AREA STUDIES versus DISCIPLINES
TOWARDS AN INTERDISCIPLINARY, SYSTEMIC COUNTRY APPROACH

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Abstract: The paper argues for a truly interdisciplinary, synergistic area approach, for applying cybersystemic and holistic thinking in the study of countries (regions of the world), for awakening to the interdependence and complementarity of different disciplines, concerned with the study of *aspects* of the world. At their very best, area studies are no more than multidisciplinary in character. Consisting of juxtaposed, not yet integrated partial studies, they are essentially disjointed. Providing the reader with a Humpty-Dumpty broken into bits, they are not *com*positions. Since unity-in-variety and variety-in-unity are universally recognized as criteria of excellence, area studies should be gobelins, or banquets, not patchworks, or buffets. Having established that scientific collaboration is not only necessary but also valuable, the author proceeds with an examination of the impediments to interdisciplinarity occasionally brought forward, and then elaborates (probably for the first time) on the contributions that systems theory, (socio)cybernetics, complexity theory and the accelerating developments in computer science and information technology could make to area studies. Thinking through the teaming up of students who use to focus their attention on one or other aspect of a country, he also touches on the importance of comparative research. In 'summary and conclusion' area students are exhaustively categorized. The provocative article, which is an exercise in second-order research, winds up with a call, not to ameliorate or innovate but to transform area (and era!) studies, radically.

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1. THE PROBLEM

Many people are considered to be knowledgeable about the state of affairs in, or the multifaceted and multilayered history of, a distinct geographic or socio-cultural area.[1] Whenever something of importance happens that concerns their domain, they are likely to be called upon to explain or interpret the event publicly. Usually, however, these 'area experts'[2] occupy themselves only with the language, literature, antiquities, arts, technical developments, religion, folklore, social structures/changes, legal system/practice, political affairs, military affairs, philosophical legacy, public health, education system, farming, energy sector, economy, business management, geological features, flora, fauna, population composition/change, media landscape or environmental problems of/in the country of their choice, inasmuch as a thorough grasp of all these issues is impossible.[3] So they are reasonably expected (a) to be well schooled in the related science/discipline, and (b) to shy away from making statements on a subject that does not fall within their purview, let alone on the area in general. When these expectations materialize, we face the problem of scientific parceling. For parceling neglects relations that matter; it disregards cross-boundary interactions. Compartmentalization deprives specialists of comprehension (*Zusammenschau*). Consequently, our 'experts' (and the decision-makers consulting them) have a country view that is radically incomplete (not just evidentially so), leading potentially to faulty arguments about the area concerned. That dramatic events might be the result of it, is self-evident.

Misconceptions of countries can also be attributed to the reading of area studies. At their very best, these studies are no more than multidisciplinary in character. Consisting of juxtaposed partial studies of a particular country, they provide the reader with a *spectacle coupé*; they lack a distinct theoretical framework by which these partial studies are overarched, or integrated. Consequently, the hallmark of true science is missing: systematized knowledge. These studies, sometimes highly acclaimed (for reasons I do not consider to be well-founded), are off-centered, essentially disjointed;

they are not *com*positions, as exemplified by *The Cambridge History of China*, – *India*, – *Russia*, – *Japan* and – *Iran*.

2. THE SOLUTION

The escape from this predicament seems to be scientific cooperation. Going into the opposite direction (*de*compartmentalization) would result in dilettantism, a return to the era of belief in the existence of the all-rounder, or leonardesque *uomo universale*. If one can not reasonably assume somebody to be so grounded in the sciences as to be able to make sound assertions about any subject regarding his/her home country, it is downright absurd to suppose that person to be scientifically qualified to deliver a lecture on whatever subject matter concerning a *foreign* country, be it a nearby or a faraway one. Therefore I can't help laughing, every time a 'China –', 'Japan –', 'Korea –', 'India –', 'Russia –' or 'USA expert' is announced, not to mention the 'Latin America –', 'Central Asia –', 'Southeast Asia –', 'Africa –' or 'Middle East authority'. Alexander Pope's saying, 'fools rush in where angels fear to tread', then crosses my mind, whereupon I wonder where the 'occidentalist' (as opposed to the 'orientalist') is hanging out — and the scholar who, master of all weapons, can be justifiably considered to be knowledgeable about the (history of the) whole world, indeed the universe.

The problem with 'area experts' is: they are, *qualitate qua*, fuzzy and muddleheaded about their methodology (the rationale underlying their research methods), assumptions and parameters; they are unable to define the theoretical structure of *their* field of study, to spell out the principles of *their* trade, to tell what the rules are of the game (singular!) *they* are playing. There are dozens of journals catering to the appetite of arabists, sinologists or connoisseurs of the Caribbean, but there is no journal in which the fundamentals of area study *tout court* are expounded and discussed. After centuries of area study, the prototype of which is *Il milione*, known in English as the *Travels of Marco Polo*, the first international conference on this queer kind of scholarship is still to be organized.

The way forward is cooperation between professionals also concerned with the context of what they are studying. What we need is neither a quasi-scientific narrative written by a literarily gifted dabbler, nor merely the concatenation of disciplinary exercises, but truly integrated views, *i.e.* many-sided area studies composed by groups of companions with a T-profile (profound knowledge in a particular field and proficiency in communicating with other experts). A condition necessary for better international relations (but, remarkably, not made in the UN Charter) is to acquire complete and coherent portrayals of nation-states. For patchworks are not gobelins, and the meaning of any text is definitely more than the aggregate, or sum total, of the meaning of its constituents.

I do not argue for 'fusion cooking', by which the scientific differentiation would be halted. However, in order to get a big *and* articulate country-picture (to see the wood and the trees, that is), bridges between faculties and departments have to be built, a requirement the chancellor of no university (what's in a name!) is in the position to disregard. Many fields of research demonstrate, that looking for interfaces can be fruitful. Ecology is a good example. The online *Encyclopedia of Life Support Systems* is an integrated compendium of twenty encyclopedias with a table of contents of 773 pages! "It attempts to forge pathways between disciplines in order to show their interdependence; it deals in detail with interdisciplinary subjects, but is also disciplinary, as each major core subject is covered in great depth by world experts".

