



WCSA - WORLD COMPLEXITY SCIENCE ACADEMY FIRST CONFERENCE

DECEMBER 4TH-5TH 2010

SALA DEL BARACCANO
BOLOGNA, ITALY

COMPLEXITY SYSTEMIC SCIENCES AND THE KEY GLOBAL CHALLENGES OF OUR TIMES

WCSA SCIENTIFIC DIRECTOR AND CONFERENCE PROGRAM CHAIR (CPC)

Andrea Pitasi (www.andreapitasi.com), G. d'Annunzio University, Chieti-Pescara, Italy

WCSA ASSISTANTS TO THE CPC

Giulio Marini and Serena Affuso, Sapienza University of Rome, Italy

WCSA HONORARY BOARD OF ADVISORS

Giuseppe Acocella, CNEL Vice President and Rector of the S.Pius V University, Rome, Italy

Alexander Riegler, Free University of Brussels, Belgium

Gabriel Altmann, Universitaet Bochum, Germany

Alberto Febbrajo, University of Macerata, Italy

Marcelo Amaral, Triple Helix International Instituite, Madrid, Spain

Dario Rodriguez Mansilla Universidad Catolica de Santiago, Chile

Felix Ortega, Universidad de Salamanca, Spain

Giancarlo Guarino, Frederick II University, Naples, Italy

Loet Leydesdorff, Universiteit van Amsterdam, The Netherlands

Giovanbattista Cavazzuti, Modena and Reggio Emilia University, Italy

Albert Laszlo Barabasi, Notre Dame University, USA

Sherry Ferguson, University of Ottawa, Canada

Lucio d'Alessandro, Pro-rector and Dean of the Education and Training Faculty, Suor Orsola Benincasa University, Naples, Italy

Sebastiano Barnara, Sassari-Alghero University, Italy

The aim and topic of the conference is to focus on the epistemological theoretical, methodological, technical and practical contributions of the systemic approach throughout each disciplinary or interdisciplinary perspective rooted in the systemic approach (sociology, biology, economics, mathematics etc.) to face the key global challenges/bifurcations of our times for example ecology, energy, business development, wealth distribution, multiculturalism etc.

The official languages of the conference are English and Italian and the conference structure is articulated into four panels as shown in the program below.

All the speakers of the WCSA conference have to be WCSA members. It will be possible to Join WCSA as a member directly at the membership desk outside the conference room.

CONFERENCE SCHEDULE

SATURDAY 4TH

9:30 a.m.

CONFERENCE REGISTRATION

10:00 a.m.

WELCOME AND OPENING REMARK

Demetrio Errigo, *WCSA President*

Andrea Pitasi, *WCSA Scientific Director and Conference Program Chair*

10:30 a.m. – 1:00 p.m.

I PANEL: SYSTEM THEORY TODAY AND TOMORROW

PANEL CHAIR

Eliana Herrera Vega, *University of Ottawa, Canada*

PANELISTS

Fausto Fraiisopi, *Albert Ludwigs Universität, Freiburg, Germany*

Mario Spiler, *California Institute of Integral Studies, San Francisco, USA*

Simona Collina, *Suor Orsola Benincasa University, Naples, Italy*

Massimo Magno, *GnoSys, Italy*

Michele Infante, *University of Malta, Link Campus, Rome*

Massimo Conte, *Institute Study and Social Research, I.S.E.R.S., Naples, Italy*

1:00 p.m. – 2:30 p.m.

LUNCH BREAK

2:30 p.m. – 5:00 p.m.

II PANEL: SYSTEM THEORY AND ITS TOOLKIT IN THE KNOWLEDGE BASED WORLD SOCIETY

PANEL CHAIR

Valerio Pocar, *University of Milan-Bicocca, Italy*

PANELISTS

Eliana Herrera Vega, *University of Ottawa, Canada*

Francesco Vespasiano, *University of Sannio, Italy*

Habib Sedehi, *Sapienza University of Rome, Italy*

Moisei Boroda, *DTKW, Herne, Germany*

Massimiliano Ruzzeddu, *UNISU, Rome, Italy*

5:15 p.m. – 6:15 pm

WCSA BUSINESS MEETING

SUNDAY 5TH

9:30 a.m. – 12:30 p.m.

III PANEL: COMPLEXITY SCIENCES AND THE KEY GLOBAL CHALLENGES OF OUR TIMES

PANEL CHAIR

Lucio d'Alessandro, *Suor Orsola Benincasa University, Naples, Italy*

PANELISTS

Roberto Montanari, *University of Modena and Reggio Emilia, Italy*

Gandolfo Dominici, *University of Palermo, Italy*

Brígida Maestres, *Universitat Autònoma de Barcelona, Spain*

Massimiliano Zanin, *The INNAXIS Research Institute, Madrid, Spain*

Shobhit Bansal, *Indian Institute of Technology Madras Chennai, India*

Giulio Marini, *Sapienza University of Rome, Italy*

12:30 p.m. – 2:00 p.m.

LUNCH BREAK

2:00 p.m. – 3:30 p.m.

WCSA SYSTEMIC RESEARCH MEDAL AWARD

WINNER SPEECH

Ervin Laszlo, *Club of Budapest International President*

CEREMONY CHAIR

Demetrio Errigo, *WCSA President*

DISCUSSANT

Luigi Nicolais, *Frederick II University, Naples, Italy*

3:30 p.m. – 5:00 p.m.

IV PANEL: EDITORIAL LAUNCH *TEORIA DEI SISTEMI E COMPLESSITÀ* BOOK SERIES AND ITS JOURNAL *NUOVA ATLANTIDE*

PANEL CHAIR

Andrea Pitasi, *WCSA Scientific Director and Conference Program Chair*

DISCUSSANT

Simone D'Alessandro, *G. d'Annunzio University, Chieti-Pescara, Italy*

5:15 p.m.

