WORLD KNOWLEDGE DIALOGUE

«Towards a Modern Humanism»

Abstracts and References Booklet

14-16 September, Crans-Montana, Switzerland

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I. Main Speakers abstracts

From Brain Dynamics to Consciousness: How Matter Becomes Imagination

Gerald M. Edelman
The Neurosciences Institute
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Prevalent views of higher brain functions are based on the notions of computation and information processing. These views suggest that the brain is a Turing machine. Various lines of evidence appear to be incompatible with this position and suggest instead that the brain operates according to a set of selectional principles. A theory addressing these principles, called Neural Darwinism, will be discussed. Neural Darwinism has a direct bearing on the search for neural correlates of consciousness. Most approaches to the understanding of consciousness are concerned with the contributions of specific brain areas or groups of neurons. By contrast, I will consider what kinds of neural processes can account for key properties of conscious experience such as its unity and its diversity, and I will present supporting evidence on the neural correlates of consciousness obtained from MEG studies of human subjects.

Devices based on Neural Darwinism have been constructed in order to study detailed neural dynamics during behavior in a real world environment. The performance of these brain-based devices (BBDs) will be briefly described. Refinement of their design and behavior points to the possibility of constructing a conscious artifact.

Searching for Simplicity in Complexity; Growth, Innovation, Economies of Scale, and the Pace of Life from Cells to Cities

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Life is the most complex phenomenon in the Universe manifesting an extraordinary diversity of form and function over an enormous scale. Yet, many of its most fundamental and complex phenomena scale with size in a surprisingly simple fashion. For example, metabolic rate scales as the 3/4-power of mass over 27 orders of magnitude from complex molecules up to the largest multicellular organisms. Similarly, time-scales, such as lifespans and growth-rates, increase with exponents which are typically simple powers of 1/4. It will be shown how these quarter power scaling laws follow from fundamental universal principles leading to a general quantitative, predictive theory that captures the essential features of many diverse biological systems. Examples will include animal and plant vascular systems, growth, cancer, aging, sleep and mortality.

These ideas will be extended to discuss and speculate about equally complex phenomena, namely social organisations: to what extent are social organisations an extension of biology? Is a city, for example, "just" a very large organism? Analogous scaling laws point to general principles of organization common to all cities. Analogues to metabolic rate and behavioral times in cities scale counter to their behaviour in biological systems: in particular, the pace of life in cities increases with size. This has dramatic implications for growth and development: innovation and wealth creation that fuel social systems, if left unchecked, potentially sow the seeds for their inevitable collapse. The presentation will at a non-technical level.

Understanding and Managing Planetary Complexity

H.J.Schellnhuber
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Germany and
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The Earth System has evolved over billions of years through strong interactions between the geosphere and the biosphere. Global industrialization has recently pushed this process into a new stage where humankind is dominating the planetary biogeochemical cycles. The most severe - yet unintentional - consequence is anthropogenic climate change that will profoundly affect nature and civilization on Earth. Coping with this crisis is possible if we dramatically improve our understanding of the systems involved and generate novel strategies for managing environmental complexity at all relevant scales. Solving the climate problem may actually bring about a transition to global sustainability where humankind is widely controlling their own subsistence conditions.

The lecture will attempt to be both general, by addressing the big co-evolutionary picture, and specific, by providing the following examples of pertinent scientific challenges: calculation of "habitable zones" for Earth-like planets; analysis of highly nonlinear palaeo-climate dynamics as reflected in proxy time series from ice cores; identification of "tipping points", teleconnections, and feedbacks in the current Earth System; modelling of bifurcations and deterministic chaos in the Asian monsoon; representation of climate system complexity in coupled atmosphere-oceans-biosphere simulators; integration of the "human dimensions" (especially semi-rational decision making) in total Earth System models; evaluation of induced technological innovation for climate protection (especially greenhouse gas emissions reduction); exploration of societal stability with respect to global warming pressure; and anticipation of long-term trends in human auto-evolution, based on deliberate "amendment" of nature.

Several of the issues addressed will eventually require approaches that transcend traditional disciplinary thinking. In particular, a Manhattan Project-type concerted research effort – considering and quantifying all major feedbacks in the Earth System – is needed to assess the likelihood of anthropogenic “runaway greenhouse” dynamics. This task can only be fulfilled with the help of powerful tools as developed in modern complexity science. Similar methodologies will be instrumental when it comes to analyzing the principal options for inducing technological innovation in the world energy system. Without such highly nonlinear interventions, all climate protection policies are bound to fail. Finally, the objectives and risks of auto-evolution cannot be addressed within a purely scientific framework. This is demonstrated by the inadequate current debate on geoengineering schemes (like deliberate sulfur contamination of the stratosphere) for greenhouse effect containment. The true limits of “improving” both the design and the crew of spaceship Earth can only be assessed through a fundamental, unprecedented trialogue between philosophy, ethics and science.

Why Physics is Easy and People are Hard

Ian Hacking
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Paris, France

Of course physics is not easy. But it has evolved ways to turn the wonderful "blooming, buzzing" confusion around us, into problems simple enough for us to solve. "Give me a laboratory and I will move the world." A current example will serve: the ultracold, the amazing domain of almost absolute zero. In the past few years it has been turned from the unattainably complex into something with which we can interact. It is teaching us new things about the universe almost every week.

Contrast the enigma of autism. It shows up early in the life of a child. Something is wrong neurologically, which may have genetic origins. Autism is devastating for parents. Despite optimistic announcements, we have no idea what causes it. We have only a little practical knowledge about how best to help autistic people. It is a deep psychological and biological problem that may teach us something about the human brain, the human mind, the human being. But only when we have overcome its complexity.

Both autism and the ultracold are fascinating. Between them they show that there is not just one kind of complexity, but at least two. The complexity of climatic modelling points to a third. Degrees of complexity in the theory of information and computation are different again. We should not address "complexity" as if it were one thing. We need to understand its many faces.