Compartmentalization, the breaking down (mentally) of a system into more handy subsystems, should not result in losing sight of the conditions under which they operate within the supersystem. A good physician, or commander-in-chief, is acutely aware of this. If and only if they are well ordered, single entities/modules constitute a whole, as every architect, astronaut, *chef de cuisine*, composer, fashion designer, Japanese flower-arranger, even a football-coach can tell. The interplay of parts or components – a process the quintessence of which is exclusivity *and* inclusivity – is the basic principle of life, the very core of all matter.

Some area students seem to be conscious of the problem pointed out, but do not come up with the solution here submitted. Neither do they seem to realize, that people who consider themselves to be, or do not object being introduced as, knowledgeable about the *history* of a country are to be criticized in two respects. For, as the past is like another country (or a series of countries), geographical areas and chronological periods should be regarded as objects of methodologically the same kind of study. In other words, an area as well as an era (say, the Middle Ages, or the Renaissance) should be approached co-professionally. Implementation of this double recommendation would mean nothing less than a revolution in higher education.

3. SCIENTIFIC COOPERATION

Interdisciplinarity is 'hot', in Europe (Paris, Brussels, Oxford, Cambridge, Edinburgh, Uppsala, Linköping, Bielefeld, Frankfurt *an der* Oder, Vienna, Zürich, Madrid, Barcelona, Milan and Rome), the United States, Canada, Australia, China, Japan, Brazil, Argentina and Mexico. Whenever the subject 'scientific cooperation' comes up for discussion, three questions are posed. What does it mean? Is it necessary? Is it possible? Let us deal with them briefly.

3.1 THE *MEANING* OF COOPERATION

Scientists involved in scientific cooperation draw the practical conclusion from their insight that reality, the nexus of interrelated phenomena, is irreducible to a single dimension and can never be grasped by separate, juxtaposed disciplines (each of which being concerned with the study of only one aspect of the world), an assumption on which universities have been based since the 18th century. While specialization has yielded sharper analytical acuity within particular knowledge domains, where the *ceteris paribus* clause has been the self-imposed, unrealistic rule of operation ('unrealistic' because other relevant things never remain unaltered!), the goal of reaching integrated understanding has receded. The gaining of benefit from depth of focus has been at the expense of breath of view.

In September 1970, the Organization for Economic Cooperation and Development (OECD) hosted a seminar on interdisciplinarity, which in her final report is defined as follows:

> "Interdisciplinarity is a noun describing the interaction among two or more different disciplines. This interaction may range from simple communication of ideas to mutual integration of organizing concepts, methodology, procedures, terminology, data and organization of research and education in a fairly large field. An interdisciplinary group consists of persons differently trained, and organized into a common effort on a common problem with continuous communication among the participants."

This definition has been cause for much discussion, but a consensus seems to be growing that genuine scientific collaboration is not achieved until the individuals involved develop a new way of thinking by actively listening to each other, cautiously venturing beyond the bounds of academic disciplines, and extensively exploring the prospects for unity of knowledge. Unless the participants change their ways of thinking, their 'cooperation' (often misleadingly qualified as interdisciplinary) remains just a division of labor.

3.2 THE *NECESSITY* OF COOPERATION

Monodisciplinary research is often based on unrealistic, overly simplifying assumptions, the *homo economicus* of economists being a case in point; for another one, the *ceteris paribus* clause, see above. Science has finally evolved to a point where difficult problems require ambitious partnerships and pooling of disciplinary knowledge and analytical skills. One man can not really know two disciplines, because it is hard enough to know just one, but two men knowing two disciplines (chemistry and biology, say) can inspire each other and co-produce something of great value. Interdisciplinary/intercollege cooperation has added value in more than one respect: scientific, because it minimizes duplication, lights up the blind spots of the participants, and leads to reconceptualization, cross-fertilization and new research questions/projects; personal, because it feels right, stimulates creativity and enriches the life of the scientists involved; and social, because the best way to understand, and to deal with, complex problems relating to human society is to approach them holistically rather than reductively, synergetically rather than one-sidedly, interdisciplinarily rather than mono- or multidisciplinarily. However, we can not bring disciplines together and transcend them, if they cease to exist as distinct entities. Without trees no forest. The best performance of a symphony is executed by professional players of different instruments put in tune. There should be otherness in sameness, but the latter should not be hindered by the former.

3.3 THE *POSSIBILITY* OF COOPERATION

Conceptual confusion between, and within, the natural, social and human sciences is occasionally brought forward as an impediment to interdisciplinarity. This point is to be taken seriously, but the importance of it should not be exaggerated. Conceptual analysis, combined with the study of the *history* of concepts (*Begriffsgeschichte*), may clear things up and lead to resonance across disciplinary borders. To further this process, one should be aware of (*a*) the difference between concepts, words and objects, (*b*) the power of metaphor (as distinct from metonymy) and analogy, (*c*) the pitfalls of binary logic, as exposed by the advocates of non-classical logics, and (*d*) the advantage that can be taken of the fast developing techniques of information visualization. Moreover, experts in 'argumentation theory', which is not coterminous with 'logic', could (assisted by communication professionals) officiate as midwives, helping to bring about understanding among differently trained but intellectually sincere and open-minded scientists. Academics who are not exclusively out for own glory, gratefully acknowledge the contributions of other scholars, and are really willing to cooperate, can learn a lot from people experienced in teamwork, versed in project management or skilled in system integration – and intelligent/collaborative software engineering.