CONFERENCE ENDING SPEECH

Demetrio Errigo, *WCSA President*

Andrea Pitasi, *WCSA Scientific Director and Conference Program Chair*

1)

FAUSTO FRAISOPI, Albert Ludwigs Universität, Freiburg, Germany

TOWARD A LOGICAL AND PHENOMENOLOGICAL APPROACH TO COMPLEXITY. META-ONTOLOGY AND SYSTEM THEORY

The System Theory as contemporary approach to complexity, as interdisciplinary approach to "objects" they need a non-classical modelisation, demand at the same time a radical discussion about the "nature" of this "objects" they can't be reduced to the classical model of "phenomenality". From a phenomenological point of view, the complex phenomenon is the manifestation of an object that exceed the simple form of "objectity" [*Gegenständlichkeit*] given from a singular "frame", in other words, from a singular "regional ontology". Introducing the multidisciplinary in the field of ontology, the phenomenological approach to the "complexity of manifestation" brings to a new conception of ontology. Quantum Mechanics as well as the analysis of CAS (Complex adaptive systems) have shown that there are many manifestations of nature which modelisation needs a framing of frames, a framing between (regional) ontologies they together (in their systemic organization) can grasp and fix out their richness. I aim to propose a meta-ontological model for the systemic approach, based upon the analogy with knowledge engineering, consisting in a "meta-theoric object" which parts are they regional ontologies and the informational treatment of any kind of object that a singular frame can give. As the Riemannian Geometry have enlarged the intuitive naïve approach to object of space, introducing the systematization of many-dimensional spaces, the meta-ontological approach to ontology can introduce the systematization of dimensions of meta-theoric objects as regional ontology. To provide to a new model of "ontology" (and not only of "objects") the phenomenological and logical approach to complexity can define, on the side of philosophy, some logical and epistemological principles:

1. The principle of meta-ontology: a ontology whatever provides to give a treatment of information that give at the same time a objectal image, an image of being "necessary relative".
2. The principle of ontological complexity: complexity or ontological complexity consists in a manifestation which richness exceed to the treatment of information of a singular frame (regional ontology);
3. The principle of meta-ontological framing: we can conceive frames as mereological components of a model of object which parts are theory, frames, ontologies. This mereological composition give us the so called "metatheoric object".
4. The principle of meta-ontological commitment: a manifestation that we called "complex" is the result of a projection of the meta-theoric object upon the ground of *sense data* and experience

2)

MARIO SPILER, California Institute of Integral Studies, San Francisco, USA

THE EPISTEMOLOGY OF CREATIVE INQUIRY

The purpose of the chapter is to explore the epistemology of creative inquiry by inquiring about how we know what we know. Areas explored include the nature of questions, inquiry, epistemology, and Neuro-Linguistic Programming (NLP) as an exemplary epistemology. Within the NLP field, the roles of a model, modeling processes, presuppositions, beliefs, emotions, the inquirer, the relationship between knowing and doing, as well as creativity and creative inquiry are examined in more detail. Another yet consistent view of inquiry is offered from the perspective of Interpretive Sociology. Solutions and recommendations are offered as a way of maximizing the experience of inquiry. Research directions relate to the discourse of inquiry as a commodity with mutual benefits to the inquirer and the community to which he belongs. It is concluded that all inquiry is self-inquiry resting on an enigmatic irony.

3)

SIMONA COLLINA, Suor Orsola Benincasa University, Naples, Italy

ROBERTO MONTANARI, University of Modena and Reggio Emilia, Italy

FLAVIA DE SIMONE, Frederick II University, Naples, Italy

CATERINA CALEFATO, Polytechnic University of Turin, Italy

WORDS' MEANING AS A CHALLENGE FOR COMPLEXITY: THE CASE OF POLISEMY

In this study we investigated polysemy as a phenomena deeply influencing the cognitive systems of interactive agents.

One of the most intriguing problems for every theory of complexity is to face the way in which a word refers to the physical world or to an abstract entity. This problem can be studied under many different perspectives, from logic to philosophy of language, from linguistic to psychology and artificial intelligence. However, a univocal approach limits the possibility to create an exhaustive system of knowledge about how humans orient themselves in the world and about how they make sense of the experience. This problem has become central in the cognitive science that, for its interdisciplinary nature, takes complexity as a challenge in its attempt to understand how humans process and represent the world. On this respect, meaning is central in the study of the mind and consequently in directing the human experience.

Language has a lot to do with communication. Language and communication are not two interchangeable concepts as humans can communicate using also non- verbal language. But, for sure, we often use verbal language to express meanings. When we do it, we engage complex processes to be efficient. According to Levelt, (1989) we articulate on average fifteen linguistic sounds every second, two-three words. Words are selected and retrieved from our mental lexicon, which holds 50-100.000 words. Of course semantic processes are not the only processes involved in language and consequently in communication. Syntactic, phonological, phonetic processes, for example, take part in this complex system. However, it is at the semantic level that cognitive science has to face the major number of problems, and it is at this level that cognitive models are underspecified.

Many words in a language are polysemous. Let's take a word like to kick: it can be used to say to kick a ball and in this case the event expressed has to do with sport. However, as speakers, we can use it in a different context, namely to kick the chair and in this case it will refer to an event of fight. For theories of meaning, to understand how polysemous words are represented and processed is a challenge. The challenge is not only to understand whether the word is represented as a set of defining features (decomposable theories) or whether it is represented as a single lexical concept in a network (non-decomposable theories), the challenge is to clarify how they enter into different context in order to define a specific event, how the event is decoded in different languages and, as a consequence, in different cultures. In this study we will start by presenting results from experiments in which polysemy has been investigated using experimental paradigms as the semantic priming and the picture word interference paradigm in order to clarify how a polysemous word is represented and processed. The between-subject experiments were aimed at verifying the variability in the processing of polysemous words according to different contexts. From the results of these experiments a second series of experiments have been designed to investigate the role of the context in nowadays research: the automotive domain and the automatic translation field. About the automotive domain what it is interesting to study is the comprehension of road signs and information with or without a proper meaningful context. About the automatic translation what is interesting is the amount of time a user needs to properly understand a text, if the context is correctly represented or not. The results will be discussed in light of the recent debates between classical cognitive paradigms and embodied theories. Finally, we will present some insights about how this field of study can contribute to epistemologically define the systemic approach.

