Special Sessions [red room]

Special Session Alife and Society (I) *Peter Lewis, Imran Khan and Alex Penn* The ALife and Society Special Session is a meeting point for all in our community developing ALife's potential to contribute to real world societal and ecological challenges. Showcasing and discussing real world ALife applications & learning, emerging ideas & new disciplinary connections with short talks & lively discussion.	19.07.2022 11:30 CEST
Invited Talk (TBC)	19.07.2022 11:35 CEST
128. **Innovation and informal knowledge exchanges between firms** *Juste Raimbault* Firm clusters are seen as having a positive effect on innovations, what can be interpreted as economies of scale or knowledge spillovers. The processes underlying the success of these clusters remain difficult to isolate. We propose in this paper a stylised agent-based model to test the role of geographical proximity and informal knowledge exchanges between firms on the emergence of innovations. The model is run on synthetic firm clusters. Sensitivity analysis and systematic model exploration unveil a sharp transition of the role of distance on innovations, with a qualitative shift when spatial interactions are more intense. Model bi-objective optimisation shows a compromise between innovation and product diversity, suggesting trade-offs for clusters in practice. This model provides thus a first basis to systematically explore the interplay between firm cluster geography and innovation, from an evolutionary perspective.	19.07.2022 12:00 CEST
115. **A Participatory Complex Systems Modelling Approach Towards Rewilding in the UK** *Imran Khan and Christopher Sandom*	19.07.2022 12:20 CEST

108. **AgTech that doesn't cost the Earth: Creating sustainable, ethical and effective agricultural technology that enhances its social and ecological contexts** *Alan Dorin, Alexandra Penn and Jesús Mario Siqueiros García* To feed the growing human population we require increased food production and security, while using less land and causing less environmental damage. Significant changes in agriculture are needed to meet these demands. One widely touted solution is smart, AI-enhanced Agricultural Technology. In this article we argue that improved technology is insufficient to address the needs of many farmers, but that by taking a whole-of-system approach gleaned from Artificial Life we can shift towards creating sustainable, ethical and effective AgTech. This can empower industrial agriculture in developed nations and small landholders from vulnerable communities alike, whilst reducing the environmental impacts of food production globally.	19.07.2022 12:40 CEST
Special Session Alife and Society (II)	19.07.2022 14:00 CEST
122. **Detecting New Phase Transition Points in Large-Scale Numerical Simulations of an Adaptive Social Network Model** *Hiroki Sayama* Understanding social fragmentation transition, i.e., transition of social states between many disconnected communities with distinct ideas and a well-connected single network with homogeneous ideas, is a timely research topic with high relevance to various current societal issues. We had previously studied this problem using numerical simulations of adaptive social network models and found that two individual behavioral traits, homophily and attention to novelty, among others, had the most significant impact on the outcomes of social network evolution. However, our previous study was limited in terms of the range of parameter values examined, and possible interactions between multiple behavioral traits were largely ignored. In the present study, we have conducted a substantially larger-scale numerical experiment with an expanded parameter sweep range by an order of magnitude in each parameter dimension, resulting in a total of 116,640 simulation runs. To capture nontrivial interactions among behavioral parameters, we modeled and visualized the outcome dependence on parameters using neural networks. Results have shown that, while the competition between homophily (h) and attention to novelty	19.07.2022 14:00 CEST

(a) is the primary determinant of social fragmentation in a low-conformity (c) regime (left), another transition plane emerges at an intermediate homophily level in a high-conformity regime (right), which was not previously known. This implies that social homogenization may be caused by more than one behavioral mechanism.	
40. **Minimal Models for Spatially Resolved Population Dynamics – Applications to Coexistence** *Rudolf M. Füchslin, Krütli Pius, Thomas Ott, Stephan Scheidegger, Johannes J. Schneider, Marko Seric, Timo Smieszek and Mathias S. Weyland* Spatial resolution is relevant for many processes in population dynamics, because it may give rise to heterogeneity. Simulating the effect of space in two or three dimensions is computationally costly. Furthermore, in Euclidean space, the notion of heterogeneity is complemented by neighbourhood correlations. In this paper, we use an infinite-dimensional simplex as a minimal model of space in which heterogeneity is realized but neighbourhood is trivial and study the coexistence of viral traits in a SIRS – model. As a function of the migration parameter, multiple regimes are observed. We further discuss the relevance of minimal models for decision support.	19.07.2022 14:20 CEST
Panel Discussion: Closing the Loop on COVID19 Modelling Aymeric Vié, Hiroki Sayama, Steen Rasmussen, Mikhail Prokopenko	19.07.2022 14:40 CEST
Special Session Hybrid life: Approaches to integrate biological, artificial and cognitive systems (Hybrid Life V) *Manuel Baltieri, Keisuke Suzuki and Olaf Witkowski* The session focuses on hybrid methods studying artificial, living and cognitive systems, looking in particular at 1) theoretical contributions across fields (agency, adaptation, etc.), 2) systems augmentation and enhancement, and 3) interactive heterogeneous systems.	20.07.2022 10:00 CEST
Invited talk: Robotic human movement augmentation: principles, challenges, open questions *Yanpei Huang and Jonathan Eden*	20.07.2022 10:01 CEST
45. **Modeling the Cell as a Network of Parallel Processes** *Margareta Segerståhl and Boris Segerståhl*	20.07.2022 11:30 CEST