Incompatibility of the quantitative and qualitative research methods in respectively the *erklärende Naturwissenschaften* and *verstehende Kulturwissenschaften* is regarded as another obstacle to interdisciplinarity. At first sight the gap seems unbridgeable. Quantity is a matter of counting and measuring (not only on ratio scales), either by direct observation or by means of suitable instruments, whereas quality concerns essential/intrinsic/necessary or accidental/extrinsic/contingent properties that can only be described or depicted. What tends to be forgotten, however, is that the two might be represented by the wings of a flying bird: the one can not do without the other. It should be added, that the so-called hard sciences are softer than their practitioners are willing to acknowledge. The Humean problem of induction is not yet solved; 'facts' (from *factum*, meaning 'something made') are not facts, because observations are 'theory-laden'; whether data are 'things given' is questionable; the issue of causality is unsettled by nonlinear analyses; and Zeno's paradox of motion is still with us. Furthermore, a rigorous definition of 'number' is not given; 'point' is a matter of distance (no geometer can tell how to transform a point into a line, a line into a plane, and a plane into a sphere); theorems (provable statements) regarding relations between points are deduced from axioms (basic propositions *not* supported by proof); and nobody commands the landscape of mathematics, *i.e.* knows whether or not this body of 'knowledge' (a contested concept) is consistent, a state of affairs people *applying* mathematics should not be satisfied with. On the other hand, the social sciences, even the humanities, are getting harder. Indeed, there is scarcely a non-natural science that does not have substantial mathematics prerequisites. Game theory, operations research, management science, actuarial science, and mathematical economics, – finance, – sociology, – anthropology, – demography, – psychology, – linguistics, and – political science are flourishing. Meanwhile, there is no denying that art and math are intimately interrelated. ‘The musician,’ James Joseph Sylvester, one of the creators of the theory of algebraic invariants, said, ‘feels mathematics, the mathematician thinks music.’ As to the organization of data sets into tables or charts, the elucidation of evidence from them, the extraction and modeling of patterns from variations or the quantification of uncertainty attached to conclusions, the statistician’s extensive toolkit is at the disposal of *both* camps.

Closely related to the quantity-quality debate is the controversy about the unity of science/knowledge, the origin of which can be traced back to the pre-Socratic preoccupation with the question of the one and the many, whether the world’s fundamental constitution, and thereby our knowledge of it, is monistic or pluralistic (see Raphael’s *School of Athens*). Interestingly, while positivists and anti-positivists are still wrangling over the issue, attempts are being made to tackle the problem in a different way.

Logic, Epistemology, and the Unity of Science is a Kluwer-Springer book series that started in 2004 and aims to reconsider the question of unity of science in light of recent developments in logic and theory of knowledge, and to provide an integrated picture of the scientific enterprise in all its diversity.

Another effort to move beyond old distinctions is network science, the applications of which range the whole gamut of sciences, natural, biological, social and human. In other words, network science, a field of research related to graph theory (subfield of topology), is a kind of glue, or cement; it is highly interdisciplinary.

(Re)unification of knowledge/science is possible, provided the readiness to engage in a respectful and learningful dialogue (in which the concern is *what is right* rather than *who is right*), provided ‘the willingness to see the other fellow’s point of view’ (Kenneth Boulding). All disciplines, different though they are, sprang from marveling, and are parts of a huge carpet weave. Therefore, it should be possible to develop and maintain a common ontology that permits differently trained scientists to interoperate.

4. CONTRIBUTIONS OF SYSTEMS THEORY

An atom, a molecule, a cell, the human body, a family, a television set, a port, a hospital, a university, a company, an industry, a city, a political party, a country, an army, the EU, the UN, a religion, a language, a game, a tree, a rainforest, mother earth, the sun and its planets, and the Milky Way is a system, a conjunction, a set of interrelated elements. There are concrete and conceptual, open and closed, deterministic and stochastic systems. The borders of social systems are alternatingly open and closed to in- and outflows of matter/energy and information. If ‘social systems’ is replaced by ‘countries’, we are talking about foreign relations.

The terms ‘system’, ‘structure’ and ‘mechanism’ are to be distinguished. A system, organism or organisation is an object whose elements, or parts, are held together by bonds of some kind. The collection of all relations among a system’s constituents is its structure, or architecture, ‘relation’ being defined as the property of two or more entities taken together. There are ten types of structures: spheres, mosaics, lattices, polyhedra, spirals, meanders, waves, branchings, symmetries and fractals. A mechanism is a process, the temporal sequence of system states. Whereas ‘structure’ points to the makeup of a system, ‘mechanism’ refers to its functioning, which helps to maintain (the structure of) the system. Social mechanisms, which are special because human beings having a sense of truth, goodness, beauty and holiness are involved, can be political, legal, economic, educational, religious, etc.; they are the study objects of various disciplines/sciences, which in turn are interrelated systems. Regardless of their nature, all systems (with the exception of one) share three properties; they are composite, are embedded in some context or other, and have a structure allowing them to function. Whoever says ‘system’, no matter the scale of the subject being treated, also says ‘structure’. Comprehending is knowing; it is, essentially, ‘seeing’ (with the mind’s eye) how a system is structured, how it works. Everything in the universe was, is, or will be a system and a component of one. Indeed, the universe itself is a system, but a subsystem of none. ‘*Dans le monde*’, encyclopedist Baron d’Holbach said, ‘*tout est lié*’.

‘Entropy’ is a central concept in the analysis of any system formed and maintained through the expenditure of energy and information, the relations between which are currently subject of heated debate. While there is a tendency toward maximum entropy in physical and living systems, social systems display an increase, over time, in complexity, which is indicative of *decrease*, rather than increase in entropy. How can this be the case, when physical science (the second law of thermodynamics) says that it should not? The answer is, that by bringing in new energy and information from its environment a social system can cope with its entropy increase. It was Ludwig von Bertalanffy (1901-1972) who, inspired by Claude Shannon and Ilya Prigogine, in one fell swoop rid sociology of its wrongheaded view (‘Spencerian dilemma’). Founding father of systems biology in the first place, he clearly defined, and generalized, the concept of system. Whether a system is physical, biological or social, it can only reach a low level of entropy through expenditures of energy and information. If they are sufficiently available to, and properly used by, the system, it can increase in complexity and consequently decrease in entropy.