Toward a Neuroscience of the Capable Person: Unity, Diversity, Oneself-as-Another

Jean-Pierre Changeux
Collège de France & Institut Pasteur, Paris, France

The aim of the presentation will be to try to establish a plausible bridge between humanities and the neuroscience on the basis of Paul Ricoeur's concept (1) of the capable person that he defines as a rational and conscious individual engaged in social relationships and with personal identity, in other words taking « oneself as another ». Will the neuroscience, in particular cognitive neuroscience, bring any help in our understanding of the capable person and conversely can one anticipate an impact of such debate on the evolution of the neuroscience ?

A first paradox is raised with the universal species-specific traits of the brain of Homo sapiens qualified by Aristoteles as a « rational and social animal ». The progress of genomics reveals a remarkable non linear relationship between the fast increase of anatomical complexity of the brain (from primitive mammals up to humans) compared to the modest changes in genome organisation which account for it. From mice to men the number of genes remains nearly the same, with very modest sequence differences between chimpanzee and humans (only about 1.2 %). What happened to the relationship between genome and brain phenotype in the course of evolution which made the brain human (2) ? The answer suggested is based upon the spatio-temporal pattern of developmental genes expession.

A second paradox concerns the apparent contradiction between the concept of a species-specific genetic envelope of human brain organisation and the genesis of a rich cultural diversity. The answer proposed relies on the mode of development of brain connections. Instead of a rigid errorless wiring process, brain networks are assumed to develop through multiple phases of exhuberance followed by steps of selective stabilisation/elimination by evoked/spontaneous activity (2,3) and evaluation/reward systems are assumed to play critical roles in these selection processes. In the course of mammalian evolution, the duration of the period of synaptogenesis increases from a few weeks in the rat to almost 15 years in humans. As a consequence, an epigenetic appropriation of developing circuits by cultural processes, such as spoken/written language, symbolic systems, moral rules… takes place. As a consequence an important epigenetic variability develops between individual brains (even from genetically identical individuals). Yet, the mathematical formulation of the selective stabilisation theory states (3) that « different learning inputs may produce different connective organisations and neuronal functional abilities but the same behavioral abilities ». Communication between individual brains at the social level then becomes possible. The human individual becomes a social person.

A third paradox concerns the neural bases of consciousness. We are at the highest and most enigmatic level of brain functions and the first question is whether

or not a science of consciousness is plausible ? The answer is yes : on both experimental and theoretical grounds. It is indeed possible to collect objective recordings of conscious vs non conscious information processing in the brain. and to account for them by neurocomputational models (4,5) for access to consciousness. The neuronal workspace hypothesis (4) proposed assumes that conscious processes mobilize cortical pyramidal neurons with long range horizontal connections (mostly from cortical layers II and III) which are specially abundant in the prefrontal cortex and create a global interconnectivity at the brain scale level. The model includes the reference to the self, personal memories, internalized rules and social conventions together with the representation of « states of mind » of others as well as a « violence inhibition » mechanism. A neuroscience of the capable conscious person then becomes a realistic, but still in progress, project (5).

The last issue to be discussed will be the plausiblily of Ricoeur's ethical project of a « good life with and for others in just institutions…» in a present world of dramatic conflicts (1). The reference to objective knowledge and scientific enquiry as a force of reconciliation at the world scale level will be suggested as a step toward a modern secular humanism (5).

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Human Migrations in Prehistory – the Cultural Record

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Until the invention of airplanes human migrations took two routes – terrestrial and maritime. There is no doubt that the first was the earliest and most common way, while crossing waterways is evident in the remains from the Upper Pleistocene but could have happened accidentally at earlier times. Colonization of new regions by humans could have been successful or doomed to failure. In the first case long archaeological sequences are expected and in the second scenario – chronological gaps mark the regional histories.

The first terrestrial migration "out of Africa" occurred when Homo ergaster made its way to Eurasia, stopping in Dmanisi (ca.1.7 Ma). Homo ergaster probably moved through the Nile Valley into the Levant, across Eastern Anatolia, or the Zagros mountains. An unresolved issue is 'why hominins left Africa'. One potential answer is the relatively small 'homeland' of Pliocene hominins and its ecological conditions. Among the limiting factors were the zoonotic and other diseases that infest the rain forest and the deserts. In addition, incidental attraction to new areas, in particular those of the Ethiopian highlands and beyond, could have played an important role in the decision to move northward.

The bearers of the Acheulian tradition, the makers of handaxes, were the migrants of the second wave. These artifacts are known from 'Ubeidiya (ca.1.4-1.2 Ma), in the Jordan valley, and many sites in the Levant, eastern Anatolia , Iran and the Indian sub-continent. While the 'Movius Line' is still considered the boundary between those who used flake and core stone tools and the makers of the Acheulian handaxes, several crossings were recorded (e.g., Bose in south China). However, this type of artifact is missing during the early Middle Pleistocene from eastern Europe and most of central Asia and north-eastern Asia. At the other edge, in western Europe, the Acheulian could have been the result of crossing the Gibraltar at ca. 0.7-0.6. Ma.

A possible third wave of migrants, perhaps of only small isolated groups, is indicated by the Acheulian stone tools with numerous cleavers discovered in Gesher Benot Ya'aqov (ca. 0.8 Ma) in the Jordan Valley. These newcomers employed the route along the Red Sea into the Levant and perhaps into southern Asia.

The following movement of humans "out of Africa" and into the Levant involved the archaic Modern humans represented in the skulls of Omo-Kibish and Herto in Ethiopia and the Skhul-Qafzeh group in the Levant. These date from ca. 200-90,000 years ago and were the bearers of Mousterian tool assemblages (also known as Middle Stone Age in East Africa). There is no evidence as yet that they succeeded to move into western Eurasia before the Last Interglacial.

The earliest Mousterian industry is rich in blades and elongated points and known from Mt. Carmel and the Galilee (Israel), as well as from the El-Kowm basin (Syria),from several sites in the Caucasus (labelled as the Djrujulan industry in Georgia) and in Obi-Rahmat cave (Uzbekistan). Hence, it is not impossible that

these groups, with an eastern orientation, avoided the Neanderthal territories in the west. We may assume that the archaic Modern humans were the ancestors of the later population that is generally considered as the creators of the Upper Paleolithic “paleo-cultures”.