4)

*MASSIMO MAGNO, GnoSys, Italy***MIMETISM, THE "MEME" AND THE EXPLOSION OF FINANCIAL MARKETS AND ECONOMIC: A SYSTEMIC-GEOMETRIC MODEL**

In the late '70s, several factors temper the perfectionists expectations of economic and econometric models: first the crisis, then the oil, the dollar and finally, the international debt, but also a double influence caused by the ecology and the social sciences. They noted the pollution, the effect of rapid and uncontrolled industrialization, while some new behaviors have shown that man cannot be reduced to the situation of *homo oeconomicus*. So economics has entered the Systemic phase. It has suffered a double impact: first, the new dialectical relationship between order and disorder, between hypercomplex and complexity, highlighted in the science of chaos: the crisis can be seen as phase transitions that obey the same laws of physics, biology and ecology, on the other hand, work onto self-organization and the self-referentiality to better understand the expectation psychological phenomena are behind the creation of speculative bubbles in stock markets or fashions.

The economic modeling take into account uncertainties inherent the theory of Chaos and Disaster preferring the construction of scenarios instead of deterministic models. The Catastrophes are bifurcations between different equilibria, or fixed point attractors. Due to their restricted nature, catastrophes can be classified based on how many control parameters are being simultaneously varied.

This proposes the presentation of nodal variables departing from the micro-social to implement those observations on systemic scenarios. Mimetism, the "meme" and control through different switches of diachronic order, are some of these variables.

Mimetism, namely "individual" ability to reproduce, in reactive attitude, behavior or decisions of other individuals; this phenomenon accompanies to all the socio-cultural evolution of the mankind, is among the crucial parameters for understanding the "explosion" of the market. The "meme" is the information unit conveyed through a channel or some channels in question, its auto-poietic process strengthens, becoming at times decisive variable, of the self-explosive character in the market crisis. In this model we will refer to a systemic-geometric model of those market variables starting from the analysis of mimetism.

We use then a model in which the decision space X , related to the principal parameters mentioned is the n -dimensional Euclidean space, i.e. $X = \mathbb{R}^n$, and the instability space S is a submanifold of X . The space S corresponds to those points in X where catastrophes could occur. We look for a path $\gamma : [0, 1] \rightarrow X$, joining two stable points x and z , satisfying the following conditions:

- γ minimizes the distance between x and z ;
- the image of γ , i.e. $\gamma([0, 1]) \subset X$, intersects S , in a finite number of points.

The meaning of the previous conditions are evident. With the first one wants to minimize the time needed to join x and z . While the second condition is required to avoid catastrophes as much as possible during the time interval necessary to join two stable points.

5)

MICHELE INFANTE, University of Malta, Link Campus, Rome

THE WEB AS AN ADAPTIVE COMPLEX SYSTEM FROM LUHMANN TO THE NET

In this paper I try to explain the hypothesis of the Web as a new step of social evolution of complexity. Base on a *systemic theory of communication* and Luhmann's lexicon (*Information, Code, Program, strukturelle Kopplung, Form/Medium, Identität/Differenz, Re-entry, Redundanz/Varietät*) we try to define the new possibility permitted by Internet (*doppelte Kontingenz, Aktualisierung/Virtualisierung des Möglichkeit, Zuordnung, Asymmetrisierung*) as form to manage and reduce the social and knowledge complexity. I will try to show as Internet is a form of «the virtual circle of complexity» (von Foerster, Varela) and the web as a complex adaptive system, a collection of interacting adaptive agents. A Complex Adaptive System (CAS) is a dynamic network of many agents (which may represent cells, species, individuals, firms, nations) acting in parallel, constantly acting and reacting to what the other agents are doing. The inner elements also have to interact and their interaction must be dynamic. The power structure of control of a CAS tends to be highly dispersed and decentralized. The system's behavior arises from the competition and cooperation among the agents themselves. Intelligent agents compose the C.A.S., as users compose the web. The users as intelligent agent scan their environment and develop schema representing interpretive and action rules. The web can be viewed as a collectivity of interacting adaptive agents, characterized by a high degree of adaptive capacity, giving them resilience in the face of information excess and communication perturbation. A C.A.S behaves/evolves according to three key principles: order is emergent as opposed to predetermined, the system's history is irreversible, and the system's future is often unpredictable, that means evolution of the web is constantly subject to change and evolution. The feature of a CAS is its focus on top-level properties and autopoietic process like self-reference, self-emergence and self-organization (Luhmann). Like the C.A.S. also the Web can be defined as a system composed of multiple interacting agents. This agents as well as the system are adaptive. In some way, the Web works as homeostatic system, where find place not only communication and cooperation, but also spatial and temporal organization and of auto-reproduction. Communication and cooperation take place on all levels, from the agent to the system level. The forces driving co-operation between agents in such a system can, in some cases be analyzed with game theory. The number of elements is sufficiently large that a conventional description (e.g. a system of differential equations) are not possible. If in the C.A.S interactions are usually physical, in the Web they involve the exchange of information. The interactions are interdependent and interpenetrated (Luhmann), any user in the web-system is affected and affects several other systems. The interactions are non-linear which means that small causes can have large results. Interactions are primarily but not exclusively with immediate neighbors and the nature of the influence is modulated. Any interaction can feed back onto itself directly, and consequently after a numerous stages, it can vary in quality.

Finally, we can say that the complex adaptive systems can be a useful a model for explain the way in which the Web is organized, operates and manages the inner complexity of the unpredictable behaviors of millions of users. The Web has to make stable the constant flow of information and users' action and practice and at the same time, it has to maintain its systemic organization, for this reason it is also an adaptive system ready to respond to the complexity challenge.