The goal of general systems theory is to model the properties and relationships common to all systems. Hence, the interdisciplinary approach of an intricate subject matter (a country, say) will only be operable if based upon its principles. Right after World War II, a group of scientists, to which Von Bertalanffy belonged, found a response to the terrible events that had killed tens of millions of people: holistic instead of fragmented thinking. They regarded ‘system’ as the best word referring to a whole. One-sidedness was to be fought in order to survive. However, man must specialize in order not to drown in the sea of available knowledge and information. Only by networking many one-sided views the weakness of specializations could be overcome. Holistic thinking was the device for connecting narrow professional capacities. In this way many problems have been solved already, but there are still many problems around. They can not be solved without creative cooperation of specialists and systemic thinking. The urgent problem of climate change is one of them; the problem as to how to understand, and best to deal with, countries is another, equally important one.

5. CONTRIBUTIONS OF CYBERNETICS

Systemics and cybernetics are akin. They are – it should not be forgotten – formal sciences, like logic and mathematics. By looking at what a wide range of phenomena have in common, they are located at a metadisciplinary level. Cybernetics (from κυβερνήτης, meaning ‘steersman’ or ‘governor’) is the science of steering, which is a ‘struggle for order’ (S.T. Bok). It is closely related to control –, information – and communication theory. Norbert Wiener (1894-1964), probably acquainted with the work of the Belarusian Alexander Bogdanov (1873-1928), coined the term in March 1946 (at the first ‘Macy conference’) as a label for studies of control and communication in animals and machines, including human beings. Though luminaries like Wiener himself, Gregory Bateson, Warren McCulloch, John von Neumann, Ross Ashby, Heinz von Förster, Béla Bánáthy, Pyotr Anokhin, Humberto Maturana, Francisco Varela, Valentino Braitenberg, Gordon Pask, Stafford Beer, John Warfield, Hermann Schmidt, Arturo Rosenblueth, Ernst von Glasersfeld, Bernard Hassenstein, Felix Geyer, Klaus Krippendorff, Lawrence Fogel, Ranulph Glanville, Sergej Kurdyumov, Valentin Turchin, Karl Reinisch, Stuart Kauffman, Robert Trappl, Stuart Umpleby, Bernard Scott, Kevin Warwick, Robert Vallée, Michael Jackson, Søren Brier and Charles François have made cybernetics what it is, the bright noontide of its rise has yet to be. My bet, for what it is worth, is that first an end has to be put to the great, perennial debate ‘realism versus anti-realism’, and that the interdisciplinary study of mind – embracing philosophy, psychology, linguistics, semiotics, sociology, anthropology, artificial intelligence, and neuroscience – will play a pivotal role in it.

The key concepts of cybernetics, one of the three major milestones in modern science (the other two being the theory of relativity and the quantum theory), are 'structure' and 'process' (precisely the concepts around which 2,500 years old Chinese philosophy has turned elliptically: *li* and *dao* respectively). Its goal is the modeling of structures and processes, abstracted from any instance of embodiment. Such models serve several purposes. They provide tools for ordering things within disciplines; they deliver a *lingua franca* for communication between disciplines; and they serve as powerful educational tools for the transmission of important insights to succeeding generations. 'First-order', classical cybernetics has been useful for solving all sorts of engineering problems. In spite of its mechanistic character, it gave a good deal of impetus to a new approach in the social sciences by stressing two points.

▪ Crucial for a system are its properties as a whole. Before entering any discussion or analysis of systems, it has to be unequivocally stated about which system one is going to talk. Only when it is clear which system is of central interest, its hierarchy can be established, meaning that its components can be treated as subsystems, its embedding in a larger system can be identified, and its boundary can be delineated. The 'holon' character is by no means anything mystical. Taking the relational view (in fact, it is difficult to see reality as not being patterned, as not being a matter of relations), one immediately sees that it is the consequence of ordering. The sum of components becomes a computer once they are properly organized and assembled. Consequently, the (indeed every) thing is more than its constituents taken together.

▪ For centuries, the idea of circular causality has been rejected, and 'begging the question' (assuming what is being claimed in the conclusion) still counts as a logical fallacy. However, recent research makes it likely that life resulted from a number of bootstrap operations, thereby casting doubt upon the Newtonian clockwork model, with its emphasis on linear relations. Examples of circular causality are positive (deviation-amplifying, morphogenetic) and negative (deviation-reducing, morphostatic) feedback loops, either engineered or occurring spontaneously. From the 1970s onward, 'second-order' cybernetics, which posits that the observer and the observed cannot be separated, has stressed positive feedback, by which it became more suitable for application in the social sciences. Publication, in 1972, of *The Limits to Growth*, a report commissioned by the Club of Rome and updated in 2004, contributed to this development. Following the theory of constructivism, second-order cybernetics is also called 'new cybernetics' or 'cybernetics of cybernetics'.

Social sciences start when two individuals begin to interact and to communicate — set foot on the as yet partly explored terrain of 'semiotic matrix', that is. Social units, like families, collegiate bodies and organizations, can be conceived of as conglomerates of actor systems behaving re- as well as proactively. What is added by sociocyberneticists, in comparison with traditional sociologists, are the detailed concepts of information technology, the sophisticated loops of circular causality (including mechanisms of confident anticipation and self-organization) and the refining tools of social software. Communities (not necessarily harmonious ones) are regarded as hybrid systems (composed of different types of social units), and 'group knowledge' is conceptualized as either knowledge stored in the memories of individual actor systems or knowledge stored in external memories, such as symbols, artifacts, books, newspapers, photographs, motion pictures, laws/statutes and electronic databases. The usual confusion of society and culture can thus be replaced by a clear distinction between social/collective-behavioral systems, of which interaction-communication is intrinsic, and – being interrelated with them – cultural systems, stocks of knowledge/belief/wisdom (including norms, values and expectations) shared by a collective and passed on to its next generation.

