

# Emergence in Complex, Cognitive, Social, and Biological Systems

# Emergence In Complex Cognitive Social And Biological Systems

**Arne Collen**



## **Emergence In Complex Cognitive Social And Biological Systems:**

**Emergence in Complex, Cognitive, Social, and Biological Systems** Gianfranco Minati, Eliano Pessa, 2012-12-06 The systems movement is made up of many systems societies as well as of disciplinary researchers and researches explicitly or implicitly focusing on the subject of systemics officially introduced in the scientific community fifty years ago Many researches in different fields have been and continue to be sources of new ideas and challenges for the systems community To this regard a very important topic is the one of EMERGENCE Between the goals for the actual and future systems scientists there is certainly the definition of a general theory of emergence and the building of a general model of it The Italian Systems Society Associazione Italiana per la Ricerca sui Sistemi AIRS decided to devote its Second National Conference to this subject Because AIRS is organized under the form of a network of researchers institutions scholars professionals and teachers its research activity has an impact at different levels and in different ways Thus the topic of emergence was not only the focus of this conference but it is actually the main subject of many AIRS activities

**Multiplicity and Interdisciplinarity** Gianfranco Minati, 2021-07-30 This book presents the human cultural and scientific contributions of professor Eliano Pessa who recently passed away His research interests and activities were varied some of which included quantum physics cognitive science and psychology systems science artificial intelligence and alpinism They were never disciplinary separated issues but rather some coherent dimensions of his interests in life He lived and not only practiced interdisciplinarity and multiple dimensions he considered it unacceptable to do only one thing in life The contributors in this volume consider discuss interpret and represent the multiplicity and interdisciplinarity experienced lived and applied by Pessa The chapters are inspired by rebuild and retrace such networked interests lived by him from the personal cultural and scientific points of view of the authors This is true interdisciplinarity and usage of non equivalences honoring the richness of Pessa s contributions **Complexity Challenges in Cyber Physical Systems** Saurabh Mittal, Andreas Tolk, 2019-12-24 Offers a one stop reference on the application of advanced modeling and simulation M S in cyber physical systems CPS engineering This book provides the state of the art in methods and technologies that aim to elaborate on the modeling and simulation support to cyber physical systems CPS engineering across many sectors such as healthcare smart grid or smart home It presents a compilation of simulation based methods technologies and approaches that encourage the reader to incorporate simulation technologies in their CPS engineering endeavors supporting management of complexity challenges in such endeavors Complexity Challenges in Cyber Physical Systems Using Modeling and Simulation M S to Support Intelligence Adaptation and Autonomy is laid out in four sections The first section provides an overview of complexities associated with the application of M S to CPS Engineering It discusses M S in the context of autonomous systems involvement within the North Atlantic Treaty Organization NATO The second section provides a more detailed description of the challenges in applying modeling to the operation risk and design of holistic CPS The third section delves in

details of simulation support to CPS engineering followed by the engineering practices to incorporate the cyber element to build resilient CPS sociotechnical systems Finally the fourth section presents a research agenda for handling complexity in application of M S for CPS engineering In addition this text Introduces a unifying framework for hierarchical co simulations of cyber physical systems CPS Provides understanding of the cycle of macro level behavior dynamically arising from spatiotemporal interactions between parts at the micro level Describes a simulation platform for characterizing resilience of CPS Complexity Challenges in Cyber Physical Systems has been written for researchers practitioners lecturers and graduate students in computer engineering who want to learn all about M S support to addressing complexity in CPS and its applications in today s and tomorrow s world Towards a Post-Bertalanffy Systemics Gianfranco Minati, Mario Abram, Eliano Pessa, 2015-12-23 This book contains the proceedings of the Sixth National Conference of the Italian Systems Society The title Towards a post Bertalanffy Systemics aims to underline the need for Systemics and Systems Science to generalize theoretically concepts related to complexity the great enemy of Bertalanffy Systemics Hopefully this goal should be achieved by working in an inter disciplinary and trans disciplinary fashion using systemic concepts arising from various disciplines and from the original or Bertalanffy Systemics as well The interdisciplinary nature of the original Systemics and its power of generalization were given overall by the fact that the problems and solutions of one discipline become problems and solutions for another Today the modeling and interpretation of multidisciplinary approaches and representations makes easier to recognize these interconnections The context however has changed dramatically Of course the challenge is still to find theoretical generalizations and applications even where we have a lot of specificities but we know very little on how to combine them We cannot however simply replace the old with the new but we must introduce strategies to recognize represent model and act on new levels combining multiple representations functions and emergence In many disciplines this has been already done and inevitably well since targets and projects are well specified and oriented The challenge is to do it for Systemics with the vocations of cultural and theoretical generalization Examples of new issues introduced by such theoretical disciplinary improvements dealt with by many disciplines include the study of mesoscopic or middle way level of multiple and dynamic coherence of equivalence non equivalence of fractality of networks of non causality of non invasiveness of non prescribability of non separability of quasi properties of symmetry properties of topological dynamics as well as of quantum theories and concepts The conference was devoted to identifying discussing and understanding possible interrelationships of theoretical disciplinary improvements recognized as having prospective fundamental roles for a new post Bertalanffy Systemics The latter should be able to deal with problems related to complexity in a generalized way In this context the inter disciplinarity should consists for instance in a disciplinary reformulation of problems as from algebraic to geometrical from military to political from biological to chemical while the trans disciplinarity should be related to the study of such reformulations and their properties The Italian Systems Society AIRS was founded in the 1996 The AIRS is a network