6)

MASSIMO CONTE, Institute Study and Social Research, I.S.E.R.S., Naples, Italy

HUMAN MACHINES OF SURVIVAL

The technical system with its plea on the future and a closer and closer functional interdependence individual-global environment, play a leading role in the meta-communicative story of modernity. The artificial and the virtual side of socio-technical or abstract living systems, of systemic decisions, of global solutions, supervise the present regime of techniques in our modernity. The challenge carried out in the cognitive and rational playground sets probabilistic risk taking (N. Luhmann, 1996) against the uncertainties of/on the future with uncertainty (M. Conte 2009). The new social prairie of the information age (M. Castells, 2002, 2003a, 2003b) multiplies the need for/placing of Trust that "defeats time or at least time differences" (N. Luhmann, 2002), after that space and time, since Einstein, have increased the ubiquity of the former and simultaneity of the latter. The interdependence and the functional differentiation of human beings and of socio-technical systems characterizes present modernity for a contrastive acting between the complexity of regulation (interdependence of parts), of control (organizing aims), of feedback (stimuli-responses) in social systems and its feedback results on living beings. Such background of complex social systems, with world opening of the way meaning is produced in communication and of expansion of expressive self (A. Giddens 1992, Goffman 1969, 1988, 1998, 2001, 2002, 2003), offers quite a new emphasis as to the conditions of simple systems for dimension, diffusion, control over feedback methods that living systems (environment) exchange with abstract models (system).

The horizon of multiplying states of retroactivity in the environment-system communication calls for individuals to negotiate and manage the spreading of life technologies (biotechnologies) through new cognitive and symbolic instruments with moral "prosthesis" of end-of-life-almost death, and the communication technologies (reliability of sender-receiver, reputation of sources, "appeal" of the communication actors, types of belief, negotiation of uncertainties). In such a complex background it seems a key point to examine forms, ways, types of regulation between human beings and virtual abstract platforms, summed up as follows: My aim is to deal with four points: 1) the taking up by the individual-environment of the contents underlying systemic innovations along the line of the making, fixing and ways of immunization of/from risk in the global age. Keywords: Immunization-Risk; 2)the double contradictory movement of current cycle of modernity lying in the relation-conflict between diffusion of rule in the various sub-systems and the call for individual independence and freedom, with the progressive expansion of the state of exception or "bare life" in between. K.: Rule-Independence-Anomie; 3)the increase of knowledge of the world gives rise to an overburden of self knowledge and a decrease of knowledge of the others, together with the key matter according to which the present broadens out in daily life due to (or thanks to) too much future in our decisions about the present. K.: Knowledge-Ignorance of the self-others; 4)the increased access to sources strikes the topic of information asymmetries, determining an equally high degree of cognitive superficiality with an insertion of Trust and confidence in external symbolic powers: money, information, science, common sense, herd instinct, gossip. K.: *Information Asymmetries- Moral Risk-Confidence-Relying on-Trust.*

7)

ELIANA HERRERA-VEGA, University of Ottawa, Canada

SYMBOLICALLY GENERALIZED MEDIUM OF COMMUNICATION IN SYSTEMS' OPERATION. COULD MONEY, TRUTH AND INFORMATION BE UNIVERSAL TOKENS?

There is an epistemological claim deriving from Luhmann's social systems theory: it is necessary to replace many of the current paradigms in social sciences in order to address the variety of challenges that society's chosen way of development (functional differentiation fostering social systems production) has put forth in respect to ecological boundaries and intra-systemic contradictions. One of such epistemologic consequences is that self-reference, as a concept, covers "final elements of any sort". I address in my paper such epistemological claims in their relationship with the diverse ways of dealing with possible futures. If self reference is absolute, communication between diverse expert systems is very difficult. Nevertheless, due to survival pressures expert systems may acknowledge eventual ecological boundaries. Given that such ecological boundaries are increasingly met by social expert systems, systems may use superior media for communication, developing self-containing mechanisms in order to limit the possibility of encountering ecological boundaries. Furthermore, intertwining communications may emerge between some of the major social systems as to develop coordination.

My analysis is organised as follows:

1. Synthesis of the epistemological claims that arise from Luhmann's proposal, as he posits those claims in his book "Social Systems".

2. Analysis of Luhmann's argument in respect to the operation of social systems:

2.1. Complexity in social life in contemporary societies, featuring specialized communications which are put forth by a variety of partial social systems. As a result of functional differentiation society attains a greater intensification

2.2. It follows that circularity defines the polycontextual characteristic of those communications which would, following Luhmann, bring society towards a polycentric form, as there is no supremacy or overarching system above all of the others.

2.3. Analysis of the media of some function systems: scientific truth, money, and information. Analysis of the media in three specific social systems: money in the case of the economic system, scientific truth in the case of science as a social system and information in the case of the mass-media system.

2.4. Understanding of such media in other separate social systems. Money as a media would be endowed with a capacity to foster communication in other binary-code systems. Money as universal token brings a comparative advantage to the economic system and to economic communications to permeate and "colonise" other social systems. Truth as universal token permits science as a social system to pervade other systems communications, and lastly, Information and its capacity to communicate in other systems and to interact with other systems binary-codes. Information would be considered as universal token and as a result, the possibility of mass-media communications to permeate and "colonise" other social systems communications.

3. Conclusions. Money, truth and information appear to be universal tokens or in evolutionary terms, and, as such, are better technical solutions to cope with conditions of rising complexity. The working hypothesis holds that truth, money and information are superior evolutionary gains than other media used by other partial systems of the society. If this hypothesis holds true, then it is possible to trace evolutionary movements towards possible futures, by which truth, money and information interact as media. Such interaction permits to acknowledge ecological boundaries faced by the totality of partial social systems and society. Indications of this direction are present in the cases of Love Economy, ecological economy and social capital. Information as universal token is used both by mass media, by science as a social system and educational institutions such as universities and government agencies, and interaction systems such as social movements. This scenario opens possibilities of action for organizations and partial systems of the society as environmental complexity regains a central place in the current communications. Finally, new possibilities for cybernetic entities to confront both their self-reference and the ecological boundaries emerge from Luhmann's epistemological claim emerge.