In order to foster interdisciplinary cooperation, a unifying, metadisciplinary basis is required. Sociocybernetics (along with informatics, synergetics and cybersemiotics) promises to provide this foundation. There are now rich dialogues between systems theorists, cyberneticians and representatives of the humanities and social/organizational sciences, as evidenced by their participation in numerous international congresses and their contributions to dozens of journals.

6. CONTRIBUTIONS OF COMPLEXITY THEORY

In environmental studies, military science, business administration or urban and regional planning interdisciplinarity results from complexity. But 'complex' should not be taken to mean 'complicated'. Whereas 'simple' is the opposite of 'complicated', 'independent' is to be set over against 'complex'. The Latin word *complexus* means 'twisted together'. This can be explained as follows. In order to have a complex system, you need at least two entities, entangled, or embracing each other, in such a way that they are inextricably intertwined. The parts are distinct from *as well as* connected to each other. The phenomenon of intercourse between two loving humans of opposite sex may serve as prime, archetypal example. A system is thus more complex when more parts, and more relationships between them, are involved. Think of the triad brain-mind-action, or a nation-state, made up of millions, sometimes hundreds of millions of actor systems. Dialectic tension, or complementary opposition, between the one (the whole consisting of parts) and the many (the parts constituting a whole) is the essence of complexity. While distinctiveness corresponds to heterogeneity, individuality and plurality, connectedness corresponds to homogeneity, collectivity and unity. Complexity can only exist when both aspects are present, when differentiation occurs in conjunction with integration. In other words, it is situated in between two reciprocally related extremes. Complexity implies two/many-sidedness, the substitution of 'both … and …' for 'either … or …', *i.e.* rejection of the Aristotelian 'principle of the excluded middle' ($p \vee \sim p$). Complexity reminds us of the dialectical monism in Chinese thinking, symbolized by the well-known, recursiveness, nonlinearity and wholeness suggesting *yin-yang* diagram, that together with the words *contraria sunt complementa* figured in the coat-of-arms of Niels Bohr: ☯. It also brings to mind the views of L.E.J. Brouwer, a Dutchman who, hundred years ago, successfully attacked the foundations of mathematics, and whose ideas are now referred to by constructivists.

Biological, medical, ecological, social, political, legal, economic, financial, educational and religious systems are not mechanical but organic in character; their variables are nonlinearly related; to explain their 'mechanism', something more than statistical mechanics is needed. To answer questions as to how a currency can be effectively and wisely stabilized, to what extent it is safe to depend on the free interplay of demand and supply (a question which has been cause of enormous political upheaval), or what the Western response to the Islamic/Chinese challenge should be (a question having been/beginning to be cause of much discussion), we have to occupy ourselves with the analysis of systems which are organic wholes, their parts all being dynamically interrelated. Doing so, we can not be sure that agent variations cancel one another out, meaning that the law of large numbers, and its offshoots (including the central limit theorem), obtain. In the human world, there are many examples of actions/events driven by positive feedback: traffic jams, hooliganism, increasing-returns (a phenomenon shunned by orthodox economists), crashes of financial markets, popularities (fashion, public opinion, pop culture), epidemics, revolutions and outbreaks of war.

A system not amenable to the calculation of averages (a complex system, that is) may be understood through modeling and simulation, either top-down, taking the system as a whole, or bottom-up, starting from the single, 'emergence' triggering agents. Speaking of models, I mean the formal representation of specific realms of reality by differential or difference equations, and models developed during the last twenty-five years, such as cellular automata, fuzzy Boolean nets and evolutionary/genetic algorithms. Computer simulation, extensively used in the Complex Adaptive System (CAS) approach ('adaptive' because the agents as well as the system have the capacity to learn and to change, giving them resilience in the face of perturbation), is the art and technique of (*a*) creating/adjusting a model of the 'mechanism' of a system, (*b*) representing the model by a computer program, (*c*) running the program and (*d*) analyzing the results hereof. Its purpose is to replace reallife processes, to test the implications of operations that would be too costly, cumbersome or hazardous to be implemented. Computer simulation, making possible the investigation of a system's development/evolution under altered initial conditions, and being complementary to the traditional approaches of theorizing and experimenting, is increasingly used, not only in physics, chemistry, geology, biology and engineering, but also in the social sciences. In 2006, the first world congress on social simulation was held in Kyoto. The second one took place in July 2008, at George Mason University, Fairfax. Joshua Epstein (Brookings Institution), Hiroshi Deguchi (Tokyo Institute of Technology) and Dirk Helbing (ETH Zürich) were the keynote speakers.

Whereas the CAS approach concentrates on a system's properties and features (like 'downward causation', 'self-organization', 'self-similarity' and 'spontaneous order'), the Multi Agent System (MAS) approach brings the actions, reactions and interactions of heterogeneous, situated agents, and the effects thereof on the system, into focus. The study of agent-based social systems goes well beyond the boundaries of disciplines. Poised at the intersection of a number of sciences, they are radically changing our view on how people live together. In an environment they affect and are affected by, agents/actors communicate, interact and negotiate with each other in many ways. Depending on the form of communication, the modality of interaction and the nature of negotiation, a great variety of socio-cultural phenomena, specific to time (history) and place (geography), emerges. In short, CAS and MAS researchers, making use of state-of-the-art developments in computer science and information technology (and predominantly active in America and Japan), are engaged in cooperative, interdisciplinary work.

7. CONTRIBUTIONS OF TECHNOLOGY

Computer science (CS), or computer and information science (CIS), is – like systemics, cybernetics and complexity science – interdisciplinary in character. Her basic concepts and techniques are applicable to a wide range of problems, which look very different at the surface. The crucial developments by which she came to the fore were fundamental discoveries made in the 1930s (Kurt Gödel, Alonzo Church, Alan Turing) and the completion of the first large general-purpose electronic computer in the 1940s (Von Neumann). Ever since, the pace of developments has been swift. Few people still remember at what time the personal computer burst onto the scene, and hardly has Internet conquered the world (causing it to be a 'global village'), when an even greater transformation is on the horizon. Efforts are being made to built a cyberinfrastructure that will benefit the public and the specialist alike by providing computer access to the breath and depth of the world's socio-cultural record — access as easy as the ability to obtain electricity from the socket and water from the faucet.