The most famous migration is that of Modern humans groups who spread from sub-Saharan Africa (according to the genetic evidence) into Eurasia and probably into South Africa. Their “paleo-cultures” are reasonably well-documented in the archaeological sequence from the Nile Valley and the Levant. The migrating groups carried the late bladey Nile Mousterian tool-kits, and slightly modified them to become what we call the “Initial Upper Paleolithic” in the Levant (once known as the “Transitional Industries”), sometime around 50,000 years ago.

The southern route across Bab el Mandeb straits, through the southern Arabian peninsula, into the Indian subcontinent and from there to New-Guinea and Australia during the Last Glacial times, is archaeologically poorly known. The best evidence for this migration comes only from the final stop in Australia and Tasmania. Moving there required a crossing of a waterway of some 80-100 km. It would be therefore difficult to deny that other parts of this long route were not done by coastal navigation.

Finally, there is little doubt now that North America was colonized by coastal navigation. The finding that the American gourd came from eastern Asia is an important indication. This does not detract from the possible terrestrial colonization of the northern latitudes through Beringia.

Finally, we need to consider several difficulties or ambiguities involved in the research of prehistoric periods and in particular concerning past human migrations.

The epistemological question of “how do we know what we know in the archaeology of human migrations”? is only answered by employing the historical records concerning dispersals of human groups as a reference collection. Cases such as the Norse occupation of Greenland can serve as an example for success and failure of human groups to adapt to a specific environment and climatic changes. Similarly, the colonization of the Pacific islands provides ample evidence including the genetic information.

In addition, the correlation between the identified stone artifacts and human populations is often a subject for disagreements among prehistorians. Needless to say that we have no “time machine” to check the identity of the tool makers in the remote past. However, several examples such as demonstrated by the Magdalenian “paleo-culture” may lend support to current interpretations. Magdalenian stone tool-kits and art objects (19-14,000 cal B.P.) across most of western and central Europe testify to the presence of the same cosmology, same tool making techniques, and most probably for the use of the same language among a large and successful population of foragers. They spread from their original homeland in the Franco-Cantabrian region and became a testimony to an expanding population of foragers.

In sum, active research, in spite of many unknowns and gaps in our knowledge concerning the prehistoric past, provides ample evidence to speculate about past human behaviours.

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Linguistic issues about the origins of modern humans

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When did our ancestors start speaking and why? Do all human languages originate from a unique “mother tongue” or from several different independent sources? Did the introduction of language precede the development of human rational thought or the other way round?

Unfortunately, historical linguistics cannot answer such questions by its own scientific tools. Comparative methods unable us to go back in time by grouping languages into families and reconstructing the common ancestor from which all the languages of the family derive. Moreover, families can be grouped into super-families by lighter (and more controversial) methods, but the accessible time-depths are still too short to address the issue of the origin of language anyway. Nevertheless, these studies play an important role in tracing back the history of early migrations of modern humans, when they are used in conjunction with population genetics and archaeology. Actually, combining linguistic and genetic findings is very valuable because they provide different and complementary pieces of information that can contribute to confirm or infirm hypotheses about first settlements in different parts of the world.

As for the origin of language, we must turn Toward other linguistic fields, rather than historical linguistics. Following Derek Bickerton, many authors in the field think that language has been preceded by a rudimentary communication system called “protolanguage” and that the emergence of fully-fledged human language took place during the transition from Homo erectus and archaic Homo sapiens to our own species. If this is the case, it remains an open question to discover why our ancestors have needed this important improvement in their communication system. One of the most important methods is to look for hints by examining structural properties, specially in syntax and semantics, which are shared by all human tongues (universals of human language) and which are not shared by other communication systems (specificities of human language). Obviously, the chances are that such properties are related to fundamental functions of language that could account for its emergence.

A Genetic View of Human Origins

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The two big questions for people interested in the history of our species concern how we humans came to be and how we are different from our closest living relatives, the African apes. The advent of new molecular genetic tools means that this topic can now be addressed more powerfully than ever before. The complete genomes of humans and chimpanzees are in hand, with other primate species to follow. Even more exciting are the proliferation of studies of gene expression, which looks at how the genetic code is employed differently in various tissues and species. It is now even possible to examine evolution in action, through the study of ancient DNA.

Long before modern humans left Africa, western Asia and Europe were peopled by a more archaic form of humans, the Neanderthals. We have developed techniques for the retrieval of DNA from archaeological and paleontological remains and used these to study Neandertals. Our results suggest that Neandertals diverged from the ancestors of modern humans about half a million years ago. Together with other findings, this supports a scenario in which modern humans originated from small African populations that colonized the rest of the world rather recently without mixing much with resident archaic humans. We are currently developing techniques that will make it possible to sequence the entire Neandertal genome. This will allow us to identify almost all genetic differences that set modern humans apart from the Neandertals.

The comparative analysis of genomes and gene function in humans and the great apes allows us to directly see mutations in the genetic code, and see which ones have led to measurable differences in gene activity. Our results so far show that the male germ line has been the target of much positive selection in both human and chimpanzee ancestors while the there are indications of positive selection also in the brain but only in humans and not in chimpanzees. Among genes that may have influenced recent human evolution, FOXP2 stand out since when mutated it causes severe language and speech problems in humans. We have shown that FOXP2 was the target of strong positive selection in humans during the last 250,000 years, i.e. substantially later than the divergence between anatomically modern humans and Neandertals. This is compatible with the idea that articulate language was a trait that distinguished modern humans and Neanderthals. In order to understand the phenotypic effects of the changes that were positively selected in FOXP2 we are currently establishing animal models to study its effects.

Further reading.

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II. Short Statement abstracts

Knowing Complex Systems. The limits of understanding

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Due to their non-linear nature, complex systems are incompressible. They are also open systems and cannot be understood without also understanding their environments and their history. To fully know something complex will therefore involve incorporating all the complexity of the system and its environment. This not humanly possible, perhaps not even possible in principle. Thus, our models of complex systems always have to reduce the complexity. Since what is left out also has non-linear effects, we cannot predict the error made in the reduction. The modelling and understanding of complex system thus always involve an element of choice which cannot be justified by pure calculation. There is always a normative element involved.

