EUROPEAN ACADEMY of Sciences and Arts

European Academy of Sciences and Arts
German-Japanese Society for Integrative Sciences

Symposium
Complexity & Integration in Nature and Society

March 1st, 2019
Juridische Fakultät der Universität Salzburg
Churfürststraße 1
Hörsaal 206
5020 Salzburg

At the occasion of the annual festive session in Salzburg 2019, the European Academy of Sciences and Arts organizes a common symposium with the German-Japanese Society of Integrative Science. According to the famous slogan of Leibniz „Unity in Diversity", the German-Japanese Society tried to integrate different scientific, cultural and religious traditions and approaches in Japan and Germany since many years. But „Unity in Diversity" is a world-wide challenge, especially for Europe. Therefore, members of both societies suggested to organize a common symposium on „Complexity & Integration in Nature and Society". The European Academy of Sciences and Arts invites their members of different classes to take part and contribute to the common symposium.

From a scientific point of view, complex dynamical systems are well-known interdisciplinary methods of modelling in the physical, biological, and ecological sciences. Therefore, complexity research brings together scientists of different fields to learn from one another and to solve different problems. In the life sciences and medicine, climate, environment, populations, and organisms are examples of highly complex systems which need interdisciplinary research. Without any doubt, our political, legal, and economic world is driven by increasing diversity and complexity. We need integration by corporate and public governance. Can digitalization solve the problem of integration with a world-wide technological infrastructure? At this point, humanities and philosophy come in to ask for ethical standards of integration. Last but not least, the demand for „Unity in Diversity" has deep roots in the world religions.
Under this scope, the symposium will consider our topic in the following sections:

- Complex systems in physical, environmental, and life sciences
- Complex systems in medicine and psychology
- Complexity & integration in technical, economic, and social sciences
- Complexity & integration in humanities and world religions

PROGRAMME

08.00 – 08.10 Opening
Felix Unger, President of the European Academy of Sciences and Arts

08.10 – 08.30 Introduction
Klaus Mainzer: *Complexity and Integration in Nature and Society*

Complex Systems in Physical, Environmental, and Life Sciences

08.30 – 08.45 Giulio Casati: *What is Chaos that we should be mindful of it*?

08.45 – 09:00 Marko Robnik: *Complex Behaviour in Classical and Quantum Chaos*

09.00 – 09.15 Arturo Carsetti: *Complexity, Self-organization and Morphogenesis in Life Sciences*

09.15 – 09.30 Juan Perez-Mercader: *Biologically Inspired Chemically Operated Synthetic Systems (BIChOSS): building complexity in the laboratory from simple parts*

09.30 – 09.45 Marc Thorsten Hütt: *Understanding biological complexity – the value of Systems Biology*

09.45 – 10.00 Edmond Pinguli/ Nasho Pinguli: *Climate Change and Global Warming. Water Scarcity in the World and in Albania*

10.00 – 10.15 Hans-Martin Sass: *Biocomplexity, Bioethics and Integration*

10.15 – 10.30 COFFEE BREAK

Complex Systems in Medicine and Psychology

10.30 – 10.45 Simon John Simonian: *Complexity in Medicine and Psychology*

10.45 – 11.00 Zoran Kovacevic: *Cancer as Paradigm of Complex Diseases*

11.00 – 11.15 Marjan Slak Rupnik: *Complex Systems in Diabetes*

11.15 – 11.30 Patriciu Achimas-Cadariu: *Complex Systems in Oncology: A Case for Ovarian Cancer*

11.30 – 11.45 Günter Schiepek: *Complexity and Integration in Psychological Medicine*

11.45 – 12.00 Ernst Pöppel*: Time Windows for Complexity Reduction in Neural Information Processing*

12.00 – 12.15 Yan BAO: *Complexity Reduction in Visual Information Processing with Different Attention Mechanisms*

12.15 – 13.15 LUNCH BREAK

13.15 – 13.30 Uwe an der Heiden: *The Complex Integrative Function of Human Memory from a Psychoneurological Perspective*

13.30 – 13.45 Viktor Jirsa: *Translational Neuroscience: from bifurcations to personalized medicine*

13.45 – 14.00 Türker Kiliç: *What Brain Research has taught us about what Life is*