This study addresses the problem of combining insights from artificial life, artificial intelligence, and biology in an efficient way to form a holistic unified view of life and living systems. Today, the study of biological life has a common root object – the cell – although lacking a formal definition of it. The theory of artificial life and artificial intelligence lacks this type of a root object. Here, we present a generalized model of the real biological cell in terms of a framework that is derived from theoretical studies of life. The framework is conceptualized generally as the MIC framework (Metabolism, Information, Compartment). The result is an autopoietic model with generic systemic properties and a network structure that can be examined further from a formal system-theoretic perspective. This study introduces a new way of describing the cell, providing new kind of access to existing biological knowledge of life. It may provide new tools for more efficient utilization of biological data and knowledge in the design and study of artificial life.	
69. **Inside looking out? Autonomy, phenomenological experience and integrated information** *Fernando Rodriguez* One of the defining, foundational axes of enactivism was its emphasis on the necessary relation between cognition and phenomenological experience (Varela et al., 1991), assumedly rooted on the particular, organizationally recursive nature of autonomous systems (Maturana and Varela,1973; Varela, 1979, 1997).However, in spite of many advances, there is no conclusive understanding about the emergence of an experiential dimension yet; a conundrum that has lead to contrasting positions within the framework(Barandiaran, 2017; Clark, 2016; Di Paolo et al., 2017; Hutto and Myin, 2017; Abramova and Villalobos, 2015; Villalobos and Silverman, 2018). In this context, we suggest that an enactive, not fully committed interpretation of ideas from the Integrated Information Theory of Consciousness(IIT) (Tononi and Koch, 2015; Oizumi et al., 2014) may result fruitful; In particular, by making use of the formal notions of intrinsic information and integration as indicative of an intrinsic (autonomous) perspective and emergence respectively.	20.07.2022 11:50 CEST
89. **Towards Hierarchical Hybrid Architectures for Human-Swarm Interaction** *Jonas Rockbach, Luka-Franziska Bluhm and Maren Bennewitz* This contribution summarizes an integrated view on humanswarm interaction which investigates how human cognition should be joined with the distributed intelligence of robot	20.07.2022 12:10 CEST

swarms. From our perspective, a capable human-swarm hybrid that is embedded in the world can be formalized as nested agent interaction matrices that are hierarchically organized.	
Special Session Artificial Perception II (ArtPerc II) *Lana Sinapayen, Sofian Audry and Eiji Watanabe* The easiest way to investigate a complex system is to study its failures. Perception can fail in spectacular ways: auditory, tactile, or visual illusions. What can we learn from machines that fail like humans do?	21.07.2022 10:00 CEST
Invited talk by Alexander Mordvinstev, creator of DeepDream and co-creator of Neural Cellular Automata	21.07.2022 10:05 CEST
18. **Navigating blind without a map: models of active wayfinding** *Inman Harvey* Maps are useful for navigation if (i) there is adequate known detail provided on the map, (ii) your present location on the map is known as is (iii) the location of your goal. Many natural examples of successful navigation, such as seasonal bird migration across continents and oceans, lack some or all of these. Success requires some strategy for continuously governing the direction of movement according to continuous sampling of available sensory cues. If sensory cues are strictly local, an instantaneous snapshot gives insufficient guidance on the course to steer. Some form of active perception is needed, where motion gives rise to cues as to whether the current course needs to change. We illustrate with one old and two novel examples of increasing complexity: (A) Run-and-Tumble strategies, such as used by e. Coli, allowing the detection of local gradients. (B) Swerve-Zone, a novel artificial life model of bird migration showing how region-wide cues, even in the absence of discernible local gradients, can nevertheless still guide. And (C) Parting-the-Waves, a proposed strategy for exploiting the wave patterns underlying long-distance steering by Micronesian navigators, showing how the boat motion is essential for discriminating between swells. All three depend on some default motion; when stationary, you cannot sense where the goal lies. They exploit motion in different ways, but all simplify navigational search into tractable forms apparently amenable to evolution.	21.07.2022 10:35 CEST
34. **En route for implanting a minimal chemical perceptron into artificial cells**	21.07.2022 10:55 CEST

Pasquale Stano, Giordano Rampioni, Andrea Roli, Pier Luigi Gentili and Luisa Damiano This paper describes a potentially rewarding research program aimed at designing, modeling, analyzing and experimentally realizing artificial cells in the wetware domain endowed with a neural network-like module for achieving minimal perception. In particular, the possible implementation of a bacterial signaling network based on phosphorylation is presented (dubbed as “phospho-neural network” by Hellingwerf and collaborators in their 1995 discussion). Although only preliminary discussions are possible at this initial level, they need to be based on the state-of-the-art of contemporary artificial cell technology, minimizing unrealistic assumptions. This contribution is intended as a sort of plan for the construction of next-generation artificial cells.	
47. **Modelling a Common Cognitive Bias and a Simple Heuristic to Overcome it** *Michael Vogrin, Guilherme Wood and Thomas Schmickl* We emulated an experiment that shows the Einstellung-effect by building an agent-based model and demonstrate a heuristic that helps to overcome the effect.	21.07.2022 11:10 CEST
Special Session Artificial Life Journal *Alan Dorin and Susan Stepney* During this session a selected number of Authors will present their recent work published in the Artificial Life Journal.	22.07.2022 10:00 CEST
Opening remarks *Susan Stepney*	22.07.2022 10:01 CEST
Life Worth Mentioning: Complexity in Life-Like Cellular Automata *Eric Peña, Hiroki Sayama*	22.07.2022 10:20 CEST
A Comprehensive Conceptual and Computational Dynamics Framework for Autonomous Regeneration Systems *Tran Nguyen Minh-Thai, Sandhya Samarasinghe, Michael Levin*	22.07.2022 10:45 CEST
The Impossibility of Automating Ambiguity *Abeba Birhane*	22.07.2022 11:10 CEST

Network-Based Phase Space Analysis of the El Farol Bar Problem *Shane St. Luce, Hiroki Sayama*	22.07.2022 11:35 CEST