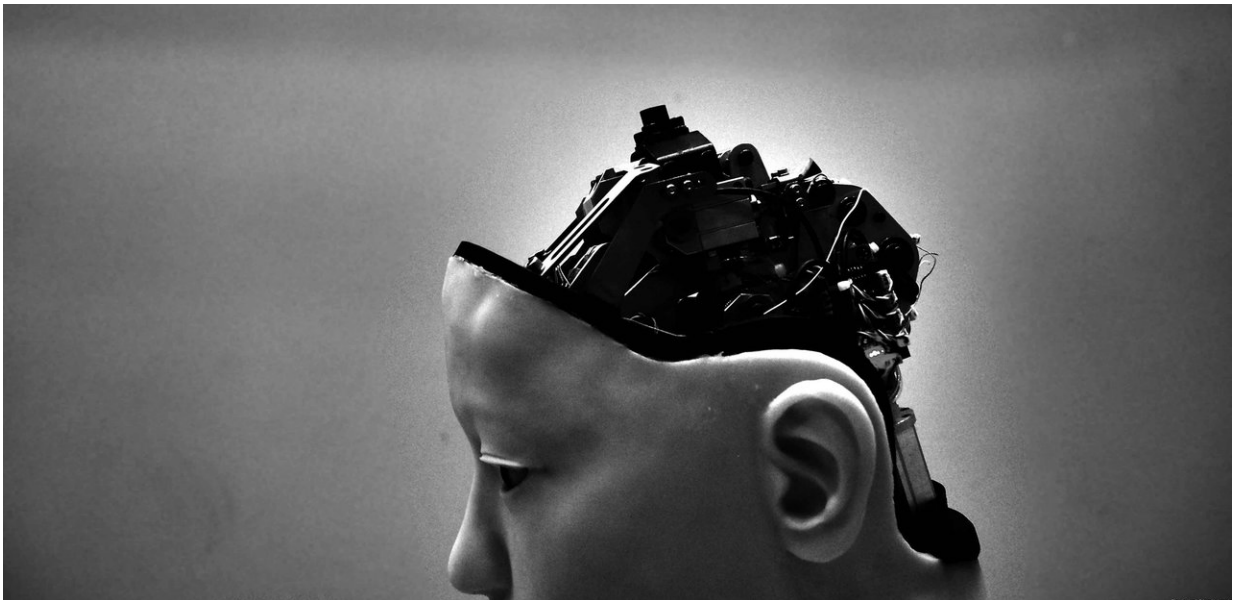


Allusive machines: How new technologies could shape beliefs and theories about life

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Alter, an upper-body android developed by professors Takashi Ikegami and Hiroshi Ishiguro, based on artificial neural networks. Credit: Jannik Friberg Lindegaard.

Two researchers at the IT University of Copenhagen have recently carried out a fascinating study that introduces the concept of "allusive machines," exploring how technical systems can persuade users into shaping their own beliefs, particularly beliefs related to the nature of life. This notion is inspired by previous studies that described technology as instruments of persuasion, with the explicit purpose of changing

human attitudes and behavior.

"Nowadays, [life](#) is not only being manipulated in laboratory practices that study living things – cells and genes – frozen, manipulated, distributed, and exchanged, but life has also become a target for digital simulation and bioinformatic representation, abstracted in computer software," Jannik Friberg Lindegaard, one of the researchers who carried out the study, told *TechXplore*. "I am curious to explore what kind of a thing life might be in our contemporary moment in history."

Researchers in the fields of bioengineering, synthetic biology and artificial life are currently working on manipulating organic and inorganic matter to develop new life forms. Emerging practices such as cloning, reproductive biology, animal breeding and stem cell research are raising complex questions about what could be considered as life, non-life, and death. In fact, in these instances, life is not considered as something universally given, but rather as something that can be actively designed, synthesized and created inside a lab.

"Scientists can now assemble new life forms from bits and pieces of biological materials in test tubes and petri dishes, as well as cardboard, silicone, plastic, nylon, and other artificial, non-carbon materials," Lindegaard said. "Some of the new sciences of the artificial—such as synthetic biology or artificial life—actively fabricate new living things to probe the margins of life, questioning seemingly commonsense terms such as 'natural' and 'unnatural,' 'biological' and 'artificial.' I was driven to view the scientific instruments that these scientists use to apprehend 'life' as things that necessarily change their capacities for experiencing and knowing what life is and how it works."

Lindegaard's project is based on the idea that 'life itself,' or at least its theoretical notion, has somewhat changed after the advent of new technologies, which are now being used to study life and perhaps

redefine its meaning. These technologies include tools such as maps, computer simulations, equations, diagrams, robots and androids, all used by scientists to examine life and try to understand its essence.

"My current research particularly focuses on how contemporary artificial life researchers – usually émigrés from biology, chemistry, physics, computer science, mechanical and electrical engineering, who resolve that the best way to know life is to make it—fabricate, study, and explore 'life-as-it-could-be,'" Lindegaard said. "Making life, they believe, opens new possibilities for knowing it and therefore yield better theories."

Lindergaard and his supervisor Lars Rune Christensen are particularly interested in how different models of reasoning, description, theories, technologies and machines can shape the way in which humans conceptualize and understand life. His work is based on the assumption that the ontology of life (what life is) cannot be separated from the ways in which researchers describe it, hence its definition will need to be renegotiated over time.