Complexity & Integration in Technical, Economic, and Social Sciences

14.00 – 14.15	Gudar Beqiraj/ Neki Frasheri: *Internet Complexity and Social Integration*
14.15 – 14.30	Mihail C. Roco: *Principles of Convergence in Nature and Society: with Illustration to Converging Technologies*
14.30 – 14.45	Markus C. Müller: *Complexity and Divergent Economic Policy Preferences – Can Governments anticipate and engineer Optimal Solutions to Popular Demands?*
14.45 – 15.00	Hans G. Danielmeyer: *Complexity and Integration – Understanding the Industrial Society with Quantitative Forecasting Quality*
15.00 – 15.15	Mirsad Hadžikadić: *A Complex System Model of an Identity-based Conflict in Developing Nations*
15.15 – 16.00	Thomas Reuter: *The Principle of 'Unity in Diversity' as a Measured Response to Resurgent Nationalism: Valuing Local Diversity as well as Global Citizenship is not a Contradiction*
16.00 – 16.15	COFFEE BREAK

Complexity & Integration in Humanities and World Religions

16.15 – 16.30	Michael von Brück: *Complexity and Integration of/in Religion, Ecology, and Ethics*
16.30 – 16.45	Annette Noller: *Intercultural Complexity and Integration of Ethics*
16.45 – 17.00	Hans-Ferdinand Angel: *Credition - The Believing Process as a Highly Complex Phenomenon*
17.00 – 17.15	Yutaka Tanaka: *Clash of Civilizations and Ways of Religious Coexistence: Christianity and Japan after the Meiji Restoration*
17.15 – 17.30	Archbishop Felix Machado: *The Cared Earth is the Common Home for the Family which is the Basic Cell of Society: a Catholic Perspective*
17.30 – 17.45	Abbot Nissho Takeuchi: *Wholeness and Variety in Buddhist Perspective*
17.45	Discussion
18.30	Closing

INTRODUCTION

Klaus Mainzer: *Complexity and Integration in Nature and Society*
TUM Emeritus of Excellence, Technical University of Munich

The mathematical theory of nonlinear complex systems has become a proven problem-solving approach in the natural sciences from cosmic and quantum systems to cellular organisms and the brain. Even in modern engineering science, self-organizing systems are developed to manage complex networks and processes. It is now recognized that many of our ecological, social, economic, and political problems are also of a global, complex, and nonlinear nature.

Modern systems science of complex systems and nonlinear dynamics plays a key role in modeling evolution and brain. Systems biology designs complex cellular networks reminding us of cellular automata and electronic circuits in engineering science. Synthetic biology constructs new technical systems of life according to these blueprints. Cognitive and humanoid robots become more and more autonomous, interactive, and adaptive, in order to master complex problems and situations. They use artificial neural networks with learning algorithms (machine learning) according to the blueprints of nonlinear brain dynamics. How far can we go to bridge the gap between computational models of the brain and cognitive states in psychology and medicine? In a first part, this talk discusses challenges of complex systems from life science to robotics and artificial intelligence.

In a second part, we consider social sciences and humanities: The global problems of mankind (e.g., energy, mobility, urbanization, nutrition, financial markets, communication) are cross-over to specialized disciplines of science and need interdisciplinary studies in systems science and technoscience. In sociotechnical systems, information and communication technology is growing together with smart infrastructures (e.g., smart grids, smart cities), in order to handle the complexity of human civilization. In the age of big data, artificial intelligence (AI) and the Internet of Things (IoT) promise support of knowledge sharing through global online participation. But big data technologies only deliver technical support, no competence of interdisciplinary problem solving. Increasing complexity of our civilization needs reflection on the foundations and laws of systems dynamics and ethical orientation, in order to guarantee safety and reliability.

References: K. Mainzer (2007), *Thinking in Complexity. The Computational Dynamics of Matter, Mind, and Mankind*, Springer: New York 5th edition; K. Mainzer, L. Chua (2013): *Local Activity Principle. The Cause of Complexity*, Imperial College Press: London; K. Mainzer (2018), *The Digital and the Real World. Computational Foundations of Mathematics, Science, Technology, and Philosophy, World Scientific Singapore.*.

COMPLEX SYSTEMS IN PHYSICAL, ENVIRONMENTAL, AND LIFE SCIENCES

Giulio Casati: *What is Chaos that we should be mindful of it*?
Center for Complex systems, University of Insubria at Como and
Lake Como School of Advanced Studies, Como, Italy

We introduce and discuss the notion of ‘deterministic chaos’. By this we mean the type of chaotic behaviour which is originated from purely deterministic laws. The existence of "deterministic chaos” may seem contradictory. In fact, this apparent contradiction arises from the psychological barriers due to centuries of tradition that have considered determinism and chaos as opposing concepts. Indeed it turns out that even simple deterministic laws, may lead to a such complex behaviour to appear indistinguishable from a purely random, unpredictable, motion. The study of these laws may lead to a better understanding of the complexity of phenomena which govern our daily life.

