

# Future Perspectives In Artificial Life

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# Artificial Life

*“...the study of man-made systems that exhibit behaviors characteristic of natural living systems.”*

Christopher Langton

Understanding general aspects of living systems is made difficult by the fact that *“life as we know it”* only occurs in a single (biochemical) implementation.

By creating artificial systems that exhibit life-like properties in other substrates, we can start to understand *“life as it could be”*.

# Artificial Life

	origins of life	autonomy	self-organization	adaptation	evolution	development	learning	behavior	ecology	artificial societies	computational biology	artificial chemistries	information	living technology	philosophy	art
soft																
hard																
wet																
hybrid																

Aguilar et al. 2014

# Artificial Life Conferences

ALIFE 2016	Cancun	
ECAL 2017	Lyon	
ALIFE 2018	Tokyo	30 <sup>th</sup>
<b>ALIFE 2019</b>	<b>Newcastle upon Tyne</b>	<b>31<sup>st</sup></b>
ALIFE 2020	Montreal	32 <sup>nd</sup>
ALIFE 2021	Prague	

# The 2019 Conference on Artificial Life

“How Can Artificial Life Help Solve Societal Challenges?”



Newcastle-upon-Tyne

29<sup>th</sup> July – 2<sup>nd</sup> August 2019 <http://2019.alife.org/>

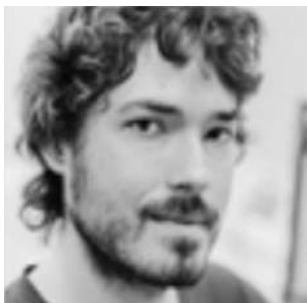
# ALIFE 2019 Organizers



**Harold Fellermann**  
General chair



**Rudolf Fuchslin**  
Programme chair



**Angel Goni Moreno**  
Sustainability Chair  
and Submissions



**Jaume Bacardit**  
Copy Editor



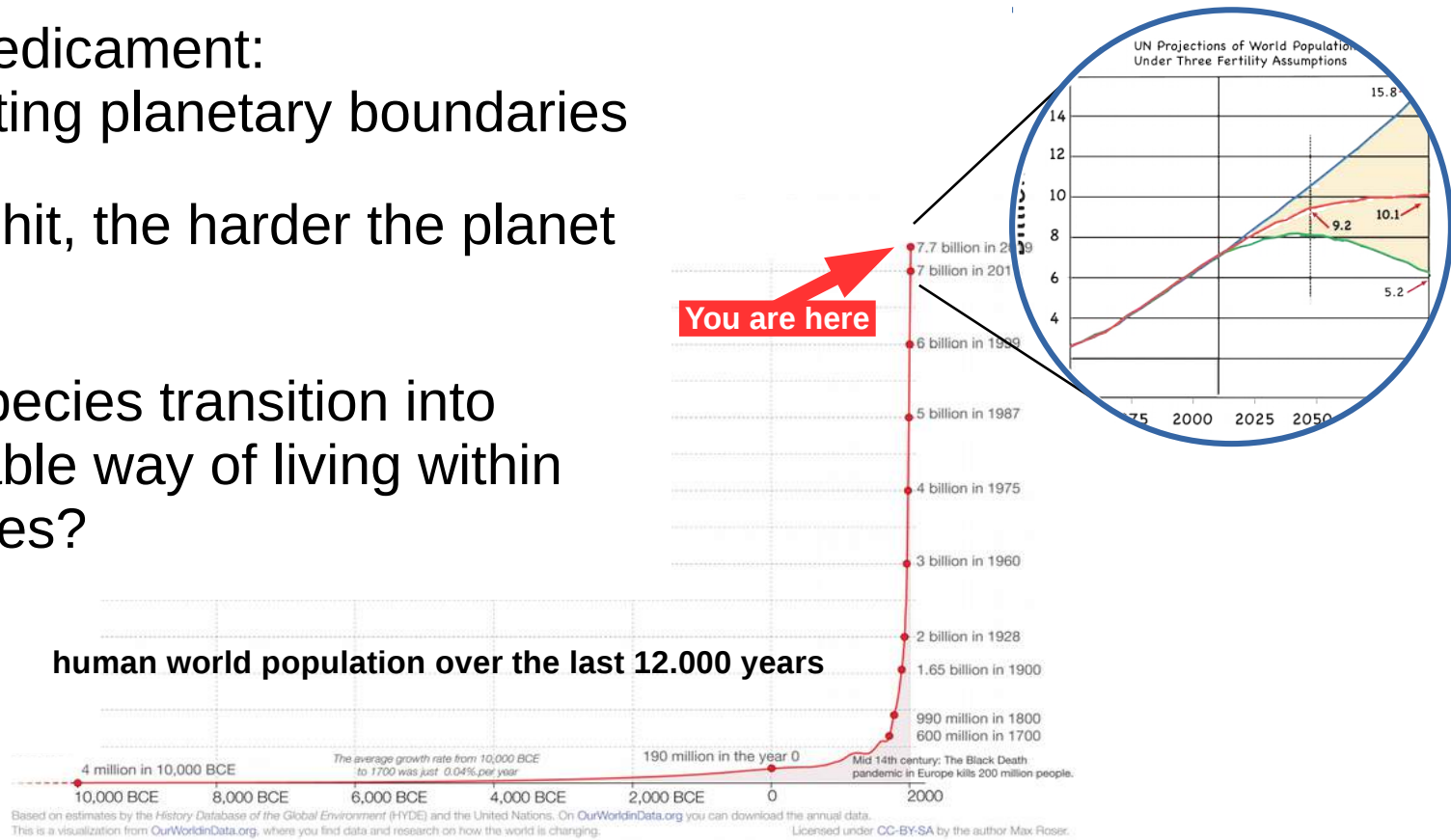
**Ben Shirt-Ediss**  
Technical chair



**Andrew Lawson**  
Head Local Organiser

# "How Can Artificial Life Help ~~Solve~~ Tackle Societal Challenges?"

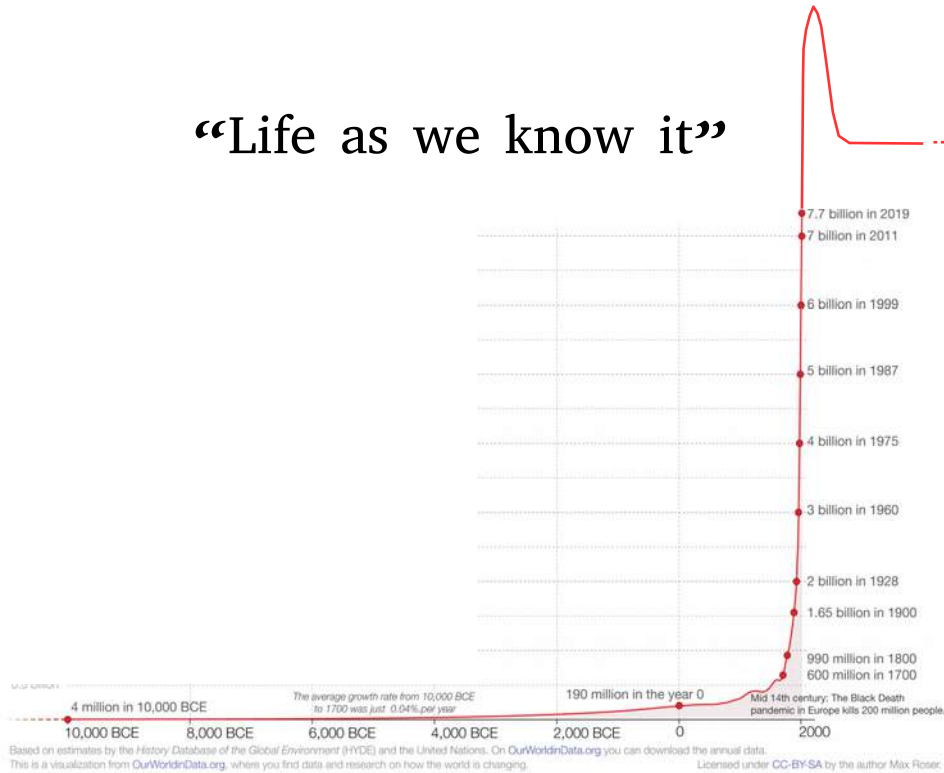
- The Human Predicament: Humanity is hitting planetary boundaries
- The harder we hit, the harder the planet hits back...
- Can we as a species transition into a truly sustainable way of living within these boundaries?