8)

FRANCESCO VESPASIANO, University of Sannio, Italy
ELVIRA MARTINI, University of Sannio, Italy

SYSTEM THEORY AND ITS TOOLKIT IN THE KNOWLEDGE BASED WORLD SOCIETY
TRIPLE HELIX DYNAMIC FOR THE REDUCTION OF THE SOCIAL COMPLEXITY

In the sociological literature the construction of the knowledge is expressed as a social process. Its realization implicates many difficulties because of the complexity of the relational mechanisms in it involved: we think about the cultural systems, the social-political and technological ones (Etzkowitz e Leyesdorff 1995; Castells 1997, 2002; Gherardi 2008; Gherardi e Nicolini 2004; Vespasiano 2005; Pitasi 2010).

Building knowledge, science and technology in a social perspective means to overcome the bipolarization between social system, in a holistic sense, and social system, in inter-subjective sense (Bloor 1991; Callon e Latour 1991) and to rediscover the "double contingency" of the relationship social system-human environment (Parsons 1965; Luhmann 1990), and to note that these same relationships are constitutive of every of the two poles of the interaction.

In this way, it is possible to understand "the space occupied by the personalization-identification processes (for unity of people and small groups, and not only for differentiation) inside the system" (Ardigò, 1988: 298). In this sense, the knowledge implies and proposes the distinction between system and environment. In other words, every knowledge is always in-a-environment and every environment is the environment of a knowledge. For this reason when we speaks about a system we always refers to a system-in-an-environment. The knowledge emerges from the sum of this difference and gives form to this paradox (Cevolini, 2007: 8).

On the base of these considerations and recalling the Luhmann's "uncoupling among system and environment" we want to underline the necessity to work with the differences, not with the unities. In our opinion, we can study that dynamics focusing on Triple Helix Model (THM) - based on interactions among institutional agents as university, industry and government (Etzkowitz 1997, 2004, 2008; Leydesdorff 2005, 2010; Etzkowitz, Leydesdorff 1995, 1998, 2000, 2001, 2003) -; we propose this analysis because THM is a social-economic mechanism based on a complex network between different social actors, each other in a complex communicative relationship (Pitasi 2010).

The relationships activated inside and by the Triple Helix Model influence the ties between the actors and the limitations of their potentialities, both expressing new energy to release the single systems from their incapacibilities. Most critical point is the quality of the social capital nets that are the base of departure to start, to sustain and to govern the triangulation of which we are speaking. These socialization nets, if good enough, operate for the reduction of the complexity in manageable and meaningful proportions. Since complexity implicates the necessity of selection and this last means contingency and accordingly risk (Luhmann 1990: 95), it is clear that the nets "employ their selection pattern as a motive to accept the reduction, so that people join with others in a narrow world of common understandings, complementary expectations and determinable issues " (King and Thornhil 2006: 18).

Particularly, the actors of the system of the Triple Helix operate under conditions of operational closing, essential condition for the pursuit of the cognitive process; in this closing, any element of the system can practice a control on the others without being checked in turn: in this way the model makes a-centric himself.

As the plot of a complex mosaic, where the differences are appreciated because system and environment don't overlap, but they occupy different spaces, even though interconnected, as well the Triple Helix governance favours the forms of collective learning and the economic and cultural exchanges necessary to the innovative development and the social inclusion become easier.

9)

HABIB SEDEHI, *Sapienza University of Rome, Italy*
IGNAZIO IUPPA, *Sapienza University of Rome, Italy*

**A DYNAMIC SIMULATION APPROACH TO ANALYSE AND MODEL A COMPLEX SYSTEM:
TECHNOLOGICAL INNOVATION PROJECT MANAGEMENT**

The paper describes the definition of a simulation model built to be capable in evaluating the possible policies in order to increase the diffusion of technological innovation projects in the Italian Public Administration (PA). In particular, the model aims to trace guidelines to identify specific "decision-making levers" that can help to improve efforts so to promote a network of institutional stakeholders able to provide advice, technological experimentation and innovative services in support to PA governance. With its ability to indicate the way in which resources are managed within an institutional network, the simulation model intends to help operatively through an innovative way a collaborative network ship governance.

The methodological basis through which the decisional tool has been build is the System Dynamics (SD) approach.

Applying SD methodology to such a naturally complex process, where the traditional management way is not anymore adequate to manage it, offers the opportunity to acquire supplied elements in order to better understand the logic by which the variables that contain the collaborative network, interact with each other. The System Dynamics approach has been very useful in order to describe and systematize the variables that form the structure of relations among the "players" in a collaborative network and focus on key elements that influence this network.

The simulation model has allowed to observe how the key elements have an impact on the whole system and how they can develop alternative scenarios.

Although the model is still incomplete, the paper presents an approach which can support the management of the PA in making relative decisions. In fact, it represent an innovative approach both for strategic and management decisions that can be used in a productive evaluation of overall research projects.

Keywords: Complex Systems, Systems Thinking, System Dynamics Modelling, Process analysis and Simulation, Project Management, Technological Innovation Management.

10)

*MOISEI BORODA, DTKW, Herne, Germany***RHYTHM AS A SYSTEMIC FACTOR IN THE ORGANISATION OF HUMAN MESSAGES**

The present paper deals with the general rhythmic principles in the organization of musical and literary texts. It discusses results of a study of musical compositions and literary texts of various styles as to the rhythmic organization – especially the duration and metric strength in music and the word-length in syllables. It is shown that in both types of human communication of such a high content-degree as musical composition or a text of literature there exist general principles of rhythmic organization, and that some of these principles are common for literary and musical texts.