of academicians scientists researchers and professionals involved in Systemics A partial list of disciplines represented is Architecture Biology Economics Education Engineering Mathematics Neurosciences Medicine Music Philosophy Psychology Physics Previous conferences had as open lecturers professors Arecchi Haken Klir and Kauffman The proceedings have been published as 1 Minati G ed 1998 Proceedings of the first Italian Conference on Systemics Apogeo Scientifica Milan Italy 2 Minati G and Pessa E eds 2002 Emergence in Complex Cognitive Social and Biological Systems Kluwer New York 3 Minati G Pessa E and Abram M eds 2006 Systemics of Emergence Research and Applications Springer New York 4 Minati G Abram M and Pessa E eds 2009 Processes of emergence of systems and systemic properties Towards a general theory of emergence World Scientific Singapore 5 Minati G Abram M and Pessa E eds 2012 Methods Models simulations and approaches towards a general theory of change World Scientific Singapore

Collective Beings Gianfranco Minati, Eliano Pessa, 2006-12-26

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**Methods, Models, Simulations And Approaches Towards A General Theory Of Change - Proceedings Of The Fifth National Conference Of The Italian Systems Society** Gianfranco Minati, Mario Abram, Eliano Pessa, 2012-03-27 The book contains the Proceedings of the 2010 Conference of the Italian Systems Society Papers deal with the interdisciplinary study of processes of changing related to a wide variety of specific disciplinary aspects Classical attempts to deal with them based on generalising approaches used to study the movement of bodies and environmental influence have included ineffective reductionistic simplifications Indeed changing also relates for instance to processes of acquisition and varying properties such as for software growing and aging biological systems learning cognitive systems and socio economic systems growing and developing through innovations Some approaches to modelling such processes are based on considering changes in structure e g phase transitions Other approaches are based on considering 1 periodic changes in structure as for processes of self organisation 2 non periodic but