Marko Robnik: *Complex Behaviour in Classical and Quantum Chaos*
CAMTP-Center for Applied Mathematics and Theoretical Physics
University of Maribor, Mladinska 3, 2000 Maribor, Slovenia, Robnik@uni-mb.si

I shall explain how chaos (chaotic behaviour) can emerge in deterministic systems of classical dynamics. It is due to the sensitive dependence on initial conditions, meaning that two nearby initial states of a system develop in time such that their positions (states) separate very fast (exponentially) in time. After a finite time (Lyapunov time) the accuracy of orbit characterizing the state of the system is entirely lost, the system could be in any allowed state. The system can be also ergodic, meaning that one single orbit describing the evolution of the system visits any other neighbourhood of all other states of the system. In this sense, chaotic behaviour in time evolution does not exist in quantum mechanics. However, if we look at the structural and statistical properties of the quantum system, we do find clear analogies and relationships with the structures of the corresponding classical systems. This is manifested in the eigenstates and energy spectra of various quantum systems (mesoscopic solid state systems, molecules, atoms, nuclei, elementary particles) and other wave systems (electromagnetic, acoustic, elastic, seismic, water surface waves and gravitational waves), which are observed in nature and in the experiments.

Arturo Carsetti: *Complexity, Self-organization and Morphogenesis in Life Sciences*
Editor of "La Nuova Critica" - Full Professor of Philosophy of Science,
"Conceptual Complexity and Self-Organization in Life Sciences"

According to Chaitin a living organism is a classical program. Evolution is to be considered as a random walk through a software space. The conceptual complexity H(M) of the mutation M is the size in bits of the program M. This is the key idea utilized by Chaitin in order to model Darwinian evolution mathematically. We are faced with an abstract process that reduces an organism to pure information encoded in its DNA, to instructional information, that is to say, searching for the best way to its self-organization. The rest of the organism such as its body etc. is disregarded. Let us emphasize, however, that the "inquiry" performed by the system is not an end in itself: it may constitute the instrument able to trigger new and more sophisticated levels of embodiment by changing Semantics through the "intelligent" recourse to the tools of non-standard mathematics.

Juan Perez-Mercader: *Biologically Inspired Chemically Operated Synthetic Systems (BIChOSS): building complexity in the laboratory from simple parts*
Department of Earth & Planetary Sciences and Origin of Life Initiative, Harvard University
100 Edwin H. Land Boulevard, Cambridge, MA 02142-1204, USA. Santa Fe Institute, Santa Fe, New Mexico 87501, USA

The most complex known systems are living systems. Yet, they can be characterized by the concurrent manifestation of four basic properties: they[(1)] handle information,[(2)] make their own parts,[(3)] self-replicate, and they evolve. Life on Earth expresses these properties using the subset of carbon chemistry we call biochemistry. We ask if another type of chemistry, perhaps simpler, could express these properties and do it concomitantly. If so, how could such systems be put together and autonomously boot-up?We will discuss the logic and present the results of experiments showing how a combination of oscillatory chemistry and Polymerization Induced Self-Assembly (PISA) is capable of producing artificial, non-biochemical and inorganic systems at the nanometer and micrometer scales. These systems emerge autonomously from a homogeneous mixture and boot up displaying primitive expressions of the above properties. We can call them BIChOSS, for Biologically Inspired Chemically Operated Synthetic Systems.

References:
[(1)] Anders N. Albertsen, Jan K. Szymański, and Juan Pérez-Mercader (2017). Emergent Properties of Giant Vesicles Formed by a Polymerization-Induced Self-Assembly (PISA) Reaction. Scientific Reports 7, 41534. doi:10.1038/srep41534

[2] *Bishnu Prasad Bastakoti and Juan Pérez-Mercader (2017). Autonomous Ex Novo Chemical Assembly with Blebbing and Division of Functional Polymer Vesicles from a "Homogeneous Mixture". Advanced Materials. doi:10.1002/adma.201704368*
[3] *Gong Chen and Juan Pérez-Mercader (2018). Polymerization-induced self-assembly for artificial biology: opportunities and challenges. Macromolecular Rapid Communications. doi:10.1002/marc/201800513*

Marc Thorsten Hütt: *Understanding biological complexity – the value of Systems Biology*
Department of Life Sciences and Chemistry
Jacobs University Bremen, Germany

Providing insight, how cellular functions emerge from the interaction of biological components, is the main goal of Systems Biology. Conceptually, Systems Biology is the attempt to provide a theoretical framework for Biology, as well as an inventory of mathematical and computational tools to analyze and interpret high-throughput ('omics') data.
At the core of systems thinking in Biology is the concept of networks: A wide range of empirical observations – about interacting genes, interacting proteins, biochemical reactions in a cell – all can be summarized in the mathematical language of nodes and links. The challenge of Systems Biology is then to relate the architecture of such networks to their biological function. Here I review the potential of Systems Biology to understand biological complexity and how a detailed study of dynamical processes in networks may contribute to the theoretical foundation of Biology.