This is not an argument against calculation, but a justification for why formal models will always have to be supplemented by narratives which make the limits of the model explicit. At the same time, the narrative models are also limited to a certain perspective. It can thus be argued that there is an irreducible ethical component to our understanding of complexity. We have to accept the responsibility for our models although we know they are flawed. When dealing with complexity there are simultaneous roles for the natural and the human sciences, for both mathematics and imagination.

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Complexity Science, Simulation and Public Health

Christopher L. Barrett
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We will describe a very large, detailed, agent-based simulation and analysis of epidemics such as pandemic influenza. The interplay between individual behaviors, societal and built structure, and contagious disease dynamics creates epidemics. Public health and individual responses to epidemics are timely and classic examples of decision-making in complex socio-technical systems and serve to illustrate general problems addressed by complexity science in both theoretical and practical settings.

In socio-technical systems, physical-, social-, psychological-, and biological processes and built infrastructure are coupled and create co-evolving systems that are not understandable in any of the "languages" dedicated to these individual aspects. Complexity science seeks to provide a transdisciplinary setting, lawfulness, and language for these kinds of circumstances. There are numerous foundations of this nascent integrative science; a reasonably encompassing minimal list includes chaotic systems with their sensitivity to initial conditions, topological mixing and dense phase spaces, interaction-based concepts involving composition of local dynamical systems and networks, computational methods, especially simulation, and the related problems of irreducible representation and issues of algorithmic complexity and algorithmic information theory.

When confronted with a complex system-of-systems, it is now common to employ so-called agent-based methods and create a computer simulation. The simulacra interact and generate the composite dynamical properties of a system; its composed dynamical properties are caused by interactions among the agents. The idea of explanation here is constructive and related to the ability of a composition of certain elements to computationally generate a property. Moreover, since individual agents are constructed of specified relations among constituent symbolic components and instantiated computationally, the position taken is apparently that the causal potency of a thing is not inherently related to its embodiment, but to the relations expressed by an embodiment. Although this is hardly a new view, it is rather extreme and involves cherished issues in physicalism and the representational theory of mind, among other things. Nevertheless, interaction-oriented methods such as agent based simulation frames systems problems in an integrative complexity science. The local dynamical systems interact and define a network which can be characterized, the network properties influence the dynamical behavior of the local systems defining constraint and co-evolution, these dynamics can be understood in terms of the properties of their phase space, the algorithmic properties of the system can be assessed, etc.

We will take as an example a high performance micro-simulation for epidemics that scales to hundreds of millions of individuals, its rationale, use and some analysis.

Boundaries between Fields and Boundaries in the Mind

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Fields of human knowledge are our inventions. They are regions in our minds and brains. Human psychological capacities such as thought, feeling, memory are likewise regions in our minds and brains.

Fields lie next to other fields with some sort of boundary between them – a wall, a fence, a dotted line. The fields of knowledge, the regions, have been studied in great and ever-increasing detail, but the boundaries have been neglected. The assumption has been that the boundaries are simply imaginary lines.

But no, boundaries can be studied. My colleagues and I have done a whole series of studies over the past twenty years on various types of boundaries in the mind. Studying boundaries begin with the realization that boundaries are not one-dimensional lines. They can be relatively thick (solid, impermeable) or relatively thin. We can assess the thickness of boundaries psychologically using the well-validated Boundary Questionnaire (taken by about 10,000 people by now) and we have recently developed brain/biological measures of boundaries as well.

Boundaries studied include boundaries between sensory modalities, between thought and feeling, between sleep and waking, between dreaming and waking, between the body and the outside world, between men and women, between our own groups and other groups, and many others. Thick boundaries imply separation, solid distinctions, serial thinking, black/white thinking. Thin boundaries imply the opposite. Statistically there is surprising coherence (correlation) between different kinds of boundaries. People who score thick on one kind of boundary tend to score thick on others too. And people with thick boundaries differ markedly from those with thinner boundaries in their approach to science, art and philosophy, as well as questions such as relations between nations. As a simple example, art students tend to score very thin overall, military officers and lawyers very thick. We also have a great deal of data on the relationship of boundaries to dreaming and to creativity.

Initiative for the scientific study of the past at Harvard University

Michael McCormick
Goelet Professor of Medieval History, Harvard University, USA

McCormick's three-year program exploits a wide range of recent advances in the natural and engineering sciences and the strengths of Harvard University to produce new data and insights into the sweeping but poorly documented historical changes of the fall of the Roman empire and the origins of medieval Europe. Intellects, methods, and labs active in science, history and archaeology who otherwise would never meet coalesce around major historical problems of the first millennium in short workshops (e.g. Life Sciences and Economic History; Climate Change), and longer research programs. Programs already underway include: isotopic studies of human bones to clarify diet, migration and economic change in the Mediterranean; ancient DNA laboratory studies in the pandemics that marked the beginning and end of the Middle Ages; ice core evidence of volcanic events and written evidence for their climate impact, 750-950 A.D.; the chemical composition of Charlemagne's coinage (LA ICP-MS); computational philology: AI and AL applications to the generation and statistical exploitation of free-access online databases of medieval Latin texts. So far the initiative has brought together archaeologists; historians; anthropologists; oceanic, atmospheric, analytical chemists; physicists; astrophysicists; computer scientists; genomics researchers; biostatisticians and molecular biologists from Belgium, Canada, France, Italy, Germany, the Netherlands,UK and the US.

Who's Afraid of Reductionism? Consilience, Cognitive Science and the Humanities

Edward Slingerland
University of British Columbia, Vancouver, Canada

In this talk I would like to provide a sketch of the increasingly strong case for breaking down the traditionally unbridgeable divide between the humanities and natural sciences and to argue for what E.O. Wilson refers to as "consilience," or what the evolutionary psychologists Tooby & Cosmides term a "vertically integrated" approach to the humanities. "Reductionism" is ultimately an empty term of abuse—any explanation worthy of being called an explanation involves reductionism of some sort. Drawing upon the work of Charles Taylor, I will try to explain what "good," non-eliminative reductionism—one that recognizes the reality of complex, emergent human-level structures of meaning—might look like. I will also argue from an embodied pragmatist perspective that these human-level structures of meaning should not be seen as possessing special ontological status, but rather must be understood as grounded in the lower levels of meaning studied by the natural sciences, rather than hovering magically above them. Practically speaking, this means that humanists need to start taking seriously discoveries about human cognition being provided by neuro- and cognitive scientists, which have a constraining function to play in the formulation of humanistic theories.