In particular, it is shown that the general principles of building relatively large musical units can be applied to building such relatively large and comprehensive units of literary text as verse lines in the poetry of various metric structure and style. Furthermore, it is shown that both in musical and the literary text (at least, a prosaic one) the more and less complex units of a definite level build "oscillations" where a shorter unit follows a longer unit (in literary text), resp. a rhythmically more complex unit in melody follows by a less complex unit. This "oscillation" – was observable both in literary texts in different languages (e.g. in German, Russian, and Georgian literary texts), and in musical compositions of a broad spectrum of styles.

In general can be said both the "building" of a musical composition and literary text rhythm plays an especially important role making a basis for human perception of text as a message.

As a material musical compositions of various styles of 18th to 20th centuries, and literary texts (prosaic text and poetry) of various styles and language origin were used. As musical units F-motif and m-segment, both unambiguously defined melodic units isolated by the author on the basis of rhythmic relations of tones and their constellations are used. The literary texts were studied on the level of words.

11)

*MASSIMILIANO RUZZEDDU, UNISU, Rome, Italy***THE COMPLEXITY THEORIES AND THE SENSE MAKING: THE CASE OF MIGRATION**

Since their origins, Complexity Theories have explored the limits of traditional model of science, that was supposed to achieve an objective knowledge on the world, as well as the rationalist model of action, that was supposed to change reality according to the subject's decision. While many theories arose in the last decades of the 20th century, in order to give account to this raise of incertitude, CT's main goals had always been to cope with and, if possible, overcome this incertitude.

The main goal of this essay will be to show that complexity is still part of the scientific work, and CT are unlikely to overcome it and to provide them with the same level of mastery that traditional science could do with mechanical objects. I will try to do that through the example of the immigration studies, a field that shows the main epistemic and comprehension problems related with complexity.

In fact, first of all migration is a complex issue, for it implies a high number of variables, such as provenience of the immigrant; level of integration; occupation; provenience before immigration, culture and social rank at the origin; culture and economics of the land of destination, relationship with institutions etc.; as a consequence, the shorter possible description of any case of migration implies taking into account a high number of variables.

Second, migration is complex also because does not fits to traditional, mechanical rationality: in fact, it implies logical paradoxes and contradictions: a big adaptation effort from the hosting people, but at the same a strong cultural enrichment; it improves poor people's lives but also decrease labor cost etc. In other words, it is impossible to describe migration according to the mechanical logic, which implies linear causality explanations, as well as the validity of not-exclusion principle. Furthermore, migration, like many other sociological objects, is to be considered complex, because implies a strong subjectivity; any observer cannot help but filtering empirical data through personal values and visions of the world: who has an universalistic idea of the humankind, will tend to privilege the positive sides of migration phenomena and vice versa.

Though, this idea of complexity has belonged to Social Science since long before CT arose on the scientific scenario. Nevertheless, there is another field of investigation, that Complexity Theorists have contributed to define: the divulgation, i.e., how can complex issue be described in other to be understood by large audiences? This complex problem, in the immigration field, stands for a specific issue: how do people perceive migration phenomena and, as a consequence, what is their attitude in interacting with migrant communities? No other social-political issues is able to trigger so strong and diverse feelings: fear, hatred, interest etc, each related to a different cognitive framework. The object of this research will be existing surveys as well as, if necessary, newspapers and tv reports. This material will be reported within the framework of the Complex Adaptive Systems: the idea is that both immigration and public opinion are complex objects and their interaction is a matter of co-evolution between social actors and "expert systems".

So that, the operational questions to be formulated in this kind of research is: how complex are the representations of Italian social actors on the immigration phenomena? Are those representations adequate or, as an alternative option, have social actors still been into the "simplifications terribles" and they interpret immigration with inadequate algorithms, that consist of in simple judgments or in mechanic explanations?

12)

MARIA WIMMER, Koblenz University, Germany

ROBERTO MONTANARI, University of Modena and Reggio Emilia, Italy

CLAUDIO DEL RIO, University of Modena and Reggio Emilia, Italy

POLICY MODELLING FOR KEY CHALLENGES OF THE 21ST CENTURY

Especially the current economic and financial crisis, resulting also from our inability to predict dramatic changes in the economy and society, sheds light on an urgent need for more effective and efficient processes of governance and policy making. This paper intends to present the objectives and methodologies of the OCOPOMO - Open COLlaboration for POLicy MOdelling project, co-funded by the European Commission under the 7th Framework Programme for Research & Development. Drawing together lessons and practical techniques from complexity science, agent based social simulation, foresight scenario analysis and advanced ICT for e-participation, this project aims at defining and demonstrating a new approach to policy formation that resolves crucial issues involved with prevailing approaches. This project provides an innovative "off the mainstream" bottom-up approach to social policy modelling, combined with e-governance tools and techniques, and advanced ICT technologies. The OCOPOMO project will create an IT platform for efficient policy development by integrating formal policy modelling, scenario generation, and engagement of wide stakeholder groups in order to formulate and monitor social policies to be adopted at several levels of government. Policy issues which are high on the European political agenda will serve as a testbed for the applied approach to policy modelling.

13)

GANDOLFO DOMINICI, University of Palermo, Italy
FEDERICA PALUMBO, University of Palermo, Italy