# Artificial Life in a Challenged World

“Life as we know it”

“Life as it could be”



- high mortality
- resource exploitation
- growing wealth gap

- low fertility
- circular economy
- social justice
- piece



# Artificial Life in a Challenged World

## What can ALIFE bring to the table?

- system thinking and inter-disciplinarity
- appreciation for ecological interactions
- non-linear analysis toolbox
- agency, social dynamics & simulation
- experience with natural, artificial and cultural evolution
- The Alife spirit: *out-of-the-box* and *pie-in-the-sky* thinking

# ALIFE 2019 Societal Sessions



Workshop on Evolution of  
Human Behaviour

Intelligent Systems for Smart Cities  
tutorial

Computational Approaches to  
Social Dynamics Workshop

ALife & Society special session



The 4<sup>th</sup> Workshop on Social  
Learning and Cultural Evolution

ALife & Social Sciences sessions



Workshop on Agent-Based  
Modelling of Human Behaviour

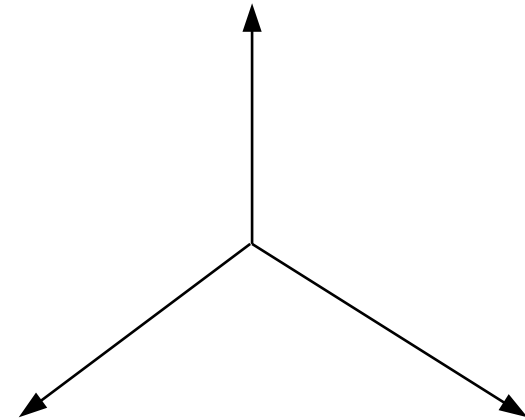
Toward Low-Carbon Academic Life-  
Styles breakout discussion

# How Can Artificial Life Help Tackle Societal Challenges?

## Alex Penn's "Living Keynote"



epistemological & theoretical



problems & applications

methods & techniques

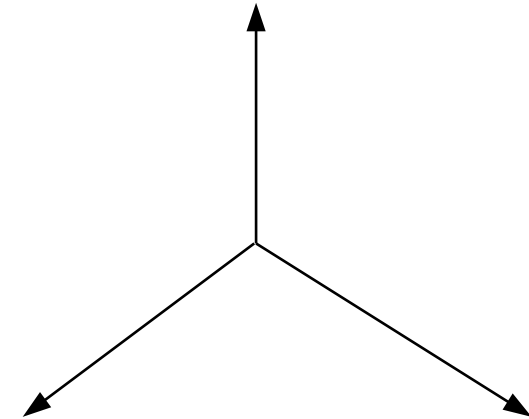
# How Can Artificial Life Help Tackle Societal Challenges?

- Context, systems, holistic thinking
- Alternative metaphors as thinking devices (e.g. organic vs. machine; OEE vs Evolution)
- Alternative forms of organisation (*x as it could be*)
- Messiness is not something we like to eliminate but we embrace
- Evolutionary grown vs rationally designed solutions
- ...