Cross-disciplinary Dialogue in Academia: Debating Complexity and Organic Development at Singapore Management University

Markus B. Karner,
Singapore Management University, Singapore

Here I present an overview of a discussion group created at the School of Economics and Social Sciences, Singapore Management University. In regular yet informal meetings, researchers from fields as diverse as economics, management, political sciences, philosophy, religion, physics, and biology, discuss issues related to complexity, chaos, dynamical systems, evolution, and organic development.

To foster cross-disciplinary understanding, the group chooses one scholarly article at a time to debate the oftentimes diverse meanings ascribed to both vocabularies and concepts across the research cultures. I will give examples of the kinds of papers discussed and the issues raised during debates. I will describe our experience with the format of the group discussions, interests, and participation levels.

Cross-disciplinary approaches often meet practical limits when participants have to “step out” of their original fields of expertise and risk exposure to easy criticism when venturing onto subjects unfamiliar to them. At the same time, knowledge of analogous approaches across disciplines is essential for maximum knowledge distribution. I will address this issue for the risk-averse Asian context.

Toward a NonModern NonHumanism

Mark M. Freed
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Central Michigan University,
USA

This paper interrogates a history of reflection on the "two cultures problem" punctuated by the work of Jürgen Habermas, Jean-Francois Lyotard, and Bruno Latour. A review of this history helps clarify the discursive conditions necessary for a "methodology of crossed views."

I begin with the Frankfurt School's critique of "instrumental reason." Habermas and others have argued that what began as science's effort to dominate nature turned into the domination of humans by humans. Fearful that scientific thinking displaced moral and aesthetic reason, Habermas calls for a reintegration of these spheres of culture. Lyotard has responded, however, that scientific knowledge, moral prescription, and aesthetic experience belong to incommensurable "language games" which do not share the same rules, and that efforts to integrate them result in a form of domination he calls "terror."

Bruno Latour contends this impasse will remain as long as we adhere to the view of the natural and human sciences as, respectively, discourses of the exclusively human and the nonhuman. A "methodology of crossed views," therefore, requires reconfiguring the natural and human sciences in ways significantly different from both their "modern" and "postmodern" forms. The nonmodern alternative suggested by Latour's "science studies" involves abandoning the ontological hermeticism typical of these discourses.

What Went Wrong? -- The losing battle of Confucian doctrine against cheating in science

Wei WU
School of Humanities and Social Sciences,
Nanyang Technological University, Singapore

May 12, 2006 was a dark date for the science world in China and South Korea. Two scientists from two top universities, both once hailed as national heroes for their world-famous “scientific breakthroughs,” made world headlines again, but for the wrong reason. South Korea’s Hwang Woo Suk was indicted and China’s Chen Jin was sacked for fabricating research results. These cases are not alone. Scandals have run rampant in top universities recently in both countries.

Both countries have long culture tradition of Confucianism, which highly respects intellectuals for their honest pursuit of knowledge and despites unethical conducts/behaviors common in the business sector. What has gone wrong? Is the 5,000-year old Confucian culture losing its influence in these countries, which have seen rapid economic growth in recent years? Is Confucian doctrine still applicable in modern business-oriented world? Before their disgraceful fall, both Hwang and Chen were strongly endorsed by their governments and received generous government fund. What has happened to the academic governance?

We will exam the growing gap between the traditional culture and modern trend of eager for quick success and overnight fame in the two countries. We will also explore the possible causes of such unethical conducts and discuss possible counter-measures so as to reinstall the public’s faith in scientists.

Many Cultures of Academic Inquiry

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Language and Literature,
National University of
Singapore, Singapore

On careful scrutiny, C. P. Snow's "two cultures" goes beyond the opposition between the "sciences" and the "humanities", revealing itself as mutually incompatible multiple epistemologies or paradigms of academic inquiry. Differences appear in the modes of:

discovery, involving ways of arriving at plausible conjectures/claims, which includes but is not restricted to "methodology" as received practices of gathering data;

justification, involving the "evidence", "argumentation", or "proof" to establish the claim as knowledge; and

critical thinking, involving the value systems and principles for evaluating knowledge claims and their justification.

For instance, norms of justification in mathematical proofs, experimental proofs, philosophical arguments, legal arguments, and literary arguments diverge, despite the shared unity that distinguishes them from theological justification and commonsense justification. "Admissible grounds" also diverge: observations in scientific inquiry, intuitions in philosophical inquiry, semi-subjective responses in aesthetic inquiry, and axioms and definitions in mathematical inquiry. Scientific and legal arguments admit defeasible reasoning; mathematical arguments do not.

Such epistemological differences lead to problems of "cross-cultural" dialogue. In my talk, I will describe a project of comparative academic epistemology that seeks to unearth the unity beneath the diversity of academic epistemologies, and help students acquire the capacity to engage in diverse forms of academic inquiry.

Nurturing students' capacity to bridge

Veronica Boix Mansilla
Project Zero, Harvard Graduate School of Education, USA

The demand is clear. To thrive in contemporary knowledge societies, young people need not only to develop insights and modes of thinking that are informed by the sciences and the humanities but also to integrate these forms of knowledge effectively—be it to develop a personal position about stem cell research, prepare for a career in intellectual property law, or understand global efforts to eradicate poverty. Preparing young people to engage in the major issues of our times requires that we nurture their ability to produce quality interdisciplinary work.

Colleges and universities increasingly offer "interdisciplinary" programs as markers of their capacity to prepare a new generation of thinkers and professionals (Lattuca, Voigt & Fath, 2004). Yet the rapid growth of these programs is accompanied by an often warranted concern about the quality of learning taking place: what constitutes quality work when individual disciplinary standards are inappropriate or inadequate?