coherent changes in structure as for processes of emergence 3 the quantum level of description Papers in the book study the problem considering its transdisciplinary nature i e systemic properties studied per se and not within specific disciplinary contexts The aim of these studies is to outline a transdisciplinary theory of change in systemic properties Such a theory should have simultaneous corresponding and eventually hierarchical disciplinary aspects as expected for a general theory of emergence Within this transdisciplinary context specific disciplinary research activities and results are assumed to be mutually represented as within a philosophical and conceptual framework based on the theoretical centrality of the observer and conceptual non separability of context and observer related to logically open systems and Quantum Entanglement Contributions deal with such issues in interdisciplinary ways considering theoretical aspects and applications from Physics Cognitive Science Biology Artificial Intelligence Economics Architecture Philosophy Music and Social Systems Systems Science and Cybernetics - Volume I Francisco Parra-Luna, 2009-10-30 The subject Systems sciences and cybernetics is the outcome of the convergence of a number of trends in a larger current of thought devoted to the growing complexity of primarily social objects and arising in response to the need for globalized treatment of such objects This has been magnified by the proliferation and publication of all manner of quantitative scientific data on such objects advances in the theories on their inter relations the enormous computational capacity provided by IT hardware and software and the critical revisiting of subject object interaction not to mention the urgent need to control the efficiency of complex systems where efficiency is understood to mean the ability to find a solution to many social problems including those posed on a planetary scale The result has been the forging of a new academically consolidated scientific trend going by the name of Systems Theory and Cybernetics with a comprehensive multi disciplinary focus and therefore apt for understanding realities still regarded to be inescapably chaotic This subject entry is subdivided into four sections The first an introduction to systemic theories addresses the historic development of the most commonly used systemic approaches from new concepts such as the so called geometry of thinking or the systemic treatment of non systemic identities to the taxonomic entropic axiological and ethical problems deriving from a general systemic cybernetic conceit Hence the focus in this section is on the historic and philosophical aspects of the subject Moreover it may be asserted today that beyond a shadow of a doubt problems in particular problems deriving from human interaction but in general any problem regardless of its nature must be posed from a systemic perspective for otherwise the obstacles to their solution are insurmountable Reaching such a perspective requires taking at least the following well known steps a statement of the problem from the determinant variables or phenomena b adoption of theoretical models showing the interrelationships among such variables c use of the maximum amount of wherever possible quantitative information available on each d placement of the set of variables in an environment that inevitably pre determines the problem That epistemology would explain the substantial development of the systemic cybernetic approach in recent decades The articles in the second section deal in particular with the different methodological

approaches developed when confronting real problems from issues that affect humanity as a whole to minor but specific questions arising in human organizations Certain sub themes are discussed by the various authors always from a didactic vantage including problem discovery and diagnosis and development of the respective critical theory the design of ad hoc strategies and methodologies the implementation of both qualitative soft system methodologies and formal and quantitative such as the General System Problem Solver or the axiological operational perspective approaches cross disciplinary integration and suitable methods for broaching psychological cultural and socio political dynamisms The third section is devoted to cybernetics in the present dual meaning of the term on the one hand control of the effectiveness of communication and actions and on the other the processes of self production of knowledge through reflection and the relationship between the observing subject and the observed object when the latter is also observer and the former observed Known as second order cybernetics this provides an avenue for rethinking the validity of knowledge such as for instance when viewed through what is known as bipolar feedback processes through which interactions create novelty complexity and diversity Finally the fourth section centres around artificial and computational intelligence addressing sub themes such as neural networks the simulated annealing that ranges from statistical thermodynamics to combinatory problem solving such as in the explanation of the role of adaptive systems or when discussing the relationship between biological and computational intelligence

**Interdisciplinary Mathematics Education** Brian Doig, Julian Williams, David Swanson, Rita Borromeo Ferri, Pat Drake, 2019-02-22 This open access book is the first major publication on the topic of Interdisciplinary Mathematics Education and arose from the work of the first International Topic Study Group of the same name at the ICME 13 conference in Hamburg in 2016 It offers extensive theoretical insights empirical research and practitioner accounts of interdisciplinary mathematics work in STEM and beyond e g in music and the arts Scholars and practitioners from four continents contributed to this comprehensive book and present studies on the conceptualizations of interdisciplinarity implementation cases at schools and tertiary institutions teacher education and implications for policy and practice Each chapter and the book itself closes with an assessment of the most significant aspects that those involved in policy and practice as well as future researchers should take into account

**Systemic Change Through Praxis and Inquiry** Arne Collen, 2018-04-17 This new volume in the distinguished Praxiology series examines the confluence of praxiology pragmatics and systemics in the study of systemic change through human inquiry particularly small group activities human organizations and globalizing trends It covers core concepts indigenous to organizational life The author presents and subsequently integrates several conceptual schemes relevant to human beings and small groups engaged in human inquiry for systemic change in organizational settings Each key concept in the volume is covered in a chapter theme that articulates the praxiology and pragmatics of human inquiry Chapter 1 examines change as a systemic idea from a research methodologist s point of view Chapter 2 articulates numerous points to distinguish systemic from non systemic research methods to bring