"I am interested in how life is scaled and calibrated, so to speak, to the human range, as contemporary artificial life researchers reach for new ways to describe it, that is, searching for ways to make life known to us," he explained.

The concept of "allusive machines," presented in a [paper published on ACM Digital Library](#), was developed by Lindergaard during nine months of ethnographic fieldwork among artificial life researchers at the University of Tokyo.

"As I came to look over the shoulders of those who seek to make 'life' apprehensible, knowable and thinkable by fabricating new media, 'living technologies' and life forms, I came to think of them as allusive

machines: material media through which these researchers became aware not of the falseness of their knowledge, but of its partiality, serving to establish and displace new horizons of possibility," Lindergaard said. "These things, I reckoned, did not persuade them that life is this or that, but simply suspended them in relays of allusion, in which they could articulate fresh, speculative, and open-ended accounts of life, without any positive assurance that what they had experienced or interpreted from the things they had made was exhaustive."



Alter, an upper-body android developed by professors Takashi Ikegami and Hiroshi Ishiguro, based on artificial neural networks. Credit: Jannik Friberg Lindegaard.

To better explain the notion of allusive machines, Lindergaard refers

back to the 1950s, when cyberneticists viewed the universe and its inhabitants as a global system of communication, with feedback loops and input-output circuitries. This point of view was partly inspired by the things they built at the time, such as artificial tortoises and homeostatic machines, which were used to theorize the relations between organisms and their environment, body and mind, life and non-life, etc.

In the 1980s and 1990s, new computational technologies allowed artificial life researchers to simulate life in computer software, allowing them to model evolutionary and reproductive processes in virtual worlds. According to Lindergaard, both cybernetics of the 1950s and artificial life studies carried out a few decades later enabled new ways to make life visible, audible and tangible, shaping scientists' knowledge of life.

"Today, in the so-called 'postgenomic age' or 'synthetic age,' robots and androids serve as yet another medium for apprehending life and its workings, operating as technical and material indices for human apprehensions of life and lifelikeness," Lindergaard said. "Robots, androids, and other types of machines operate as experimental tools that assist in shaping new conceptions of what counts as life today, if not altogether changing what qualifies as life."

Lindergaard perceives robots, androids and embodied objects that can interact with humans as allusive, meaning that they hint at new spaces of possibility and modes of reasoning, by stirring up our imagination. Rather than persuading humans or offering insight about how the world works, he sees them as things with which scientists and others bounce off ideas, in order to articulate new theories and meanings of life.

Focusing on Alter, an upper-body android based on artificial neural networks, Lindergaard's study showed how machines become allusive to human thinking and acting. He observed that the researchers who had developed Alter were not necessarily convinced that life could take hold

inside machines, but rather that Alter would persuade them to think of life in cybernetically inflected ways.

"These artificial life researchers say that Alter is 'programmed not to be programmed,' an entity not within human control, a possible aperture through which to imagine life outside its biological moorings," Lindergaard said. "For them, Alter did not provide evidence of artificial life, offering fidelity to 'real life' or something designed to denounce biology, but was instead a material entity enabling them to think against the biological framework in which life is usually articulated."

In this context, therefore, Alter could be considered as an allusive machine, helping researchers to articulate life and its underpinnings in ways that differ from traditional biological approaches, which assume that organic compounds are the physical basis of all living things. In other words, interacting with Alter allowed artificial life researchers to develop new views of life based on their own perceptions and subjective experiences, rather than on previously established schemes.

"At this point, it's hard to say what the practical implications of this study will be in the future," Lindergaard said. "At the moment, I'm mostly concerned with finding appropriate ways to describe and represent my experiences in the field in order to do justice to those artificial life researchers who have been so kind to let me into their world, into the labs."

In the future, Lindergaard hopes that his study will help to refine our understanding of how theories and beliefs are connected with new technologies and material objects. This could ultimately shed light on how people form beliefs, theories, and knowledge about life.

"Perhaps the most potent finding is that artificial life researchers, among other things, fabricate new living things, such as Alter, in order to better

articulate what life is and how it works," Lindergaard said. "By doing so, these things become allusive machines that materialize new possibilities for creating new meanings of life – not simply as something 'out there,' a transcendent quality outside human comprehension, but something articulated through allusive machines that allows artificial life researchers and their audiences to apprehend glimpses of vitality and hatch new ideas, by making life both materially explicit and interpretively available."

During his fieldwork, Lindergaard concluded that although life is by definition unstable and seemingly impossible to pin down, it also has a social history, a human history of instruments, institutions, theories and technologies that collectively shape how we come to understand what it was, is, and might become. After finishing his Ph.D., he hopes to continue his scientific inquiries into the mysteries of artificial life and death.

"Admittedly, in between doing this anthropology of [artificial life](#), and maybe as an extension of it, I have been thinking about doing some sort of anthropology of 'artificial' death, more precisely as expressed in practices such as cryonics," Lindegaard said. "I guess this would complete the cycle, if there is one."

More information: Jannik Friberg Lindegaard et al. Allusive machines, *Proceedings of the 10th Nordic Conference on Human-Computer Interaction - NordiCHI '18* (2018). [DOI: 10.1145/3240167.3240189](#)

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