Hans-Martin Sass: *Biocomplexity, Bioethics and Integration*
Hans-Martin Sass (sasshm@aol.com) Professor Emeritus, Ruhr University, Bochum FRG; Honorary Professor, Renmin University, Beijing PRC ; Senior Research Scholar Emeritus, Georgetown University, Washington DC USA

No individual bios or species bios can live independently. I come from my parents; I need foods and drinks, and other complex adaptable interaction and integration with other bios. The 8 C's (communication and cooperation, competence and competition, contemplation and communication, compassion and cultivation), which are represented in all bios, define in their specific human settings us as individuals and our networks, including state and non-state bios such as religions and corporations. The hexagrams of Dragon Fu Xi, Confucius' 'similar and in harmony, but not identical', and Hobbes' Leviathan are just a few classical examples of our understanding and dealing with bio complexity. We humans are not eusocial as ants and bees, thus we have species-specifically developed bio-ethics in religions and philosophies from the Vedic 'tat tvam asi' to Jesus' 'love your neighbor' and Fritz Jahr's 1926 'Bioethical Imperative: Respect every living being as an end in itself and treat it, if possible, as such'. We had to to do this for good life and happy and healthy survival. Recently, additional to traditional religions, new cyber-bios has developed in 'internets of people, things and everything', interacting and integrating with geo-bios in expanding CAS's (complex adaptable systems).

COMPLEX SYSTEMS IN MEDICINE AND PSYCHOLOGY

Simon John Simonian: *Complexity in Medicine and Psychology*
Former Harvard Professor of Surgery and Science. Now President of World Union Formation.

Physicians practice medicine as a complicated, not complex, scientific system, based on the old Cartesian (1596-1650) and Newtonian (1648-1727) reductionist, deductive, mathematical, closed system that works successfully in top down hierarchy controlling variables. What was good, is showing reduction in value to the patient and increase in health care costs. Physicians

lack education to practice medicine as a complex scientific system (CSS). CSS needs expansionist, inductive, open, emergent, non-linear, feedback loops, computer algorisms, interconnectedness of diverse, multidisciplinary, collaborative, research team members surrounding the complex patient in center stage, continually learning and sharing feedback until all patient's needs are met. Bruce Ramshaw, MD, USA pioneered the application of CSS in surgical repair of ventral abdominal incisional hernia. Results showed increased patient value and reduction of healthcare costs.

Zoran Kovacevic: *Cancer as Paradigm of Complex Diseases*
Former Head of the Institute of Biochemistry of the Clinical Center in Novi Sad and Chief of the Department of Biochemistry of the Medical Faculty in Novi Sad

It is obvious that the explosive development of biomedical sciences is not followed by advance of clinical medicine as it should be expected. The reason for this paradox is that contemporary medicine is facing the enigma of complex diseases. These are, first of all, the process of aging, chronic degenerative diseases and cancer. The cause of aging and degenerative diseases is, in essence, the process of entropic destruction which is stochastic, with nonlinear dynamics and with characteristics of complex and chaotic behaviour. In the case of neoplasm entropy or disorder, caused by carcinogens, is followed by malignant alteration of cells but organism faces another mighty force – enormous potential for reproduction, mutation and diversification with creation of the clon which is resistant to all systemic therapies. In spite of the rich database, there is no field in clinical practice which is so overloaded with dilemmas and controversy like cancer. The main reason for this is the enormous heterogeneity of malignant neoplasmas and unpredictable initiation and progression of malignancy. In this report I shall discuss factors that make cancer a system of enormous complexity with elements of chaos.

Marjan Slak Rupnik: *Complex Systems in Diabetes Research*
Center for physiology and pharmacology, Medical University Vienna

Diabetes mellitus is a common, chronical, and progressive catabolic disease resulting from an absolute or relative lack of insulin, a key anabolic hormone enabling influx of nutrients into all cells in an organism to support nutrition, housekeeping or energy storage. The first line of defence of the organism to limit the extent of resulting and life threatening loss of proteins and fat is marked by the increase in plasma glucose levels to support extensive insulin release. Recent analyses of beta-cell collectives yielded novel insights into regulation of collective sensing and related dynamic network activity to the metabolic code.