about systemic change Chapter 3 discusses the prevalence of hierarchy and control Chapter 4 focuses on disciplinarity viewed as one kind of quest for understanding complexity and change Chapter 5 describes praxiology in inquiry Chapter 6 elaborates on emergent forms of praxiology Chapter 7 demonstrates the viability of systemic change through praxiology Chapter 8 targets the general features of research process that are the means to effectuate systemic change while Chapter 9 elaborates on these means toward developing systemic inquiry to systemic change Chapter 10 discusses complexification in human inquiry and systemic change Systemic Change Through Praxis and Inquiry is a pioneering effort to attain a more integrated view of research methodology for human inquiry It will be of great interest to students of business management and organizational studies Arne Collen is a long standing member of both the Executive Faculty at Saybrook Graduate School in San Francisco and the Research and Teaching Adjunct Faculty in the California College of Organizational Studies and the California College of Professional Psychology of Alliant International University San Francisco Bay Campus He is a research methodologist who over the last three decades has applied systemic and sociocybernetic perspectives to advances in research methodology for human inquiry With Wojciech W Gasparski he is co editor of Design and Systems Volume 3 of the Praxiology series

*Professional Learning in the Work Place for International Students* Georgina Barton, Kay Hartwig, 2017-06-28 This book shares a range of examples where international students have undertaken a work placement practicum internship or participated in work integrated learning Contributions reflect on the successes and challenges that this particularly diverse group of students experience when undertaking work placement programs in a variety of disciplines such as education engineering and health The book explores these experiences via three main conceptualisations 1 Internationalisation and interculturalisation including the diversity of international student cohorts and the associated policy practices and assessment related to international students in higher education 2 Multi socialisation of international students with a focus on new cultural contexts professional learning and disciplinarity and 3 Reflection and reflective practice acknowledging that for improvement and change to occur those involved need to reflect on current and possible future practice A working model of effective practice is introduced which can inform prospective international students their mentors supervisors work placement coordinators and other relevant university staff

**Fieldwork in Humanities Education in Singapore** Teddy Y.H. Sim, Hwee Hwang Sim, 2021-02-20 This book addresses the topic of humanities education fieldwork using the Singapore context as its primary focus It explores how the thought processes behind and techniques of various humanities and social sciences subjects can be applied to fieldwork in a variety of school and training settings In addition it discusses how humanities students and educators could stand to benefit from utilizing fieldwork techniques and skills used in archaeology and anthropology beyond undergraduates majoring in that discipline Finally the adoption of multidisciplinary approaches in fieldwork incorporating history geography literature and social studies demonstrate how these subjects can collaborate together in actual case studies to facilitate participants learning in the field



**Multiple Systems** Gianfranco Minati, Maria Pietronilla Penna, 2024-01-04 This book presents the proceedings of the Eighth National Conference of the Italian Systems Society. The contributions underline the need for Systemics and Systems Science in order to address multiple changing systems involving several coherent versions. The conference focused on identifying, discussing, and understanding possible interrelationships between fundamental theoretical advances in different disciplines. Given their scope, these proceedings represent a valuable asset for all researchers whose work involves multiple systems.

**Summer of Simulation** John Sokolowski, Umut Durak, Navonil Mustafee, Andreas Tolk, 2019-05-07 This book is based on the Summer Simulation Multi Conference (SCSC) which has been a prominent platform for the dissemination of scholarly research in the M/S community for the last 50 years. In keeping with the conference's seasonal title, the authors have called this half-century the summer of simulation, and it has led not only to simulation-based disciplines but also simulation as a discipline. This book discusses contributions from the SCSC in four sections. The first section is an introduction to the work. The second section is devoted to contributions from simulation research fellows who were associated with the SCSC, while the third section features the SCSC's most influential contributions. Lastly, the fourth section includes contributions from the best papers in the last five years. Features: A comprehensive volume dedicated to one of the simulation domain's major conferences, the SCSC. Offers a scientometric analysis of the SCSC. Revisits high impact topics from 50 years of the SCSC. Includes chapters by simulation research fellows associated with the SCSC. Presents updated best paper contributions from the recent conference. This work will be of value to anyone interested in the evolution of modeling and simulation over the last fifty years. Readers will gain a perspective on what drove this evolution and develop an understanding of the key contributions that allowed this technology to grow into its own academic discipline and profession.