An infrastructure is deeply embedded in the way we do our work. When it works efficiently, it is invisible: we use it without really thinking of it. An infrastructure is an installed base on which other things are built. Because it is extensive and expensive, it tends to be built incrementally, neither all at once nor everywhere at once. The infrastructure of scholarship, for example, was built over centuries. It includes the diverse collections of written, printed, or other graphic or visual material in libraries, archives and museums; the bibliographies, searching aids, citation systems and concordances that make this information retrievable; the standards that are embodied in catalogues and classification systems; the printers/publishers of books and periodicals; and the librarians, archivists and curators who link the operation of this infrastructure to the scholars and scientists who use it.

This kind of infrastructure is going to be fundamentally changed by e-science, a field of research concerned with the intersection of CS, information & communication technology (ICT) and the traditional sciences — natural, biological, social and human. E(lectronic)-science will offer the potential to study complex systems collaboratively. Its key concept is 'computational grid'; a network of robust and reliable services providing electronic access to the full range of facilities required by researchers. What is exciting about this network is the combination of vast quantities of digitized data ('digital libraries'), high performance computers and connectivity between computers, all three of which are expanding rapidly! It will make possible applications that are orders of magnitude more potent than even a few years ago. 'Grid computing' will be the new paradigm, allowing users to share computing resources across geographic and disciplinary boundaries.

When Blue Waters – a joint, National Science Foundation (NSF)-supported effort of the university of Illinois' National Center for Supercomputing Applications, IBM and the Great Lakes Consortium for Petascale Computation – comes online in 2011, it will have greater computing capacity than all the current top 500 supercomputers combined. Blue Waters will deliver sustained performance of at least a petaflop for many scientific and engineering applications, meaning that researchers will be able, *e.g.*, to predict the behavior of complex biological systems, understand the production of heavy elements in supernova, design catalysts and other materials at the atomic level, predict changes in the earth's climate and ecosystems, and simulate complex engineered systems like power plans and airplanes. 'A petaflop' is computer parlance for 1 quadrillion calculations *per second*. Differently put: "If you could multiply two 14 digit numbers every second, it would take about 31 million years to complete the 1 quadrillion calculations Blue Waters will complete every second" (John R. Melchi).

Some researchers are even dreaming, and assiduously exploring the feasibility, of a synthesis – through interdisciplinary work – of computer science, information science and quantum physics; they believe that the computer age has not yet really began! In 1997, William Phillips, co-winner of the Nobel Prize in physics, said: "Quantum information is a radical departure in information technology, more fundamentally different from current technology than the digital computer is from the abacus."

Perhaps the greatest challenge of our time is to cope with the 'data explosion', or 'data overload'. At the moment (November 2008), the fast increasing number of bytes of information created and replicated worldwide amounts to more than 125 quintillion (one byte being equal to eight bits). So the big question is, how to derive insight from these data. In addition to the advancing technique of data mining (the process of exploring large amounts of usually business/market related data in search of patterns or correlations, and building predictive models based on them), two developments are promising, particularly when viewed in tandem.

▪ To date, our main means of accessing database facilities are search engines, such as Google and Yahoo, that can do the work of file *retrieval*; computers have no reliable way to process the *semantics* of information. The so-called Semantic Web aims to make up for this, to bring structure to the meaningful content of data. Collaborating, intelligent software agents will roam from page to page on the Internet, carrying out sophisticated tasks for users. The first steps in weaving the Semantic Web into the fabric of the existing Web, which is only a huge archive, have already been taken. The pursuit of a fully functional information-centric software architecture, elevating computers beyond the rote storage and processing of data to the representation of information as a basis for automatic reasoning capabilities, has begun. After two 'winters' (1974-'80 and 1987-'93), Artificial Intelligence is coming of age. The human-computer interaction is rising to the level of meaningful collaboration.

▪ The other hopeful development concerns the art and technique of information visualization. The sensational advances in this field can be attributed to (*a*) the possibility to store huge quantities of digital data, (*b*) computation that allows the rapid, interactive selection of subsets of these data for flexible exploration, and (*c*) the availability of high-resolution graphic displays (wall-sized and divided into multiple frames) that ensures a match between the presentation of data and the power of the human visual and cognitive systems. The technique is also called Data and Visual Analytics (DAVA), which, being connected with 'Cultural Analytics', is defined as the science of analytical reasoning facilitated by interactive visual interfaces. Emphasizing the importance of cognitive science and requiring interdisciplinarity, it goes far beyond traditional ways of information visualization. DAVA can clarify concepts, show the structures and processes of systems, and foster the cognition of cooperating scientists. To illustrate is, etymologically as well as actually, to enlighten. As the proverb goes: ‘A picture is worth a thousand words’.

8. THINKING THROUGH THE TEAMING UP

A point to be given due attention is comparative research. Comparing, which should not be confused with equating, is part of our daily life. We are able to ‘think of one thing as another when it plainly is not’ (Ted Cohen). Knowledge of the self is gained through knowledge of the other, *vice versa*. The sense of identity/similarity and diversity/dissimilarity is ‘the very keel and backbone of our thinking’(William James). Sameness and otherness are like adjacent, supplementary angles: they add up to 180 degrees, but determine each other’s size. Without contrasts we can’t perceive or understand anything; choosing/decision-making, the outcome of mental processes currently being the subject of research from several perspectives, would be impossible. Comparing is what scientists do systematically (and what cooperating scientists will not be exempted from doing) in order to get a sharp (composite) picture. If a country is the object of study, and if the comparing concerns the establishment of likenesses and unlikenesses of ‘they’ and ‘us’, the main difficulty will be to bracket conceptual frameworks, to scrutinize one’s own premises (what is taken for granted, or tacitly assumed), to be unprejudiced, to undertake a ‘journey beyond culture’(Edward T. Hall). This obstacle will be particularly difficult to surmount when ‘us’ refers to Westerners, the often arrogant inhabitants of a region that, being the birthplace of modern science and technology, has dominated the world.