Korošak D, Slak Rupnik M (2018) Collective sensing of beta-cells generates the metabolic code. Frontiers in Physiology. 9:31.
Gosak M et al. (2017) Network science of biological systems at different scales: a review. Physics of life reviews. doi.org/10.1016/j.plrev.2017.11.003.

Patriciu Achimas-Cadariu: ***Complex Systems in Oncology: A Case for Ovarian Cancer***
University of Medicine and Pharmacy Iuliu Hatieganu Cluj-Napoca, Institute of Oncology „Prof. Dr. Ion Chiricuță", Cluj-Napoca, Romania

Today cancer is leading cause of death. Characterized as a heterogeneous disease, it represents one of the biggest research challenges of our time. Ovarian cancer, an evolutionary mismatch in modern societies, makes no exception, and is composed from a complex system of cells best described by features such as clonal evolution, spatial and temporal genetic heterogeneity and development of drug resistance, thus the most lethal gynecologic cancer. Seminal work on cancer as an evolutionary process has a long history however recent cost-effective large scale molecular profiling has started to provide novel insights coupled with the development of mathematical algorithms. There is also recent evidence that the clonal dynamics in ovarian cancer are subjected to a process of immune editing with heterogeneous

efficacy within the same system. Integrative design of future research is key for the development of robust predictive modelling tools for complex systems in oncology that will ultimately provide tumor control.

Günter Schiepek: ***Complexity and Integration in Psychological Medicine***

Institute of Synergetics and Psychotherapy Research, Paracelsus Medical University Salzburg, and Department of Psychology, Ludwig-Maximilians University Munich

Complexity is a scientific term with manifold meanings. One of these meanings refers to the integration of different levels of functioning in humans: the physiological level (e.g., brain dynamics), the mind (cognitions and emotions), behavior, and social interaction. An example will be provided how these levels can be investigated in a multi-level multi-methods project on psychotherapeutic change dynamics. The challenge is to integrate the different time scales of mind-brain dynamics (fMRI scans, immunological end endocrine parameters) and of the personal development during the whole period of psychotherapeutic treatment, which can be assessed by daily self-ratings. The aim is to identify synchronized phase transitions in bio-psycho-social system dynamics which introduces another meaning of complexity: dynamic complexity. In times of digitalization in psychological medicine internet- and app-based methods are used for a continuous real-time monitoring of human change processes. The resulting time series are analyzed and visualized in real-time and provide substantial information on the dynamic features of these processes, like dynamic complexity and critical instability, dynamic synchronization of treatment-related cognitions and emotions, phase-transitions between dynamic patterns and its precursors, and others. Therapists make use of these markers and features for continuous shared decision making together with their patients. Another way of understanding complex systems is by building mathematical models on change dynamics which integrate available knowledge and empirical findings on psychological mechanisms of change. A newly developed model formalizes the circular causality between order and control parameters in a set of nonlinear difference equations and shows how self-organized thresholds create critical instabilities and order-to-order transitions of dynamic patterns. The model explains many features of change dynamics which are known from psychotherapy research. It can be validated by empirical time series data and allows for short term predictions of critical periods and perhaps also on the possible effects of interventions before these are applied to real patients. Here we are at the crossroads of digitalization, personalization and complexity science on the way to intelligent systems in psychological medicine.

Ernst Pöppel: ***Time Windows for Complexity Reduction in Neural Information Processing***

Human Science Center and Institute of Medical Psychology
Ludwig-Maximilians-Universität, Munich, Germany

It has been assumed that information processing in the brain is of continuous nature. Critical reasoning and experimental evidence leads, however, to the conclusion that temporal processing has to be of discrete nature, that „time windows“ are necessary. Two such time windows have been disclosed. They represent anthropological universals shared by all humans. One such time window is observed in the temporal domain of some tens of milliseconds in which events are defined as material basis of consciousness. As an underlying mechanism neural relaxation oscillations are suggested. The other time window has a duration of approximately 3 seconds and it can be considered as the operative basis of the „subjective present“ or what we experience as „now“. This time window can be observed in brain activities, in our perceptions, actions, memories, speech and even in poetry and music.