**Converging Minds** Aleksandra Przegalinska, Tamilla Triantoro, 2024-06-17 This groundbreaking book explores the power of collaborative AI in amplifying human creativity and expertise. Written by two seasoned experts in data analytics, AI, and machine learning, the book offers a comprehensive overview of the creative process behind AI-powered content generation. It takes the reader through a unique collaborative process between human authors and various AI-based topic experts created, prompted, and fine-tuned by the authors. This book features a comprehensive list of prompts that readers can use to create their own ChatGPT-powered topic experts. By following these expertly crafted prompts, individuals and businesses alike can harness the power of AI, tailoring it to their specific needs and fostering a fruitful collaboration between humans and machines. With real-world use cases and deep insights into the foundations of generative AI, the book showcases how humans and machines can work together to achieve better business outcomes and tackle complex challenges. Social and ethical implications of collaborative AI are covered, and how it may impact the future of work and employment. Through reading the book, readers will gain a deep understanding of the latest advancements in AI and how they can shape our world. **Converging Minds: The Creative Potential of Collaborative AI** is essential reading for anyone interested in the transformative potential of

AI powered content generation and human AI collaboration It will appeal to data scientists machine learning architects prompt engineers general computer scientists and engineers in the fields of generative AI and deep learning Chapter 1 of this book is freely available as a downloadable Open Access PDF at <http://www.taylorfrancis.com> under a Creative Commons Attribution No Derivatives CC BY ND 4.0 license

Religion as Brand Razieh Mahdiah, 2024-11-25 Religion as Brand An Analogy to Reconceptualize Religion delves into the complex relationship between religions and brands Through a process of abstraction the book creates an analogy to compare religion with brand which clarifies the similar functionalities of both within society and explores the complexities in this comparison beyond mere semiotic aspects Through this innovative lens it unveils the common mechanisms of both phenomena and unveils fundamental incentives and needs in human being nature that are evoked and fulfilled by these two social institutions Across four diverse case studies the book examines this analogy in real world contexts and demonstrates how this approach can generate hypotheses These cases explore diverse scenarios including ISIS and Al Qaeda as sub brands of Islam the dynamic of Islam and Judaism as brands in the Israeli Palestinian conflict Ashura ceremonies as a campaign for Shi'i Islam and the narrativity of Evangelicalism as a sub brand of Christianity This thought provoking exploration generates new hypotheses and challenges preconceived notions of both religion and brand

**Computational Science - ICCS 2020** Valeria V. Krzhizhanovskaya, Gábor Závadszky, Michael H. Lees, Jack J. Dongarra, Peter M. A. Sloot, Sérgio Brissos, João Teixeira, 2020-06-19 The seven volume set LNCS 12137 12138 12139 12140 12141 12142 and 12143 constitutes the proceedings of the 20th International Conference on Computational Science ICCS 2020 held in Amsterdam The Netherlands in June 2020 The total of 101 papers and 248 workshop papers presented in this book set were carefully reviewed and selected from 719 submissions 230 submissions to the main track and 489 submissions to the workshops The papers were organized in topical sections named Part I ICCS Main Track Part II ICCS Main Track Part III Advances in High Performance Computational Earth Sciences Applications and Frameworks Agent Based Simulations Adaptive Algorithms and Solvers Applications of Computational Methods in Artificial Intelligence and Machine Learning Biomedical and Bioinformatics Challenges for Computer Science Part IV Classifier Learning from Difficult Data Complex Social Systems through the Lens of Computational Science Computational Health Computational Methods for Emerging Problems in Dis Information Analysis Part V Computational Optimization Modelling and Simulation Computational Science in IoT and Smart Systems Computer Graphics Image Processing and Artificial Intelligence Part VI Data Driven Computational Sciences Machine Learning and Data Assimilation for Dynamical Systems Meshfree Methods in Computational Sciences Multiscale Modelling and Simulation Quantum Computing Workshop Part VII Simulations of Flow and Transport Modeling Algorithms and Computation Smart Systems Bringing Together Computer Vision Sensor Networks and Machine Learning Software Engineering for Computational Science Solving Problems with Uncertainties Teaching Computational Science UNcErtainty QUantificatiOn for ComputatiOnAl modeLs The conference was canceled due to the COVID 19 pandemic

