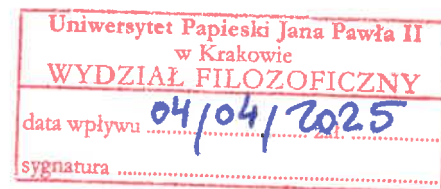




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Evaluation of the scientific works submitted for the habilitation degree under the title "Informational environments as evolutionary scaffolds: the natural history of cognitive artefacts" by Dr. Hajo Greif

Dr. Hajo Greif submitted the following list of published works as a scientific achievement in the field of philosophy. The monograph "Environments of Intelligence: From Natural Information to Artificial Interaction" (1), published by Routledge, London in 2017, serves as the primary work. This monograph is supplemented by four single-authored papers published in well-recognised philosophical journals:

- (2) "What is the Extension of the Extended Mind?" *Synthese*, 194.11, 2017: 4311-4336;
- (3) "Affording Illusions? Natural Information and the Problem of Misperception". *Avant. Trends in Interdisciplinary Studies*, 10.3, 2019: 1-21;
- (4) "Adaptation and its Analogues: Biological Categories for Biosemantics". *Studies in History and Philosophy of Science*, 90, 2021: 298-307; and
- (5) "Likeness-Making and the Evolution of Cognition". *Biology & Philosophy*, 37, 2022.

These works are supplemented by the self-written summary of a research work ("Autoreferat"). As described by the candidate in this document, the publications collectively form the basis for the habilitation degree procedure under the title "Informational Environments as Evolutionary Scaffolds: The Natural History of Cognitive Artefacts". The "Autoreferat" is well-structured, carefully prepared, and it effectively demonstrates the connections between the submitted works, facilitating the evaluation process.

Regarding **formal requirements**, the Routledge publisher is listed among the recognised academic publishers in the official scientific publishers list (Komunikat Ministra Edukacji i Nauki z dnia 22 lipca 2021 r. w sprawie wykazu wydawnictw publikujących recenzowane monografie naukowe). The same applies to the journals, where the aforementioned works (2-5) were published (Komunikat Ministra Nauki z dnia 05 stycznia 2024 r. w sprawie wykazu czasopism naukowych i recenzowanych materiałów z konferencji międzynarodowych). **Therefore, I confirm that the presented works are in line with the recommendations for the candidates to the habilitation degree** (art. 267 ustawy z dnia 20 lipca 2018 r. Prawo o szkolnictwie wyższym i nauce, ust. 2 pkt 2).

When it comes to the **evaluation of the importance and the contribution** of the presented works to the discipline (philosophy), my opinion is undoubtedly positive.

First, all the works submitted for the evaluation form a consistent series of publications concerning the philosophical aspects of information environments and cognitive artefacts. As the author points out in the "Autoreferat"—the contribution to the discipline lies in the philosophical side of 4E Cognition. In this respect, the main work is naturally the monograph. Here, the author navigates very fluently between the wide scope of theories presented and convincingly presents various approaches to the concept of information, information environment, and cognitive artefacts. Importantly, the author's contribution is clearly marked and discussed against the background of previous works. The monograph offers an in-depth analysis of the concept of information and a novel approach to the informational environment and cognitive artefact. I agree with the author's diagnosis presented in the "Autoreferat" that the approach presented (in the monograph and in the papers) is pluralistic and multi-layered.

The core of the proposal is a novel concept of informational environments (Chapter 6). The concept is an effect of the integration and refinement of already existing ideas from the broadly taken subject literature. The informational environment comprises proximal signals, natural or artificial, which, under normal conditions, relate to distal conditions that are ecologically relevant to the agent (see p. 97). As presented in the monograph, the resulting concept is productive in the sense that it allows us to explain how (and why) information in the environment may be relevant to the ecological needs of agents understood as situated beings. It also allows for describing how informational environments change.

The monograph also offers an author's concept of the cognitive artefact, which is closely linked to the one of informational environments (Chapters 8 and 9). The author proposes a wide approach to cognitive artefacts, which allows incorporating memory aids of various sorts, computers and other digital artefacts, but also books, memory aids, and even speech, music, and rituals under this term. The main novel contribution here is the argument presented showing the capacity of such artefacts for changing informational environments and thus the integration of this concept into the proposed framework of situated agents' environments.

To sum up this part of the review, the core concepts of the monograph already exist in the subject literature, but the author presents their extended and novel versions, which are integrated into one consistent framework. This framework is an important contribution to the domain of philosophy. Additionally, it establishes certain interdisciplinary connections (by linking the 4E approach with biological concepts, like niche construction), and as such, it may play an inspiring role for other disciplines, like cognitive science.

