuelling the OOA, which is responsible for the genesis of Cartesian dualism and a row of other inconsistencies met with intoday's science, can be replaced and the SOA promises the removal a long row of embarrassing and bewildering situations met with in classical human conceptualization. We can also expect a unification of the different disciplines of sciences so that, e.g. the social sciences can be treated on an equal footing with the natural sciences – and thus the embarrassing gulf between natural science and humanism can be removed. In this view measurements, perceptual impressions and inner feelings become nothing more than subjective facts to be treated at the same level of experience – it is just the choice of concepts, tools and measuring sticks that makes the difference. Needless to say these

subjective fact must be mankind-internally tuned by procedures of consensual agreements – and firmly founded on the choice of a sound set of human conventions to be used in each discipline respective.

Notes

1. Taking the objects (or the things) of the world for granted or pre-given without any further specifications.
2. God made the natural numbers, everything else is the work of man.
3. By this I do not deny the ontological existence of neither a God or Nature – what I deny is that we as scientists can depend on their assistance in truth decisions – because both phenomena, even if they exist in some other sense, cannot be the legal subjects of scientific knowing.
4. "An intellect which at any given moment knew all the forces that animate Nature and the mutual positions of the beings that comprise it, if this intellect were vast enough to submit its data to analysis, could condense into a single formula the movement of the greatest bodies of the universe and that of the lightest atom; for such an intellect nothing could be uncertain and the future just like the past would be present before its eyes."
5. However, such an assertion is strictly invalid, since the question is undecidable.

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