**epistemological & theoretical**

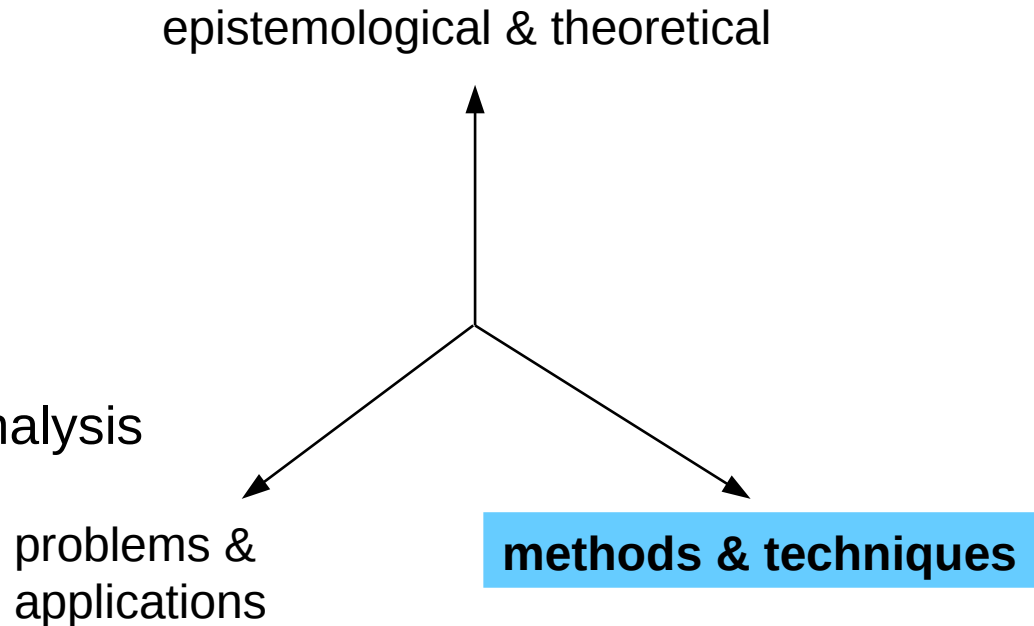
problems &  
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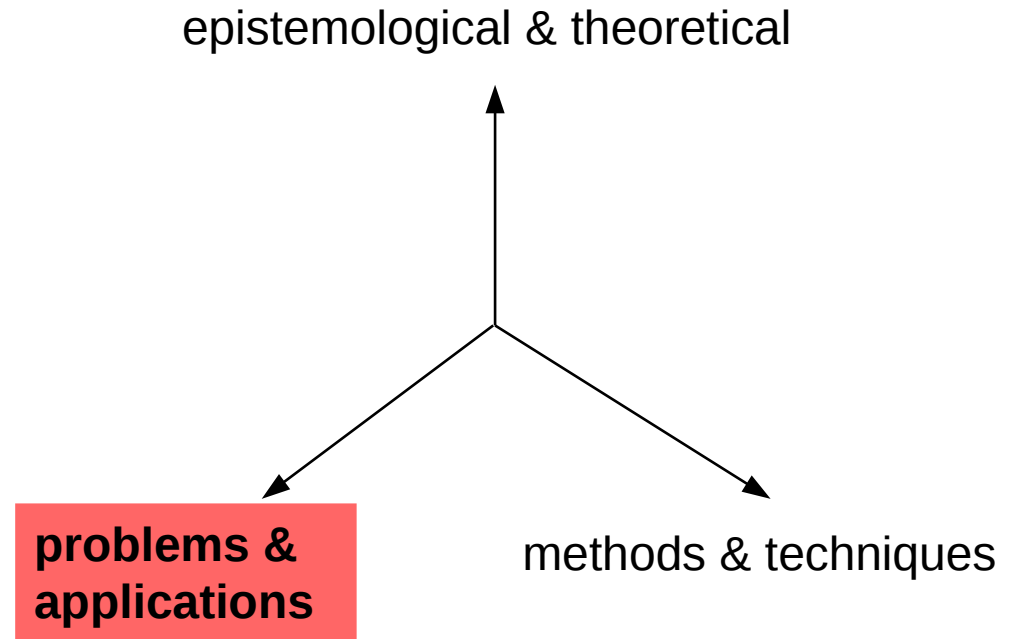
# How Can Artificial Life Help Tackle Societal Challenges?