The "case" I proposed introduces pedagogical framework to assess students' developing capacity to integrate the sciences and the humanities in order to advance their understandings of particular problems. The framework highlight dimensions of quality in interdisciplinary student work and stems from a multiyear empirical study of assessment practices in recognized undergraduate interdisciplinary programs in the Unites States (e.g. Stanford Human, Swarthmore's Interpretation Theory, University of Pennsylvania's Bioethics). Attached please find two papers outlining and illustrating the framework proposed.

A new Initiative at the University of Tokyo - Integrated Research System for Sustainable Sciences(IR3S) and Transdisciplinary Initiative for Global Sustainability(TIGS)

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Transdisciplinary Initiative for Global Sustainability (TIGS),
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A new Initiative for conducting knowledge in the academia has been started in the University of Tokyo. It is based on the following perceptions;

(1) The 20-th century was a century of explosion and war, but the 21-st century should be a century of sustainability and peace.
(2) Knowledge is also explosively accumulated and we tend be lost in a huge amount of knowledge.
(3) In order to overcome this situation, we have to integrate various disciplines through various methods, such as a structuring knowledge and issue-driven approach.

In order to achieve the above goals, new initiatives are started. The one is IR3S(Integrated Research System for Sustainable Sciences), which is a network of universities and research institutes in Japan and TIGS(Transdisciplinary for Global Sustainability) is a center in the University of Tokyo, which is responsible for coordinating and organizing research activities to respond to issues in the present society.

In TIGS, five research axis are defined, that is, (1) science and technology fundamental for sustainability sciences,(2) Global warming and energy issue,(3)population, food and water issue,(4) harmonization between a city and a village, and (5)risk management in a modern society. Following these axis, coordination activity is being done. For example, globalization and regional diversity is being discussed through foods and dishes, or food culture, where natural scientists, historian and human science peoples are participating.

III. Informal Discussions abstracts

The Common Pivot in the Methodological Dialogue of Sciences: The Case of Moral Sciences

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In this abstract I want to explore the methodological dialogue of sciences with special reference to moral sciences. For the actual realization of this dialogue we need a common or universal standard that interculturally is acceptable for different sciences or scientists. It seems that if we accept it more or less as a fact that all the sciences are based on a kind of reason or are searching for it we have discovered this commonality. Then the function or aim of this reason will become in the focus. It seems that the characteristic of reason is to order and not merely to know something. Therefore in every science to know the order of the science's parts with each other and with the things beyond them is the most important sign of the existence of reason in that science. Every science needs this ordering and there is no exception. But order can be related to reason in many different ways and this is not something artificial or abstract but natural. On the whole notwithstanding this plurality there have to be relation between order and reason. Therefore in every science like natural, mechanical, rational and moral sciences the order of every special subject-matter by reason is under consideration. Accordingly, is moral sciences the order of voluntary actions by reason is under way.

Considers for things

The order that reason considers for the external things

The order that reason considers for -------- voluntary actions

In this regard we have to mention to three main points:

- the kinds of order that can be found in things,
- the different ways that order relates to reason, and
- The imperfect operation of reason makes a differentiation of sciences.

Apparent Shape Analysis

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The evolution of Israeli cities, constitute a remarkably suitable 'test bed' for the synthesis of a complexity based comprehensive city/culture dynamics.

During the last hundred years, different groups within the population, sometimes possessing dissimilar sets of spatial contexts, were, in order to survive (literally) faced with the task of adapting their differing spatial contexts to the Israeli city that they encountered at the time of their arrival (or at the time that the city became a locus for their activity) or with the task of changing the actual city, i.e. adapting the actual city to their current spatial contexts, enfolded in the Israeli or Palestinian culture.

City dynamics is thus driven by a variety of maintenance decisions of which the decision to change location - migrate - is just one of many.

Nevertheless, the prominence of immigration in the Israeli experience, and the origins of CAS in Physics, has made the study of immigration systems the prime motivation for the application of discrete non linear dynamics – CAS methodology - to culture dynamics and to city dynamics, in particular.

This realization motivated me to develop, as an ongoing project, a comprehensive city analysis based on the functioning of the city as both a location and a memory of culture, on Complexity, and on a city dynamics, that accounts for both changes in location – immigration – and changes in culture (in the shapes of boundaries, depicted, in the actual city) named ASA (apparent shape analysis); and to test its validity on actual changes (of boundaries) which occurred in Israeli cities.

The proposed discussion recounts some insights about CAS (Complex Adaptive Systems) dynamics, gained while developing ASA – (Apparent Shape Analysis).

ASA is an interdependent set of instructions (tool-kit), for analyzing change in a particular city (or any other human settlement) and in its components (i.e. streets, residences, neighborhoods, etc.), based on a comprehensive discrete non linear city dynamics. Changes take place in one system, enfolding both the actual city (depicted as changes in repeating outlines of boundaries), and the 'replacement of the inner world' of spatial decision makers, i.e. in the spatial component of its inhabitants' culture (which can't be depicted directly). However, by making use of general CAS properties, discovered earlier via its application to analysis of phenomena in nature (in the frameworks of Micro-Biology, Ecology, Condensed Matter Physics etc.), ASA maintains that ad-hoc rules connecting adjacent states of a relevant system, enfolded in a particular city-culture pair, at a certain period, can be revealed, depicted and re-used for further analysis.

The dynamics that is the core of ASA, utilizes also former enhancements in the application of complexity, to other socio-ecological systems (mainly economic markets (Arthur) and migration systems (Sonis)). From this point of view, ASA 'represents' the current state of modifications induced in general CAS dynamics, by

its application to systems, which include human decision, i.e. where each decision contains a reflection of decisions made by other participants (in a common culture).

The knowledge about complexity in general, which was accumulated in culture/city -dynamics research, can be considered the 'interest' that we owe natural sciences' CAS pioneers, since it hones our understanding of the roles of observation and of coexistence, in the study of complexity.