Touching on the importance of comparison, and skipping the thorny problems of translation (*traduttore traditore*?), brings us to the ongoing ‘emic-etic debate’, which resolves around the question whether an account of actions should be given in terms meaningful to the actors belonging to the country under study, or in terms applicable to actions in other countries as well. Emicists maintain that a country is *sui generis*, for which reason notions having their origin elsewhere do not apply to it. Understanding of the area is only possible from within; the analytical categories should be indigenous. Eticists, however, consider this epistemic relativism to be self-referentially incoherent, because, if it is right, the very notion of rightness is undermined, in which case epistemic relativism is unable to defend itself. Despite this powerful response, the eticists themselves also face a tall problem: how to develop a non-relativistic epistemology which (*a*) is not dogmatic, (*b*) rejects any notion of a privileged framework in which knowledge-claims must be couched, and (*c*) is self-referentially coherent.

There is a way out of the controversy: developing an attitude of mind beyond the positions taken by the emicists and the eticists. Both camps set too low an estimate upon the possibility of inter-national/inter-cultural communication, which is a *process*, a progressively continuing operation that, predicated on the principle of integrity, must lead to what the Syilx Indians call *en’owkin* (understanding through a gentle process of clarification and integration). Such an ‘authentic dialogue’ (Gadamer), in which the partners do not talk at cross purposes (none of them only bent on proving him- or herself right and not wanting to gain insight), will be greatly facilitated, not by unduly focusing on ‘ratio’, the foundation of which has been shown shaky, but by savoring and mulling over Peter Senge’s *The Fifth Discipline* (2006), and by considering ‘**system**’ to be – in the spirit of Von Bertalanffy and his illustrious colleagues – the best word referring to any country.

9. SUMMARY AND CONCLUSION

An area, country or nation-state is a hugely complex, multiminded, nonequilibrium system that has an individuality, a style, a *Gestalt*. It is a hierarchically ordered, configurational whole that constantly changes (sometimes turbulently), having properties none of its constituent subsystems has (much in the same way as the nature of water is irreducible to the attributes of hydrogen and oxygen). It is to be defined by four fields (the geographic, historic, socio-cultural and individual-creative one), and can be represented/modeled by the regular, Plato already fascinating polyhedron with four equilateral triangular faces: the tetrahedron. If we let G, H, S and I stand for the fields, each of which supposes the three others, a nation is to be seen as a multiple intersection: $G \cap I \cap S \cap H$. Being a *Gefüge*, a quaternion, a four-dimensional, at one time open, at another time closed, system of systems (of geological, biological, demographic, medical, ecological, political, legal, military, economic, financial, managerial, technological, educational, social, linguistic, religious, artistic or other nature), a country can only be understood across various disciplines — by integrative study, that is. Silo or stove-pipe peering has to be avoided. For, as Zhuangzi (369-286 BC) already said, *Jing wa bu ke yi yu yu hai* (you can't speak about the sea with a frog in a well). To cut an area into morsels for single sciences to handle would amount to destroying a 'system'(*con*stitution) in order to *com*prehend it. Nations, big or small, are to be thrown into a fresh perspective. Concepts borrowed from the science of complex systems, such as 'attractor', 'bifurcation', 'chaos', 'dynamics', 'fractal', 'fuzziness', 'granulation', 'instability', 'nonlinearity', 'randomness', 'scalability' and 'synergy', must be applied to them. Studies have been done on cognition/consciousness and complexity, religion and complexity, economies and complexity, policies and complexity, morality and complexity, aesthetics and complexity, social networks/processes and complexity (SACS Toolkit), and cities and complexity. It is now time for thinking of writing, authoritatively, about *countries* and complexity. The path to systemic, interdisciplinary study of a nation may be long and arduous, yet there is no other way if the ambition is to attain comprehension, if the desire is to gain a view in every direction. The panorama will be breathtaking.

Nominally and exhaustively, area students associated with a university or scholarly society (as distinct from skimming, scandal/sensation-loving newspaper or television correspondents) can be categorized as follows:

▪ Those who – without a textbook containing a presentation of the principles and vocabulary of their trade (area-study) – boldly claim to synthesize the results of all kinds of professional study regarding the country of their predilection. Having no degree in any of the disciplines concerned (nor having contributed to the theoretical development of any of them), they do not shrink from rushing in where angels fear to tread. Pretending to be experts, these jacks-of-all-trades (but masters of none) leave the reader/listener in the dark as to how the parts fit into the whole and, conversely, how the whole stands interconnected with the parts. Their area (or era!) approach is to be called *mile-wide but inch-deep.* Though their population is dwindling, they are by no means extinct. I am not saying, that country all-rounders are completely useless. Certainly not; they may refer the listener/reader to *professional* literature. However, what I do say and what I accuse these polyhistors of is, that – taking advantage of the ignorance of their credulous audience or readership – they are seldom explicit and unequivocal about the shallowness of their own knowledge.

▪ Those who modestly confine themselves to studying, say, the language(s) of a country but deem it unnecessary first to receive an academic degree in general linguistics. Their area approach is *inch-wide and inch-deep.* It may be hard to believe, but these dabblers do exist. Able to speak, say, Arabic, or Chinese, they manage to get through the academic reception line unnoticed, even at top universities in the United States.

▪ Those who, abhorring amateurism and loathing shallowness, allow themselves to be disciplined in the faculty of, say, literary studies (as distinct from language studies!) before hurling themselves at a particular body of written works. Their monodisciplinary area approach is to be called *mile-deep but inch-wide.* These *Fachmenschen* (Max Weber) are blinkered, disposed to cylindrical thinking; their view is cyclopean.