A VIABLE SYSTEM VIEW OF THE JAPANESE LEAN PRODUCTION SYSTEM

Today enterprises have to deal with high and increasing levels of internal and external complexity that challenge traditional models of management and control; to be competitive they must be able to reach high degrees of reactivity, flexibility and adaptivity. In the last 30 years the Japanese lean production system has been considered the ideal system to achieve both effectiveness and efficiency. The limit to the adoption of lean production outside Japan is due mainly to the lack of comprehension of its inner functions and its links to the Japanese business environment. The complexity of the relations between the Japanese environment and the *kaisha* is the main problem when trying to reproduce the lean production system outside Japan. A better understanding of its peculiarities and its complex relations with supra-systems and the environment, can be useful to be able to understand how to adapt this system to different environments in different countries. In this vein, the Viable System Model (VSM) is able to interpret the lean production system and analyze its features and their relation with the external environment, thus helping to understand the processes underlying it. In this paper we apply the Viable System Model (VSM) to the main aspects of lean production systems in Japan representing the lean production system in a viable system framework. First we describe the application of VSM to business, as highlighted by Stafford Beer and developed by the Italian school of G.M. Golinelli. In this approach the enterprise is conceived as a viable system which is capable of maintaining a separate existence (Beer, 1979), surviving and growing in a highly dynamic environment and, at the same time, preserving its own identity. The firm is an open system that establishes relations and interactions (flows of energy, resources, raw materials and information) not only with the subsystems it contains, but also through the system and with supra-systems in which it is included. Through these relations and interactions the enterprise seeks structural conditions of consonance, it creates the basis for developing systemic conditions of resonance and then pursues a common objective with its stakeholders 3 *Kaisha* (会社) is the Japanese firm. 1 (Golinelli, 2000). Thus the VSM perspective underscores the role of collaborative relations with the suprasystems as well as supplier, consumer, distribution, financial and institutional systems that, according to a porterian vision, are considered competitive forces which can affect viability. We proceed depicting the peculiarities of the lean production system, shedding light on its roots in the Japanese business environment (Dominici, 2009). Then we highlight the similarities between the Japanese lean production system and the Viable Systems approach. In particular: •the strong interactions of the *kaisha* and the *keiretsu*

Keywords: Viable System Model, Lean production system, Keiretsu, Kaisha, Japanese business environment, 4 The Japanese industrial group. When written in Japanese, *Keiretsu* (系列) comprises two *kanji* ideograms (*kei* and *retsu*), meaning "system" and "row". Thus the term keiretsu is now used more generally to mean an alliance of companies and individuals that work together for mutual benefit.

14)

BRÍGIDA MAESTRES, Universitat Autònoma de Barcelona, Spain
MARTA CRUELLS, Universitat Autònoma de Barcelona, Spain

WHAT ARE EUROPEAN PENAL POLICIES RESONATING AT? THE ANNOYANCE ROLE OF SEMANTICS IN THE CHANNELING OF THE PROCESSES ATTEMPTING THE EUROPEANIZATION OF EUROPEAN PENITENTIARY POLICIES

As stated in this paper, punishment is better understandable and therefore tractable as a matter of social knowledge than as a mere objective knowledge about criminality and/or simply as a matter of imprisonment input/output conditions. Penitentiary policy has more to do with semantics about society and trends in political systems than with statistics about imprisonment and/or changes in normative frameworks. This is especially true when the question is the Europeanization of penitentiary policies, and the uncontrollable and/or unexpected effects are the conclusion of introducing same norms in different countries.

The premises implied in this statement can be found in many constructivist theoretical approaches as, for instance, in Niklas Luhman's general theory of social systems: "The way in which reality is perceived, states a problem to diagnose and find solutions". This paper offers a comparative analysis of penitentiary policies as support for these premises and therefore provides a sketch/scheme, map of this comparative analysis as an exploratory pattern to study penitentiary policies. The objective of the study was to develop a comparative and qualitative exploration over the semantics and meanings underlying the discourse and/or the execution of the penal/penitentiary policies in Denmark, France, United Kingdom and Canada. In so doing, we proceeded to develop an original approach within the qualitative realm of social research. Our analysis combined both: a systemic approach, in which the distinction between operative and semantic orientation is crucial to understand the logic of social systems; and a discourse analysis approach, in which discourses about penal/penitentiary policy were the gate to the semantics of those systems built upon them. As a result, we developed categories that play both: the role of describing a singular policy as such and the role of an operative functional differentiated structure, which made possible the comparison of different semantics. The conclusion drawn from the dialogue with contemporary literature about penal/penitentiary studies, specially the one focused on the Europeanization process, is the need to consider the notion of "resonance" in explanations concerning the two ways in which Europeanization has been focused in.

15)

MASSIMILIANO ZANIN, The INNAXIS Research Institute, Madrid, Spain

COMPLEXITY IN ATM - INTRODUCING THE COMPLEX WORLD. NETWORK

The Air Transport System, and more generally any transport infrastructure, holds a strategic role in our society: both for its economical significance, and for its social impact, as an instrument for mobility and territorial cohesion. Recently, the importance of this transport mode has been the centre of a strong international and political discussion, when the eruption of the Eyjafjallajökull volcano caused significant disruption to European air travel. The Air Traffic Management system (ATM) -that is, all the equipment, people and procedures whose aim is to allow a safe, effective and efficient movement of aircraft- shows a lot of characteristics of Complex Systems. For instance, there is a large number of components, highly heterogeneous (airports, regulations, aircraft, natural conditions, etc.), and with a complex structure of the interactions between pairs or groups of those components; it is a highly structured system: there is an airport network structure, on one side, and many different layers (commercial, regulation, passengers, traffic) on the other; it's a system of systems, where single components as airports may also exhibit complex features; and it is an open system, interacting with a changing external environment, and permanently out of equilibrium. Contrary of what has been done with other complex infrastructure (for instance, road networks or power transmission networks), little research effort has been devoted to understand the ATM system from the Complexity Science perspective. And this, despite the fact that the profound transformation which is happening in the European Air Transport makes this an ideal moment to pose this problem: from the SES II implementation, to the ATM modernization programmes (SESAR, NextGen, ASTRA) or the inclusion of aviation in the Emission Trading Scheme.

The aim of this contribution is to present the creation of a new initiative, led by the Innaxis Foundation and Research Institute, the University of Seville, DLR, NLR, the University of Palermo, and the University of Westminster, and called *_Complex.World_*. Born as one of the SESAR Workpackage E Research Networks, in the next four years ComplexWorld will bring together researchers from academia, research establishments, industry and SMEs that share common interests and expertise in the field of ATM Complexity Management, providing them with a structured way and a stable forum for the development, exchange and dissemination of research knowledge. We truly believe that Complexity Science will help in shaping the future ATM system, by understanding the complex relationships between its different elements, explaining its emergent behaviours, and thus helping improve the overall performance of the system in different Key Performance Areas.