- Modelling methodologies guided by our conceptual underpinning
- Incredibly rich modelling toolbox
- Purposes of modelling
  - Communication device
  - Thought reframing device
  - Experimentation and scenario analysis
- ...



# How Can Artificial Life Help Tackle Societal Challenges?

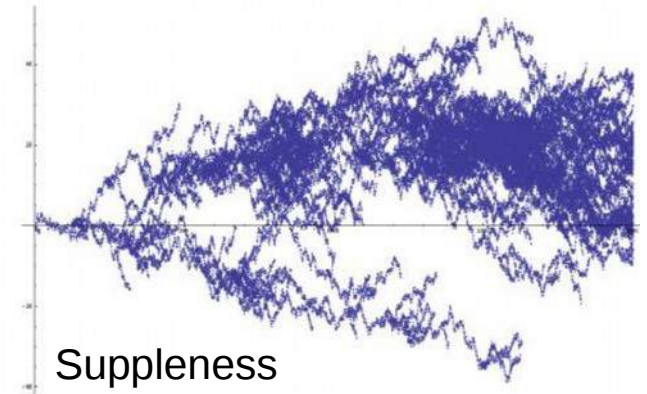
- Society & technology interactions
- Governance models
- Open source biotech
- Education
- ...



# Example: Suppleness and Open-Endedness for Social Sustainability by Hiroki Sayama

Sustainability based on robustness or resilience (as typical for conservatism) is not compatible with evolution, let alone open-ended evolution.

Suppleness, the ability to continually and creatively adapt to environmental changes might provide a better conceptual grounding.



# A Demonstrator for Sustainable Conferencing

- ALIFE 2019 allowed for and encouraged remote participation
- streaming of most conference presentations
- satellite seminars in Tokyo, East Lansing & Mexico City
  
- plastic free, meat-reduced catering
- reduction of printed materials
- low-waste, reusable merchandise



# A Demonstrator for Sustainable Conferencing

## Virtual Participation:

*Delegates:* ~200 in-situ, 9 remote, ~50 in satellite seminars

*Streaming views:* ~130 views by ~70 unique viewers (for a typical keynote presentation)

*Train travel:* 15 claimed discounts by international delegates

→ **aviation-related CO2 reduction 9.6% – 41%**

**Catering-associated waste reduction:** e.g. over 3,000 cups replaced by reusable tumblers

**Print material reduction:** estimated 15,000 pages (95.7%) replaced by online only schedule, program and book of abstracts

Practices now shared with professional services, other organizers, Max Plank Society

# Trends in Artificial Life

## **Open-Ended Evolution**

still one of the major driving questions  
still no show stopper demonstrator

## **Origin of life, protocells & Synthetic biology**

strong “droplet” community  
interesting work on diverse dissipative structures

## **ALIFE and Society**

cities as organisms, open-endedness and conservationism  
scalability of our analytical methods

# Trends in Artificial Life

## **Machine Learning**

numerous studies incorporate deep learning approaches

## **Robotics**

strong developments in cognitive, evolutionary, bio-inspired, soft, self-replicating robotics, a.s.o.

## **Hybrid Life**

interesting works that bridge the classic ALIFE subfields of wet, soft, and hard

# Trends in Artificial Life

- Community is as young and enthused as ever!
- Why does Artificial Life not share the recent success of Artificial Intelligence?
- Why are there so few applications of Artificial Life?
- Is the field becoming too diverse? Would we benefit from a new set of guiding questions?