Chapter APE A Command Line Tool and API for Automated Workflow Composition is available open access under a Creative Commons Attribution 4.0 International License via [link.springer.com](http://link.springer.com)

*Systemics of Incompleteness and Quasi-Systems* Gianfranco Minati, Mario R. Abram, Eliano Pessa, 2019-06-20 This book contains the proceedings of the Seventh National Conference of the Italian Systems Society The title *Systemics of Incompleteness and Quasi Systems* aims to underline the need for Systemics and Systems Science to deal with the concepts of incompleteness and quasiness Classical models of Systemics are intended to represent comprehensive aspects of phenomena and processes They consider the phenomena in their temporal and spatial completeness In these cases possible incompleteness in the modelling is assumed to have a provisional or practical nature which is still under study and because there is no theoretical reason why the modelling cannot be complete In principle this is a matter of non complex phenomena to be considered using the concepts of the First Systemics When dealing with emergence there are phenomena which must be modelled by systems having multiple models depending on the aspects being taken into consideration Here incompleteness in the modelling is intrinsic theoretically relating changes in properties structures and status of system Rather than consider the same system parametrically changing over time we consider sequences of systems coherently We consider contexts and processes for which modelling is incomplete being related to only some properties as well as those for which such modelling is theoretically incomplete as in the case of processes of emergence and for approaches considered by the Second Systemics In this regard we consider here the generic concept of quasi explicating such incompleteness The concept of quasi is used in various disciplines including quasi crystals quasi particles quasi electric fields and quasi periodicity In general the concept of quasiness for systems concerns their continuous structural changes which are always meta stable waiting for events to collapse over other configurations and possible forms of stability whose equivalence depends on the type of phenomenon under study Interest in the concept of quasiness is not related to its meaning of rough approximation but because it indicates an incompleteness which is structurally sufficient to accommodate processes of emergence and sustain coherence or generate new equivalent or non equivalent levels The conference was devoted to identifying discussing and understanding possible interrelationships of theoretical disciplinary improvements recognised as having prospective fundamental roles for a new Quasi Systemics The latter should be able to deal with problems related to complexity in more general and realistic ways when a system is not always a system and not always the same system In this context the inter disciplinarity should consist for instance of a constructionist incomplete non ideological multiple contradiction tolerant Systemics always in progress and in its turn emergent

*Integrating Evolution and Development* Roger Sansom, Robert N. Brandon, 2007 The chapters in *Integrating Evolution and Development* not only make a case for the importance of developmental synthesis they also make significant contributions to this fast growing field of study

**RELIGION, CULTURE AND SUSTAINABLE DEVELOPMENT**

**-Volume I** Roberto Blancarte Pimentel, Robert Charles Elliot, Robert Holton , 2010-12-18 Religion Culture and Sustainable

Development is a component of Encyclopedia of Social Sciences And Humanities in the global Encyclopedia of Life Support Systems EOLSS which is an integrated compendium of twenty one Encyclopedias The Theme on Religion Culture and Sustainable Development with contributions from distinguished experts in the field discusses matters of great relevance to our world such as Religion values Culture and Sustainable Development These three volumes are aimed at the following five major target audiences University and College students Educators Professional practitioners Research personnel and Policy analysts managers and decision makers and NGOs

**Social Responsibility: Range of Perspectives Per Topics and Countries** Matjaz Mulej ,Robert G. Dyck,2015-04-30 Current global economic crises call for social responsibility to replace neo liberalistic one sided and short term criteria causing monopolies of global enterprises Humanity s existence is endangered under the threat of global capitalism unless the positive concept everyone s social responsibility impacts everyone in society becomes the basis of the new socio economic order This concept must be realized together with related concepts of interdependence and holism embodying the principles of accountability transparency ethical behavior and respect for stakeholders to support the rule of law international norms and human rights Range of Perspectives Per Topics and Countries brings forth discussions from researchers from different countries The contents of this volume include discussions related to community involvement disaster response and disease epidemics among other topics The volume also includes studies on social responsibility standards in a Mexican city as well as a discussion of social responsibility in BIRCS countries

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