Yan Bao: *Complexity Reduction in Visual Information Processing with Different Attention Mechanisms*

School of Psychological and Cognitive Sciences, Peking University, China

We are bombed with an overwhelming amount of visual information when we open our eyes. One way to reduce the complexity of our visual world is mediated by human attention system which selectively facilitates the processing of only certain location or aspect of the visual scene, thus allowing us to prioritize some aspects of information while ignore the others. Recent studies on attention with behavioral and neuroimaging methods have shown that our selective attention system is not homogeneous across the visual field; the foveal and perifoveal regions are significantly different from the peripheral visual field with respect to both the magnitude of attentional control and the circadian phase of attentional rhythm. However, a same time window of approximately three seconds is indicated to unite the two attention systems in the visual field, suggesting a common temporal platform for reducing the complexity of visual information processing.

Uwe an der Heiden: *The Complex Integrative Function of Human Memory from a Psychoneurological Perspective*

University of Witten Herdecke, Germany; adheiden@uni-wh.de

We do not remember everything we are experiencing. The human memory is highly selective. The main function of our memory is forgetting. There are a few people having a photographic memory. They are generally unable to lead an independent, self-determined life. The human memory operates at a self-organizing basis which is directly connected to learning and thinking. Memory is a dynamic process. Its neural correlate are the connections between the nerve cells, the so called synapses. Neural plasticity means that synapses are both formed and destructed. Human memory, contrary to the much weaker memory of animals, is basically supported by language. There are several kinds of memory: sensory memory, short term memory, long term memory. The last one can be subdivided into declarative, procedural, episodic and semantic memory. Everyone is responsible for her or his memory. There are special exercises to train and improve memory.

Viktor Jirsa: *Translational Neuroscience: from bifurcations to personalized medicine*

Aix-Marseille University, Institut de Neurosciences des Systèmes, Marseille, France

Dynamical principles underlie the formation of all patterns in physics, biology, and chemistry. Brain sciences is no exception. However, it appears that brain function is better understood from the perspective of a constantly changing flows than a repertoire of brain states. A new idea is to take advantage of the non-stationarities in human brain and behavior and link it back to theories of nonlinear dynamics. In other words, the target of investigation will become the brain state changes rather than the brain state itself. This novel entry point allows to elucidate mechanisms underlying the propagation of activity through large-scale networks. When merged with individual structural information on patient brains obtained from non-invasive neuroimaging, we can build virtual patient brain models. We demonstrate the validity of these approaches along concrete patient models and show how they can be translated into clinical applications.

Türker Kiliç: *What Brain Research has taught us about what Life is*

Founding Dean, BAU School of Medicine, Chair, Dept. of Neurosurgery

Many scientists have tried to identify how the brain creates a working information processing system through its network of neurons, also called the Connectome. I propose that brain research can also teach us many things about the essence of life. The information rivers flowing through the brain are constantly recreating themselves through an infinite number of possibilities. Maybe life, as an infinite number of possibilities is also made up of integrated information systems. That is, what if the structure of the Connectome and how it creates thought as well as consciousness reflects what is perhaps a network of consciouses – “a collective conscious”? This could be the simplest, most elegant explanation of how complexity and integration manifests itself in nature and in society, and could form the basis of how and why the wellbeing of each and every single living thing on this earth should matter to all of the rest.

COMPLEXITY & INTEGRATION IN TECHNICAL, ECONOMIC, AND SOCIAL SCIENCES

Gudar Beqiraj/ Neki Frasheri: *Internet Complexity and Social Integration*
Academy of Sciences of Albania

There was needed understanding social issues of research and ICT in Albania, collaborating with IFIP WG9.4, supported by SSRC. Internet complexity results from interconnecting simplicity. Internet topology becomes black box. There is complexity within Web and social networks, reflecting complexity of society and “tacit knowledge”. Kransberg law specifies “technology in neither good nor bad, neither neutral”. Internet globalized the World, coupling local optimization practices, breaking production-consumption traditional cycles, worsening stability mechanisms of this complex undeterministic system: the negative feedback and fast adaption ability. Old hypothesis “cyberspace becomes public space with all vices and virtues of humanity” remains valid. Internet and mass-media are creating post-modernist virtual realities, distributed virtual communities and unrealistic debates, integrating and differentiating gaps between physical and spiritual life of people. Technology and data are concentrating, used for manipulation of virtual communities. Technology is solving problems while shifting old problems in new dimensions.