16)

SHOBHIT BANSAL, Indian Institute of Technology Madras Chennai, India

IMPACT ASSESSMENT CHALLENGES IN POLICY MAKING FOR ALTERNATIVE RESOURCES OF ENERGY

Ever since the humanity was faced with bio-physical limitations of many of its resources, it has been forced to look towards alternative means to meet its ever increasing demands. Energy is the key driver for all human activities. With Fossil fuels powering almost the entire development process for the first half of twentieth century, world finally came to face with finite reserves which might get depleted soon. Environmental issues like Global warming and air pollution further raised the alarm with regards to indiscriminate use of fossil fuels to drive the world economy.

Several alternative resources like wind power, hydropower, solar and bio-fuels etc. have been proposed and put forward for implementation to supplement the energy needs for the world. There are many technical and socio-economical barriers for the widespread use of renewable. In a free market scenario, these alternatives cannot compete with the conventional resources. It is mainly public policy and political leadership that are driving the widespread acceptance of renewable energy technologies.

Over the past decade or so, the renewable energy consumption has grown at a tremendous pace. Most of this can be attributed to various tax benefits and subsidies provided to these sectors by the various policy makers world over. But, all these incentives seem to suffer from a lack of foresight with regard to impact of large-scale penetration of renewable energy technologies on the overall energy system. Such impacts have been seen to spill over effect into other areas also highlighted most recently by the food v/s fuel debate. This problem arose because of insufficient determination of scope of Environment Impact Assessment studies conducted in the seventies. There is another problem associated with blind incentives being handed out for renewable. There is little or no study on the competition among the renewable resources. This becomes a lot difficult task with data associated with them distorted to a great extent by incentives. This comparison also becomes harder as the various technologies are at vastly different stages of maturity. But merely neglecting the significance of the inevitable competition and limiting the scope of Environmental Assessment for simpler results can prove to be disastrous.

A sound mathematical basis for comparative Environment Impact Assessment for introduction of alternative resources or processes to conventional ones is needed. The relationships between bio-mass for fuels or for food can be taken as analogous to the predator-prey model and competing species model from Lotka-Volterra equations. A similar approach was used by Richard Goodwin for his Class-struggle model in economics. These models though similar, do not truly represent the problem involving renewable and non-renewables. Competition is observed between food and fuel requirements at one level and between various competing resources (renewable and conventional resources) at the other. Use of crops for fuel instead of food, will have an impact akin to exotic species on an ecosystem.

17)

GIULIO MARINI, Sapienza University of Rome, Italy

ANTI-RACKET ASSOCIATIONS AS ANTI-SYSTEM ORGANIZATIONS: WHAT IS STILL LACKING TO DEFEAT MAFIA?

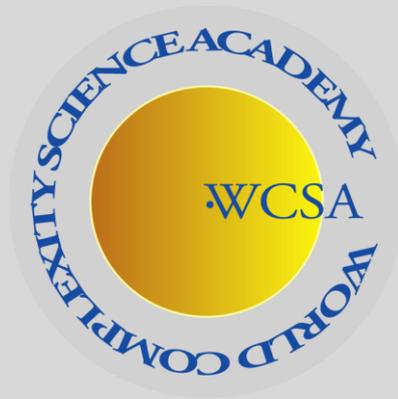
The presence of different organizations labeled generally as Mafia is differently widespread, diffuse and pervasive according to different territories. So forth, different social and economic systems have different degrees of "pollution" and contamination about organized crime. In this paper the mafia organizations are not considered ordinary, tough organized, crime, but a different alternative system that in such a way replaces the legal democratic presence of the State and other institutions. In this case, mafia is something deeper than deviance because its institutionalization inverts common and hegemonic values.

Some metaphors of the mafia presence in a system are discussed in order to take into account different points of view from the systemic approach. Eventually, the phenomena of spontaneous anti-racket associations led by little entrepreneurs and traders is examined as an example of anti-mafia activity.

Avoiding any sort of rhetoric, narrative and ideological discourse about mafia and anti-mafia, here the main assumption is that in many contexts the mafia rules the values, attitudes and behaviors and this is considered an empirically based starting point. By doing so, some traditionally considered amoral values like «omertà» (to stay silent, to don't witness anything, to waive other's rights and even one's own rights) are more deeply discussed to get a more comprehensive portrait of this social reality. In this so designed pattern, safety – a public good that mafia is able to destroy and spoil – can be afforded only in a «amoral familistic way» that equals to a general not-brave and giving up attitude over the social and public sphere. On the other opposite poles there are the mafia affiliates and anti-mafia activists who both live in a continuous danger and under death threat. In this scheme, any continuum among these three ideal types may be easily found out. In any case, the medium mass – who (does not) decide to give up and "live" their lives in the most common possible way – shift the balance in mafia's favor.

The associations that rose since the first 90's in Sicily and are still now working especially in the South of Italy are an example of self-organization and self-coordination that pushes a policy-making instead of a sterile opposite flux (policy makers who decide to establish organizations in a not-autopoietic way). Nonetheless, these associations are still far to be the final solution and face the threat to be overcome by times. Moreover these associations are very different from the Tocqueville assumptions that were studied in the north America of the *manifest destiny* credo because they were born to struggle the main society (instead of nature or "savages" human establishments) and to react against a system, even if that system is against the legal and democratic system that would be supposed to represent the main institutions.

The results of this paper highlight what until now has been successful to face mafia presence and what this autopoietic experience still has to demonstrate in order to defeat critically the presence of different forms of racket among the widespread socio-economic contexts.



**WORLD COMPLEXITY SCIENCE ACADEMY
BOLOGNA, ITALY**

PROJECT MANAGEMENT AND INFORMATION DESK:

Giulio Marini giulio.marini@uniroma1.it
Serena Affuso serena.affuso@gmail.com