Pythagoras Reconceived: A Perspective With Regard To the Relationship between Discrete Points in Space

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Pythagoras' Theorem states that x2 + y2 = z2 where x, y, and z are the distance between three points (e.g. A, B, & C) on a plane and where ∠ABC is a right angle. The Theorem is limited to two dimensions as shown by Wiles (Annals Math. (1995) 142: 443-551). The problem as to "why" the equation is so has not been asked nor answered until recently. Here it is suggested that the square of the distance between two points on a plane represents the relationship between those two points (for non-right triangles the equation x2 + y2 - 2xy.cos = z2 is used). This is exemplified by the equations relating gravity (Fgrav = (G.m1.m2)/d2), energy and mass (Ek = ½ mv2; E = mc2), electrical power, resistance, current, and voltage (P = I2 R; P = V2/R); and algorithms used in statistical analyses (Alon et al. (1999) Proc. Natl. Acad. Sci. 96: 6745-6750). For dimensions >2, distances can be constructed from two-dimensions in vector format. Many other relationships in nature are now open for interdisciplinary study, including the chemistry of biology at all levels from atomic interactions within molecules to the inter-relationships between organisms, psychology, economics, sociology, and philosophy.

Soils & Civilisations

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John W Crawford
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There is a saying that civilisation started on a downward spiral when the first plough broke the soil. Whilst the truth of this statement is questionable, what is not is the connection between Mans ability to survive and the soils ability to produce sufficient food. Despite soil supplying 99% of the World's food, containing most of the Earth's biodiversity, and supplying $23 Trillion worth of ecosystem services each year, we are in danger of irreversibly losing this resource through misuse. The increase in Globalisation of food production has led to a situation where we have lost the connection between soil and ourselves. Previously, where populations relied on local food production, the health of soil was monitored. As populations grew, and trade became less local, we stopped caring about soil. Today much of the food consumed in one country is produced in another, often poorer, country. Yet the erosion of soil reaches across the planet, impacting on all of us. Our new model accounts for how the smallest organisms in earth help to maintain a healthy soil and help Man survive on Earth. This Micro-Gaia theory provides a new way of thinking about and managing soil, from microbe to civilisations.

Culture Self and Knowledge In the Post-Modern World

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Contemporary psychologists believe that we construct knowledge by using an internal framework of meaning developed through daily interaction with the environment. This framework is anchored around the meaning of self. In the postmodern world, the culture, self, and knowledge connection becomes highly problematic. The frame of culture and one's self-identity, are undergoing continuous scrutiny and transformation. Giddens proposed that in the postmodern world, there is on the one hand globalization, but very much on the other hand a "sequestration of experiences". Increasingly, we define our self-identity within the limited experiences of our profession, be it in natural sciences, humanities or technology, each has its own worldview, a radically different paradigm. In order to have cross-disciplinary understanding, we need to fundamentally address the paradigm differences across these different disciplines. More importantly, we need, as educators, nurture the intellectually multicultural citizen, one who internalizes a hybrid of framework that encompasses both the science and technological world and the world of the humanities. Some universities, including our own, provide cross-disciplinary courses for their students. However, management and evaluation of these programs vary from one program to another. It is also very difficult to assess the effectiveness of such courses, as they address the long term development of the person and not the short term gain of knowledge and skills.

Information Technology for Poverty Reduction – Does It Really Works for the Poor? A Reality Check from Africa

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The United Nations Economic Commission for Africa (ECA) launched the African Information Society Initiative (AISI) in May 1996, which serves as a guiding framework for using information and communication technologies (ICT) in Africa. Thus far over 30 countries in the continent have embarked on the development of national ICT strategies supported by ECA. One specific element of the ICT policy development process is to use of ICT for poverty alleviation. The major question arises is whether we are developing ICT for improving the lives of the poor or developing ICT as another creamy layer in the society. In other words whether we are creating another 'economic divide' in our rush to bridge the 'digital divide'?

The SCAN-ICT programme of the ECA tries to look into this dimension of the emerging information technology driven society today in poor nations of Africa. It developed indicators and benchmarks for measuring the progress made through implementation of the ICT policies and the impact of the ICT applications in socio-economic development especially on poverty eradication.

This case study presents the results of the first phase of the SCAN-ICT (Ethiopia, Ghana, Morocco, Mozambique, Senegal, and Uganda) and tries to inform the ongoing debate on whether super specialized technologies really leap-frogs economic upliftment of the poor or delays their progress further by creating another barrier.

The Place of Science in General Education: Implications from an Integrated Science Curriculum

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General education intends to broaden a student's perspective and to develop empathy for other worldviews. Yet experimental science can be quite peripheral or even absent from what passes for general education. While colleges and universities are stuffed with science courses, they result in singularly little sympathy or understanding of science for many if not most undergraduates. The barriers preventing general education from bringing science to non-scientists are many. When science is not well integrated into a general educated worldview, science can be easily misjudged as capable of taking the place of other modes of analysis; in particular, it can be asked to generate rules for deciding right from wrong, which it cannot do. At Columbia University we have endeavored to repair this problem locally by creating a new required core undergraduate course that makes the science component of a solid general education curriculum interdepartmental, taught by practitioners of science, and which offers students an opportunity to debate and discuss the philosophical, historical and methodological contexts of current research. We have an obligation to preserve a flat field for discourse among the diverse groups who come together in academic settings. General education in science is the one obvious but largely untested way to show that science is in fact open to people of all backgrounds.

How to reconcilie humanities with natural sciences: A two-levels methodology

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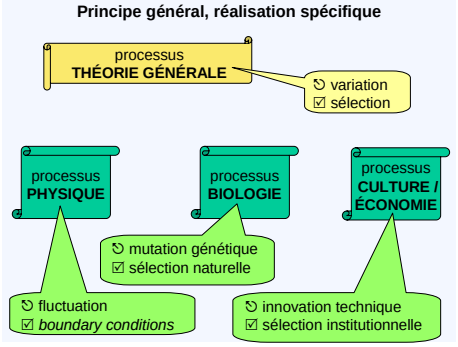
Recent developments in natural sciences, humanities and transdisciplinary approaches demonstrate intriguing correspondences between different fields of human knowledge, possibly revealing common principles in the realisation of natural and cultural processes, reinvigorating the debate on a possible integration of science (von Bertalanffy 1968). In their attempts to link natural sciences and humanities, methodological approaches such as analogical or metaphorical thinking most often lead to the reduction of intrinsically different properties to mere general similarities between natural and cultural phenomena, without making a clear distinction between what such processes effectively share (common principles) and what makes natural (and inside natural processes, between physical, biological, neuronal, etc.) and cultural processes irreducible to one another (specific characteristics).