Ref: https://arxiv.org/pdf/1312.2246.pdf

Mihail C. Roco: *Principles of Convergence in Nature and Society: with Illustration to Converging Technologies*
National Science Foundation and National Nanotechnology Initiative, United States, mroco@nsf.gov

Knowledge, technology and society evolve increasingly turbulent, coherent, and emergent. Convergence is a problem-solving strategy for holistically understanding and transforming an ecosystem for reaching a common goal. Basic principles and methods underlying the convergence science will be presented. Their application will be illustrated for understanding nature and facilitating the emergence of converging technologies[1]. A special trend is the synergism of foundational science and technology fields (nano-, bio-, info-, cogno- and AI fields) from their basic elements (atoms, bits, genes, neurons, logic steps), using similar system architecture and dynamic networking concepts. Convergence approach creates a framework for decision-making and problem-solving not only for science, education and technology, but also for business and humanities[2,3].

References:
[1] *Roco MC, Bainbridge WS (2003) Converging technologies for improving human performance. Kluwer, www.wtec.org/ConvergingTechnologies/Report/NBIC_report.pdf;*
[2] *Roco MC, Bainbridge WS, Tonn B, Whitesides G (2013) Convergence of knowledge, technology and society. Springer, https://www.nano.gov/node/1047*
[3] *NSF Big Ideas (2019): Growing convergence research, www.nsf.gov/news/special_reports/big_ideas/convergent.jsp*

Markus C. Müller: ***Complexity and Divergent Economic Policy Preferences - Can Governments anticipate and engineer Optimal Solutions to Popular Demands?***
Global Head of Chief Investment Office, Deutsche Bank

Concerns about social inequality and falling living standards have been exacerbated by the economic fall-out from the global financial crisis. But has the policy response to the crisis also been part of the problem? In particular, has the focus on QE-style extreme monetary policy unintentionally displaced conventional debate around policy preferences, encouraging the emergence of populist politicians promoting appealingly simple alternative strategies? Fiscal pressures and technological change, inter alia, mean that governments increasingly need to face up to a range of complex resource allocation and other decisions delayed for the last decade – but is it realistic to believe that clientelism can eventually be replaced by a longer-term, ethical and consensus-driven approach to political decision making? In a fast-changing economic environment, can governments really anticipate their populations' needs and priorities and enact effective forward-looking legislation? Or will political party fragmentation continue, with parliaments limited to a reactive role?

Hans G. Danielmeyer: ***Complexity and Integration - Understanding the Industrial Society with Quantitative Forecasting Quality***
Hans G Danielmeyer, Thomas Martinetz, Institute for Neuro- and Bioinformatics, University of Lübeck, http://www.inb.uni-luebeck.de

With the Cold War's longest peace on G8 level soil the world's average existential conditions improved by an order of magnitude. But the top decile owns now 90% of all assets, and the lowest decile nothing. Nevertheless, long-term forecasting quality exists for six per capita quantities when a nation's innovation is strong enough for pushing the inherited male and female maturation programs along their given genetic limits (Springer Link Jan. 19, 2018 or inb.uni-luebeck.de). Four quantities with three directly measured time constants were immune even to World War II. Innovation supports simultaneously Adam Smith's intermediate-term programs of accumulating destructible wealth for optimal recoveries from national disasters. Both programs have their own per capita saturating dynamics. They caused the continuously decreasing economic growth rates with negligible G7 level interest. Every human civilization has the same natural limits. We predict the peaceful future for China, USA, Russia, Germany, Japan, and the UK.

Thomas Reuter: ***The Principle of 'Unity in Diversity' as a Measured Response to Resurgent Nationalism: Valuing Local Diversity as well as Global Citizenship is not a Contradiction***
University of Melbourne & Universität Bonn

The persistent ideological backlash of resurgent nationalism against neoliberal globalism in recent years, exemplified by Trumpism, Brexit and the rise of right-wing populism in Europe, suggests that important popular grievances are not being addressed. Supporters of a renewed parochialism and xenophobia in turn fail to acknowledge the fact of global interdependence and, indeed, the urgent need for even greater global cooperation.
The resulting polarisation poses a serious risk and prevents rational solutions. I argue that this tendency must and can be avoided by reconciling principles of national sovereignty and cultural diversity with the need for global cooperation and unity. I will develop such a more integrated perspective, beyond nationalism and globalism, by drawing on my research on revitalisation movements pushing back against globalisation impacts in Asia and on my engagement with global science organisations that nonetheless value and protect diversity.

COMPLEXITY & INTEGRATION IN HUMANITIES AND WORLD RELIGIONS

Michael von Brück: *Complexity and Integration of/in Religion, Ecology, and Ethics*
Former Chair of the Interfaculty Programme “Study of Religion”, Ludwig-Maximilians-University Munich

In time and space religions are central aspects of cultural evolution. Change in time and according to spacial differences is the reality of religions which, however, for various reasons claim to represent an identity that would be trans-temporal and trans-spacial. This again leads to a complexity of phenomena and interpretations of the same according to certain structures which also have developed in time. Today, religions intermingle as never before. This leads to new integrational identities which might be fostered or challenged consciously by vested interests of the people and groups involved and concerned. However, religions are powerful motivating/demotivating forces for developing certain lifestyles which will shape societies in long-time perspective. Facing the ecological crisis today it needs to be asked which kind of religious motivations could be aroused in order to meet the challenge, that is to say in which way can religions contribute to an integration of values and ethical norms for a life-style that would be demanded by the ecological imperative.