Here, I would also like to point out that I find Chapter 9 of the monograph—where the analyses are focused on artificial agents and their informational environments—especially interesting. Here, the terminology established in previous chapters of the monograph is applied to artificial entities such as cognitive robots, social robots, online game avatars, and augmented reality. For the social robots part, I am wondering how—from today's perspective—the author evaluates his idea presented on p. 156 concerning the participation of social robots in a non-blinded version of Turing's imitation game. How do modern social robots fit the proposed idea? Also, what about non-embodied agents involved in

the game—particularly large language models, which are now eagerly involved in various versions of the Turing test?

As for the papers submitted with the monograph, two of them were the basis for chapters in the monograph. One should stress, however, that this fact is clearly marked in the book and in the “Autoreferat” and the papers are more detailed than the respective chapters in the book.

“What is the Extension of the Extended Mind?” (2) is the earliest work from the submitted works (as it has been available ‘online first’ since 2015). Here, the author explores the Extended Mind Hypothesis and develops an argument for the grounding of environmentally extended cognitive traits in evolved biological functions. This paper is the basis for Chapter 7 of the monograph. Thus, its contribution to the discipline and novelty is already discussed above.

The same applies to paper (3) “Affording Illusions? Natural Information and the Problem of Misperception”. Here, the author is discussing Gibson’s ecological theory of visual perception, which leads to the argument that perceptual illusions actually help an organism to correctly perceive an affordance. This argumentation (especially Section 4, “Perceptual Illusions”) matches the one in the monograph (Chapter 3, section “Perceptual illusions vs. misperception: the empirical strategy”). I see this paper (and the respective monograph chapter) as an exploration of certain consequences of the introduced concept of the information environment. The novel contribution of this argumentation to the philosophical debates is the idea that perceptual illusions might possess or acquire ecologically relevant functions.

I believe that the main reason why these works are included in the submitted application proposal (especially (2)) is to present their impact in terms of bibliometric parameters—see the review below.

Another two papers may be treated as a natural extension of the topics discussed in the monograph. “Adaptation and its Analogues: Biological Categories for Biosemantics” (4) explores biological analogies in the biosemantics programme in the philosophy of mind. The argument here addresses the concept of cognitive artefacts as introduced in (1) and the author points out that the current functions of certain artefacts may differ from those which were the reason why they appeared in human prehistory.

“Likeness-Making and the Evolution of Cognition” (5) is a voice in the discussion of the question of what made our cognitive abilities special in the animal kingdom. This may be perceived as the continuation of the considerations about early human artefacts. The author forms an interesting argument focused on the so-called likeness-making and points at the role of the Palaeolithic engravings and figurines as the artefacts acting as material scaffolds in the development of collective practices of symbolic reference-making.

Both (4) and (5) continue and expand the issue of cognitive artefacts. The contribution of the presented arguments to philosophy lies mainly in the fact that they show how these artefacts are rooted in the evolutionary history of humans. I think that these papers also show how pluralistic and multi-layered is the approach to the topic of informational environments and cognitive artefacts.

When it comes to the bibliometrics of the evaluated works, I consider it satisfactory. As of 25th March 2025, the most cited work (according to Google Scholar) is "What is the Extension of the Extended Mind?" (cited 55 times). Other works have 5 citations ("Environments of Intelligence. From Natural Information to Artificial Interaction" and "Affording Illusions? Natural Information and the Problem of Misperception") while "Adaptation and its Analogues: Biological Categories for Biosemantics" has only one.

Additionally, what I see as a clear strong point of the submitted works is that all of them are available in open access.

It should be stressed here that the author himself openly discusses the location of this work on the map of various scientific disciplines (it is present in the monograph and "Autoreferat"). He manages to argue that the philosophical contribution is clear, which I find convincing. I also agree with the author that the potential impact of the work reaches beyond philosophy, e.g. to cognitive science or anthropology. "What is the extension of the extended mind?" was noticed even by researchers from the human-robot interaction field (see e.g. Ustunel, Z., & Gunduz, T. (2017). Human-robot collaboration on an assembly work with extended cognition approach. *Journal of Advanced Mechanical Design, Systems, and Manufacturing*, 11(5), or Christen, N., & Neustein, A. (2023). The missing links between computer and human languages: animal cognition and robotics. In *AI, IoT, Big Data and Cloud Computing for Industry 4.0* (pp. 479-524). Cham: Springer International Publishing).

Conclusion. As a whole, I assess the presented works dedicated to informational environments as evolutionary scaffolds as achievements that **significantly contribute to the development of philosophy** (especially to the ongoing debate on 4E cognition). The scientific achievements of Dr. Hajo Greif **fully meet the requirements specified in appropriate regulations** (art. 267 ustawy z dnia 20 lipca 2018 r. Prawo o szkolnictwie wyższym i nauce, ust. 2). The conclusion of my evaluation of the works submitted under the title "Informational environments as evolutionary scaffolds: the natural history of cognitive artefacts" is **positive**. Thus, I support the continuation of the subsequent stages of this habilitation procedure.


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