Building a more general theory (Hull 1982, Callebaut & Pinxten 1987), or meta-theory (Delorme 1997) that encompasses natural and cultural processes might serve as an alternative to such reductive approaches. Such a methodology rests on a two steps process which can be illustrated by the following relation (Callebaut & Pinxten 1987:37): biological exemplar → general model → model of culture. Such a two-levels methodology allows for the conceptualisation of common principles (at the conceptual, theoretical level) and the recognition -and analysis- of specific characteristic (at the local, contextual level) which can also lead to the re-conceptualisation of local, "disciplinary" theories.

Two-levels methodology can be exemplified (cf. illustration above) with the general conceptualisation of the variation/selection interplay that takes radically different form in the natural and cultural realms, which is based, in the case of biological evolution, on the co-evolution of organisms/populations and their natural environment, and in the cultural sphere, on the dialectical relations between the social behaviours (individual and collective creativity, innovations) and the selective action of institutional conditions (social values -what is good/bad-, collective rules – what is permitted/forbidden-, routines). Such an approach is also useful inside natural sciences, as illustrated by the common but differentiated realisation of selection processes at different biological levels (multipolar selection).

Figure 1: Schematic illustration of a two-levels methodology



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Variation in dopamine receptor D4 and the origins and migration of modern humans

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Thought to arise approximately 50,000ybp around the time of expansion out of Africa, the 7R allele of the DRD4 dopamine receptor provides an important case study for the origins and migration of modern humans. The 7R allele is known to be associated with ADHD and population variation in the frequency of the allele has been suggested to effects of either 1) the propensity of individuals to migrate; 2) the degree to which impulsive and non-complaint males have higher reproductive success in different cultural settings. While the 7R allele has been associated with reproductive intentions among individuals of European ancestry, neither of these hypotheses has been tested directly in non-agricultural populations. The Ariaal, pastoralists of Kenya provide an interesting test case. The Ariaal are polygamous, and contain settled and nomadic groups. We collected hair samples from 200 Ariaal men to determine the frequency of the 7R alleles. We compared the frequency of the 7R allele in settled vs. nomadic males to determine its association with migratory behavior, as well as difference between polygamous and monogamous males to test its association with reproduction. The implications of these results for behavioral change with the origins of modern humans are discussed.

BRAINetwork: Experience in Transdiciplinary Neuroscience Research At Universiti Sains Malaysia

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The University as a knowledge-based organisation, must provide evidence-based solutions to a range of social, ethical and material problems. Our emphasis on sustainable development and dependence on science and technology requires that research-based solutions are not limited to a single viewpoint but cut across disciplines. In our University, this need is apparent in the Neurosciences which is seen to “belong “ to medicine. The medicalisation of the brain has made it difficult to envision research designs that are responsive to community needs which transcend the discipline of medicine.

To address this issue, BRAINetwork initiated a collaboration in fundamental and translational brain research involving humanities and the sciences. Our problem was that transdisciplinarity had to thrive within the context of a discipline-based academia and a mindset that had difficulty in finding a framework within which to conceptualise transdisciplinarity. Our ally was the commitment of the university in promoting transdisciplinarity and our strategy was to increase awareness and develop programmes to bridge this psychological gap.

A study after 18 months indicated that researchers were aware of transdisciplinarity but still assessed achievements within their discipline. Tensions were detected between scientific methodology and the philosophical viewpoint of the humanities. This required a reassessment of strategy with a focus on community outreach programmes as well. Since community needs are always transdisciplinary, BRAINetwork now aims to let desired community outcomes drive the process Toward transdisciplinarity in brain research.

Complexity in Cultural Systems

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-Knowledge Management and Complexity in the Transatlantic Baroque (2005-2009). Study of some of the knowledge management tools developed by the baroque system of culture to prove that far from being just a matter of private pleasure or market consumerism, a society creates new forms of artistic expression in order to harness the complexity in which it is living. Artistic expression is, then, not only the result of cultural identity, but also its pre-condition.

-Complexity Theory and the Humanities (2006-2008). Exploration of the possibilities opened up by complex systems theory in the humanities. How research in the humanities can take advantage of the concepts found in complexity theory. Moreover, it will demonstrate that using formalization and calculus as part of various research projects can complement qualitative research in the arts and humanities.

-The Hispanic Baroque: Complexity in the First Atlantic Culture (2007-2013). Multidisciplinary and international team, 35 researchers. We consider the cultural system under the light provided by its “baroque patterns”. How the formation of discourses on identity (information that guarantees the cultural reproduction) locks with specific technologies of culture (ways of doing things in a reproducible manner) to provide dynamic stability to the whole system. This stability shows that the system is more efficient (permanence) when it produces certain interactions, and that this efficiency relies on its networks of artistic production. How these efficiencies are created in three spheres of culture (the constitution of the Baroque; its religious expressions; a culture of cities), and how and why they emerge, transformed as neobaroque patterns, today.

The Paradigm Shift in the Relationship Between Science and Society

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One of the defining issues of the 21st century would be to articulate and clarify the role of scientists in society. The advance of knowledge and the complexities characterizing modern day developments now require a major infusion of knowledge in decision-making and policy formulation.

A pertinent example of this confluence of science and policy lies in the work of the Intergovernmental Panel on Climate Change (IPCC). The IPCC is a remarkable amalgam of different disciplines, all of which continue to provide policy relevant assessments on all aspects of climate change. The understanding of policy relevance requires close coordination and dialogue with policy makers, which helps IPCC report summaries to be written in language that it is intelligible to politicians, civil servants and diplomats etc., without compromising on scientific integrity.

The presentation would look at the record of the IPCC in creating a platform between scientists and policy makers, its procedures for establishing transparency, credibility and objectivity in the assessment produced, as well as the impacts that it has had on the society thus far. Embedded in a study of the IPCC are valuable insights into the paradigm shift in the relationship of science with society, which would provide a basis for a part of the Global Knowledge Dialogue.

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