Annette Noller: *Intercultural Complexity and Integration of Ethics*
Professor of Social Ethics / Diaconic Sciences at 'Evangelische Hochschule Ludwigsburg', Chair of the Ethics Committee. Venia legendi of Theological Faculty of University of Heidelberg. Member of the Ethics Section of the German Society for Social Work (DGSA) and the 'Conference on Diaconia and Development' of Diakonie Deutschland. International lectures on socio-ethical and diaconical topics.

The Intercultural complexity of ethical discourses is the subject of this lecture. Culturally shaped values, which are anchored in the 'cultural memory' (Jan and Aleida Assmann) of societies, are currently meeting an increasing technology-based global communication. Digital achievements require moral communication methods, which enable Politicians and Scientists to develop ethical standards in intercultural contexts. In this lecture scientific approaches to methods of intercultural moral communication are given. Examples of ethics discourses and aspects of religious sensitivity are presented. They are to be regarded as basics for integrative communication methods in complex discourse forums and ethically reflected research settings.

Hans-Ferdinand Angel: *Credition - The Believing Process as a Highly Complex Phenomenon*Karl-Franzens University Graz, Institute for Catechetics and Religious Education**,** ferdinand.angel@uni-graz.at

In the recent decade the scientific interest in the phenomenon “belief” has found a new and increasingly broader interest from different fields of research (as for instance religious cognition, pathology, neuroscience, information theory, and Artificial Intelligence research). At the Karl-Franzens University of Graz in 2011 the Credition Research Project was inaugurated. It is highly interdisciplinary and has established a global network of researchers (https://credition.uni-graz.at/). It paved the way for a paradigm change “from the question of belief to the question of believing”. Fuelled by the interest in understanding the process of believing (= credition) a highly complex “concept of credition” as well as a first “model of credition” has been elaborated.

HF Angel, L Oviedo, RF Paloutzian, A Runehov, RJ Seitz (Eds.) Processes of Believing: The Acquisition, Maintenance, and Change in Creditions. Springer 2017

Yutaka Tanaka: *Clash of Civilizations and Ways of Religious Coexistence: Christianity and Japan after the Meiji Restoration*

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Part I: The Buddhist Principle of Relativity

(1) Nāgārjuna's use of "tetra lemma" as via negativa or the way of deconstructing four opposing opinions
(2) Dōgen's use of "tetra lemma" as *via positiva* or the way of resurrecting four opposing opinions after denial

Part II: Whithehead's *Principle of Relativity* Reconsidered and its application to the Locus of Interreligious Dialogue

(1) Panentheistic Cosmology beyond the Opposition of theism and pantheism
(2) "Sur-Relativism" and "Creative Transformation" or Self-transcendence of Christianity beyond the Dialogue with Buddhism

Part III: Christianity and Buddhism in Japan: From Confrontation to Dialogue

(1) The Success and Failure of Jesuit Missionary in Japan during the early modern Era: "Deus Destroyed" and "Deus Resurrected": the meaning of "underground" or "hidden" Christians before and after the Meiji Restoration
(2) The Origin of "Non-Church Christianity" in Japan and Uchimura Kanzo's self-criticism of "the just war argument" for the Shino-Japan War
(3) Uchimura Kanzo's attitudes towards Japanese religious and cultural traditions: *Representative Men of Japan* (1894) and *The Japan Christian Intelligencer* (1926-28)

Abbot Nissho Takeuchi: *Wholeness and Variety in Buddhist Perspective*

Chairman Daiseion-ji e.V.

Through the collision of cultures and different civilizations complex global problems arise, which cannot be solved with the mindset of separation. Big challenges have to be mastered by the modern civilizations.
It is the goal to recognize the relationship between wholeness and multiplicity through the thinking of integration of the subject and object. The decisions of a society have global effects and this cannot be thought about on a regional basis only.
To answer these questions, we are going to look at 5 exemplary points from a Buddhist view point, explain them and discuss them.
The thinking of integration and complex systems is the key to a change of a paradigm shift in the 21st century. Because of this, the exchange between science, art and social sciences is very important.

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