▪ Those who, schooled in the principles of, *e.g.*, economics and familiar with the jargon of this discipline, not only expatiate with fluency on a country's business cycles, income distribution or balance of international payments but are also easily led away to lecture on subjects that pertain to disciplines in which they have no grounding. They are what Ortega y Gasset aptly called 'ignorant scholars'. These hybrids, difficult to shoo away, can be found on almost every campus.

▪ Those who, graduated, sitting at a regular polygonal table (symbol of the inseparability of differentiation and integration) or organized online, and familiar with computer-supported cooperative work, clearly understand that solid and enduring collaboration of scientists is the indispensable condition of drawing a complete, coherent and 'fully rounded' (E. M. Forster) area picture. Their unified (but not uniform) country approach is *mile-deep and mile-wide* and, as a corollary, the dilemma that has troubled *academia* so long (whether to take the road to knowing-nothing-about-everything or to knowing-everything-about-nothing) is finally broken.

Leaving it to the unbiased reader to judge deliberately into which class or classes the area students he/she is acquainted with are to be put, I argue for interdisciplinarity, which – I stress and repeat – is not to be confounded with *multi*disciplinarity. Unless the participants in scientific cooperation change their ways of thinking and develop a new one (by politely challenging, and actively listening to, each other), their 'cooperation' remains just a division of labor. On the other hand, I do not advocate 'fusion cooking', the constitution of a pack of mice, all having the same color. This should not be regarded as making a logical mistake, as I hope to have clarified, pointing out the essence of complexity. Whoever believes that a country can be comprehended *mono*disciplinarily or *juxta*positionally is deceiving, not only him- or herself but also others.

System theorists, sociocyberneticists and complexity scientists converge on the conclusion that holistic (rather than reductive) thinking is necessary for understanding the world in and around us, and the fast-paced developments in computer and information science are pointing in the same direction. Therefore, it is remarkable that, so far, nobody has had the bravery and fortitude to plead for a truly interdisciplinary approach and computer-aided application of systemic-sociocybernetic-complexity thinking in the study of a nation. 'Bravery and fortitude' because the man/woman who expresses this heterodox opinion will risk the wrath and contempt of well-established people who do not want their boat being rocked; he/she can forget about making career in their trade.

Given the fact that men are cooperative as well as competitive, it can be said that in each country things hang together, tightly or loosely, but uniquely, and in a way that is baffling. Each country is an intricate network of interfacing networks, 'different in extensiveness and intensiveness' (Michael Mann). Its basic, elementary units are 'involved in a continuous interplay of complex determinations' (Evelyne Andreewsky). Similarly, nations hang together, in a manner that is even more bewildering, as particularly Immanuel Wallerstein has made abundantly clear. They form a 'World-System'; a collective of collectives of collectives; a parentless family, some members of which are living in disharmony; a global, earthbound, history-haunted community in search of peace.

Blaise Pascal (1632-1662) once said:

> *Toutes choses étant causées et causantes, aidées et aidantes, médiates et immédiates, et toutes s'entretenant par un lien naturel et insensible qui lie les plus éloignées et les plus différentes, je tiens pour impossible de connaître les parties sans connaître le tout, non plus que de connaître le tout sans connaître particulièrement les parties.*

To this profound statement Stephen Hawking probably would have assented, when, in January 2000, he declared: "I think the next century will be the century of complexity."

Briefly then: studying a country, one should be acutely aware of the parts of the parts and the whole containing the whole; one should have a sharp eye, not only for the things related but also for the kind of relationships between them; the orientation should be top-down as well as bottom-up; and the approach should be, from the very outset, a comparative and cybersystemic one, aimed at holism of insight and based on the consciousness that disciplines are interdependent and complementary. Area studies have got to be transformed, radically; they must be lifted from mere juxtapositions to genuine compositions, from poverty to richness. The issue is big — much bigger than many academics, oblivious of the root meaning of 'intelligence', may care to realize.

[1] For the sake of convenience, *area*, *country*, *nation* and *nation-state* are used interchangeably in this essay, the much longer, copiously annotated and referenced version of which the author will be pleased to send on request.

[2] Americanists, Africanists and Asianists (formerly: orientalists) constitute subsets of the set 'area experts', which I confront with the group of people having a good grounding in one of the natural, social or human sciences. Sinologists, Japanologists, Indologists, 'Central Asia –', 'Southeast Asia –' and, lo and behold, 'Middle East experts' form subsets of one of these subsets. Therefore, all that I am saying about the set of area students directly applies to all who, countable by the thousands, make up its constituents.

[3] Area students occupy themselves, sometimes in great detail, with big and small issues related to the country of their predilection. One only needs visit the website of the Encyclopedia of American Studies (http://eas-ref.press.jhu.edu), the African Studies World Wide Web (www.africa.upenn.edu/padis/telmatics_sisskind) or the Asian Studies WWW Virtual Library (http://coombs.anu.edu.au/wwwvl-asianstudies) to be convinced of it. The amount of information created by these scholars is growing exponentially. However, there is a clear distinction to be made between first- and second-order research, between doing, *e.g.*, Iran, or Indonesia, study and thinking about how Iran/Indonesia study *ought to be done*. So, for deeper understanding of the topics that engage the attention and energy of area students, in the East and the West, an occasional intellectual soul-searching might be useful. It is precisely this what I am aiming at in the article. I leave it to each individual 'area/country expert' to try-on the cap, and to shoot at the piece, if she/he has the urge and the courage to do so. Two final remarks: (I) in order to be unambiguous, one should speak of America –, Africa – and Asia studies rather than American –, African – and Asian studies; (II) whereas Americans (USA) have a 'master narrative' (Agnes Heller) and constitute a 'community of destiny' (Edgar Morin), the natives of Africa, and Asia, do not.

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